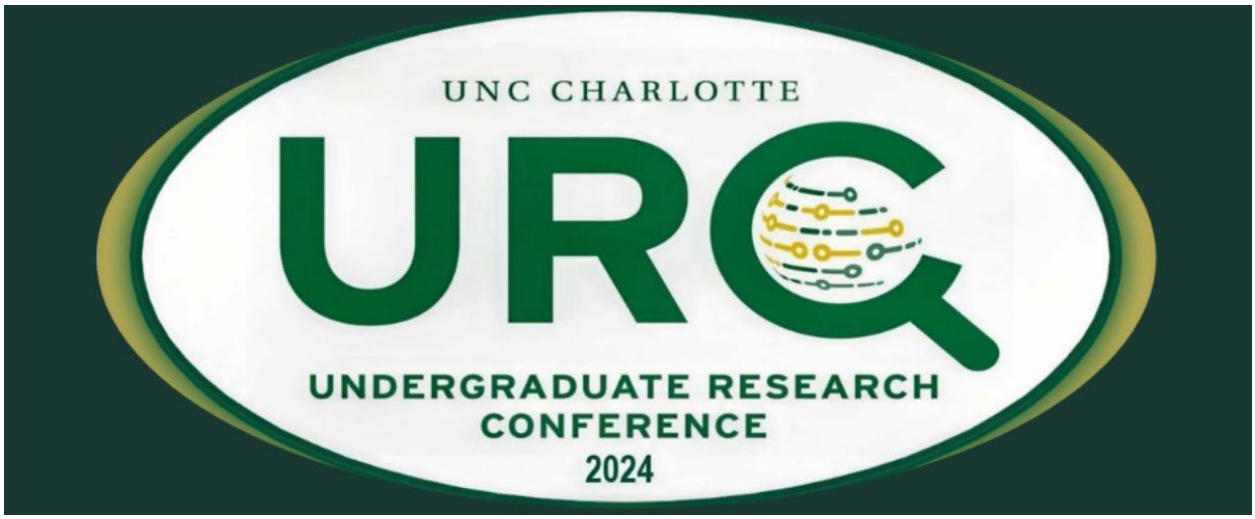
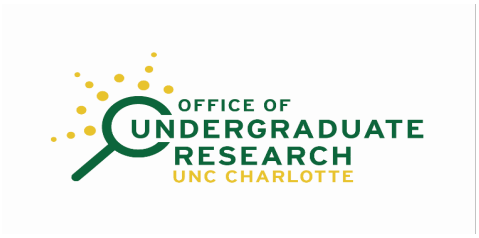


URC 2024

Abstract Book

12 April 2024

Popp Martin Student Union



UNIVERSITY OF NORTH CAROLINA
CHARLOTTE

Welcome to the 2024 Undergraduate Research Conference (URC) at UNC Charlotte! The URC conference is one of the highlights of each academic year. The URC is an important vehicle to showcase research projects completed by undergraduate students at all levels from the colleges and departments in the University.

I would like to thank the Office of Undergraduate Research, Division of Research, Honors College, and Levine Scholars Program for helping to organize and sponsor the URC. Thank you, as well, to the faculty mentors who have helped to support and guide the diverse set of research projects presented at the URC. The conference is vital to UNC Charlotte as it expands opportunities and promotes academic success for undergraduate students through community engagement, innovation, mentored scholarship, creative expression, and entrepreneurship. Students who participate in the URC are rewarded with a rich experience that goes beyond classroom applications and helps to launch them into careers as alumni.

Congratulations to the undergraduate students presenting at the URC 2024! As students, you read about the products of research in your courses all the time. You use and benefit from the products of research on a daily basis. But taking the opportunity to work with faculty in the field or in their labs, studios, and programs means that you have taken advantage of the best of what a research university like Charlotte offers. You get to participate in the process of discovery. What you learn may eventually end up in someone else's textbook or may lay the groundwork for new technology. Whether that happens or not, you also had a valuable experience and acquired important research skills; you learned to define a problem, frame researchable questions, develop the methods to address the questions, carry out a systematic study, analyze your findings, and then communicate your findings in a public format.

Participating in the URC will serve you well in the future. For many students, undergraduate research is a pathway to career success. Getting involved in undergraduate research may lead you to an internship or graduate school. Niner alum who have gone before you got their start at the URC and are now making a local-to-global impact in their respective fields. UNC Charlotte is committed to your success! On behalf of the faculty mentors that you work with, I want to add that we are proud of the research and creative endeavors that you are presenting today. We can't wait to see where this opportunity takes you in the future.

Go Niners!

Jennifer Troyer
Provost and Vice Chancellor for Academic Affairs

Office of Academic Affairs
9201 University City Blvd.
Charlotte, NC 28223
704.687.5717
provost.charlotte.edu

URC 2024

Welcome to the 2024 UNC Charlotte Undergraduate Research Conference (URC)! The URC 2024 is brought to you by UNC Charlotte's Office of Undergraduate Research (OUR). The URC reflects one of the goals of the OUR, which is to support undergraduate students through opportunities to communicate their research to the wider community. Thank you to Academic Affairs, the Division of Research, the Honors College, the Levine Scholars Program, the Mu Chapter of the Phi Beta Delta (PBD) Honor Society for International Scholars, the Phi Kappa Phi (PKP) Honor Society, Sigma Xi Honor Society, and urbanCORE for sponsoring the URC 2024 and presentation awards.

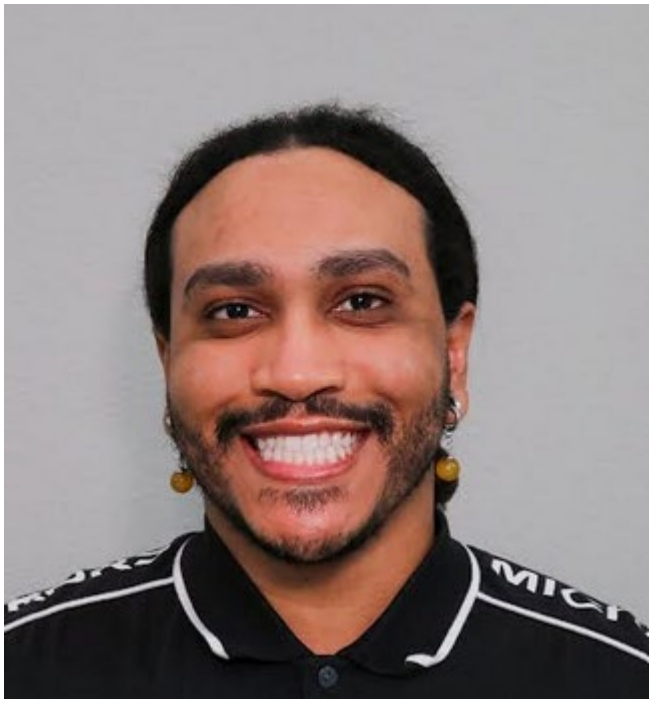
URC 2024 is a hybrid conference that includes a virtual component. Please encourage family, friends, alumni, and others to visit the URC Symposium site: symposium.foragerone.com/urc2024. The URC would not be possible without the commitment of our UNC Charlotte faculty. The conference has a strong representation from faculty members who participate as research mentors and judges. The URC also represents the dedication of UNC Charlotte's staff and graduate students, who also serve as mentors and judges. A big thank you to the faculty, staff, and graduate students for your service and dedication to undergraduate research, creativity, and scholarship. Likewise, special recognition goes to the staff in the Office of Undergraduate Research, the URC Student Leadership Team, and the conference organizing committee who all played integral parts in the planning for URC 2024. Most of all, please join us in congratulating our undergraduate researchers for their hard work and efforts! Now engage in the conference presentations, take pictures, and use the #NinerURC24 to share your URC moments on social media. At the end of the conference, please complete the URC 2024 Evaluation and Feedback form, which is located at: https://tinyurl.com/CharlotteURC24. Enjoy the URC 2024!

Dr. Erik Jon Byker, Chairperson of the URC 2024 Organizing Committee
and Faculty Fellow in OUR

URC 2024 Organizing Committee Members

Dr. Lance Barton, Director, Office of Undergraduate Research
Dr. Sarah Powell, Associate Director, Office of Undergraduate Research
Ms. Sarah Hedrick, Administrative Assistant, Office of Undergraduate Research
Ms. Emma Wakeman, Graduate Assistant, Office of Undergraduate Research
Dr. Abasifreke Ebong, William States Lee College of Engineering
Dr. Colleen Hammelman, College of Humanities & Earth and Social Sciences
Dr. Didier Dréau, College of Science
Dr. Heather Smith, Director of the Levine Scholars Program
Dr. Jeffrey Leak, Honors College
Dr. Luke Donovan, College of Health and Human Services
Dr. Megan Smith, College of Health and Human Services
Dr. Michelle Pass, College of Science
Dr. Mohsen Dorodchi, College of Computing and Informatics
Mr. Ryan Harris, J. Murrey Atkins Library
Dr. Tamara Johnson, Director of Engaged Scholarship, urbanCORE
Ms. Tiffany Wilson, Levine Scholars Program
Ms. Kirsten Gade, Graduate student, College of Humanities & Earth and Social Sciences
Undergraduate Student Leaders:
Mariana Gracia Akshara Sisodiya Sindhu Gadiraju

Featured Alum Keynote Speaker



Keynote Speaker: Dante Gil Rivas

Dante Gil Rivas was born in Santo Domingo, Dominican Republic, and raised in Charlotte, NC. He graduated Cum Laude from UNC Charlotte in 2021 with a Bachelor of Arts in Architecture, a minor in Urban Studies, with Arts and Architecture Honors, and from the Martin Scholars Program. During his time at UNC Charlotte, he studied in Tokyo, Japan, in 2019 and worked at the Integrated Design Research Lab at the School of Architecture. These experiences inspired Dante to pursue a Master of Architecture at Rice University, supported by a full tuition award. At Rice, he received the Morris R. Pitman Award in Architecture in 2022 to research sustainable architecture in Denmark, Sweden, and Norway and worked in Boston, Massachusetts at Payette. Wanting to broaden his global experiences, in 2023, he studied in Paris, France, and worked in Singapore at HKS. Dante now awaits graduation in May 2024.

URC 2024 Awards and Sponsors

URC Poster Printing Sponsor	URC Poster and Oral Presentation Awards	Community-Engaged Research Awards	Honors College Awards
DIVISION OF RESEARCH	OFFICE OF UNDERGRADUATE RESEARCH UNC CHARLOTTE	URBANCORE	HONORS COLLEGE
Mu Chapter of Phi Beta Delta (PBD) Global Research Award	**Phi Kappa Phi (PKP) Awards**	**Sustainability Awards**	**Sigma Xi STEM Awards**
ΦΒΔ SCIENTIA MUTUA MUNDI	THE HONOR SOCIETY OF PHI KAPPA PHI ΦΚΦ	LEVINE SCHOLARS	ΣΞ

URC 2024 Schedule

Monday, April 8, 2024

8AM: The URC 2024 Symposium system opens to the public. University community members are invited to view and comment on the presentations. We recommend searching by author's name or abstract number. For more details, please visit: symposium.foragerone.com/urc2024

Friday, April 12, in the Popp Martin Student Union

8:30 AM: URC 2024 Registration opens outside of the 340 Ballroom

9:15 – 10 AM: **Opening Ceremony and Keynote Speech in the 340 Ballroom**

Fanfare for Innovation performed by UNC Charlotte Trumpet Ensemble
Composer - Eli Mathew (freshman BM in Composition)
Directed by Dr. Eric Millard
Dr. Erik Jon Byker, Chair of URC 2024
Dr. Lance Barton, Director of the Office of Undergraduate Research (OUR)
Mariana Gracia, Introduction of Keynote Speaker
Dante Gil Rivas, Keynote Speaker, UNC Charlotte Alum and Martin Scholar

*Thank you to the Honors College and the OUR for sponsoring the Keynote

10:15 AM – 1:45 PM: **Research Presentation Sessions**

Poster and Creative Arts Presentation Sessions in the 340 Ballroom

10:15 AM – 11:15 AM:	Poster and Creative Arts Session A
11:30 AM – 12:30 PM:	Poster and Creative Arts Session B
12:45 PM – 1:45 PM:	Poster and Creative Arts Session C*

*****At the conclusion of Session C, please breakdown the easel and put on the floor next to where you presented. Thank you.

Oral Presentation Sessions in the 200 Level Rooms of the Popp Martin Student Union

10:30 AM -12 PM:	Arts & Humanities – Room 261
10:30 AM - 1:15 PM:	History & Social Science - Room 262
10:30 AM - 12:15 PM:	Health Sciences - Room 263
10:30 AM - 1 PM:	Applied Science - Room 265
10:30 AM - 1 PM:	Biological Sciences 1 - Room 266
10:30 AM - 1 PM:	Biological Sciences 2 - Room 267

Panel Sessions in the 200 Level Rooms of the Popp Martin Student Union

12:30 PM - 1:30 PM:	Community Engaged Research - Room 261
12:30 PM - 1:30 PM:	Sustainability Research - Room 263

2 PM – 3 PM: Closing Ceremony and Presentation of Awards in the 340 Ballroom**

Dr. Erik Jon Byker, Chair of URC 2024
Dr. Sarah Powell, Associate Director of the Office of Undergraduate Research
Blaire Gardner, OUR Scholar, Class of 2024
Dr. Deb Thomas, Division of Research
Dante Gil Rivas, Keynote Speaker with Closing Reflections

Presentation of URC 2024 Awards
Dr. Erik Jon Byker, OUR Poster and Oral Presentation Awards
Dr. Didier Dréau, Biological Sciences Awards
Dr. Tamara Johnson, Community Engaged Research Awards
Profesora Susana Cisneros, Global Research Award
Dr. Stephanie Norander, Phi Kappa Phi (PKP) Awards
Dr. Christine Richardson, Sigma Xi Awards
Ms. Tiffany Wilson, Sustainability Awards
Mr. Jordan Boyd, Honors College Awards

**At the conclusion of the Awards Ceremony, we asked that all winners remain in the 340 Ballroom for further instructions about group pictures. Much thanks to Ryan Honeyman for providing photography for the URC 2024.

3 PM – 4PM: Reception to follow in the 200 Room of the Popp Martin Student Union

Thank you, again, to all the faculty members, staff, and graduate students who served as mentors and URC judges. Thank you to the URC Student Leadership team for all your help with the conference organization. The reception is in honor of you!

ORAL SESSIONS

10:30 AM – 1:15 PM

Oral Presentation Session A: Arts & Humanities
Room 261

10:30 AM: Abstract #900 - Interpreting Penthesilea of the Achilles-Penthesilea Sarcophagus by Hollie Rode; Mentor: Dr. Jim Frakes, College of Arts + Architecture

10:45 AM: Abstract #901 - From 'I Cain't Say No' to 'Astonishing': An Analysis of Golden Age to Contemporary Musical Theatre by Abigail Williams; Mentor: Dr. Jay Grymes, College of Arts + Architecture

11:00 AM: Abstract #902 - Dua Lipa and *Levitating*, A Trio of Lawsuits by May Smith; Mentor: Dr. Jay Grymes, College of Arts + Architecture

11:15 AM: Abstract #903 - In the Shadows: The Place of the Tenor Saxophone in Solo Classical Music by Gavin Foley; Mentor: Dr. Jay Grymes, College of Arts + Architecture

11:30 AM: Abstract #904 - The Value of Impermanence in Japanese Aesthetics by Samantha Fine; Mentor: Seirin Nagano, College of Humanities & Earth and Social Sciences

11:45 AM: Abstract #905 - Exploring Kamen Rider Fan Alters: Religious Expressions of Superhuman Power and Community Values by Jared Spears; Mentor: Dr. Alexandra Kaloyanides, College of Humanities & Earth and Social Sciences

Oral Presentation Session B: History & Social Sciences
Room 262

10:30 AM: Abstract #906 - Reforms in Saudi Arabia and their Social, Legal, and Economic Impact on National & non-National Women, 2015-2023 by Carrigan Marlowe; Mentor: Dr. Hania Al-Shamat, College of Humanities & Earth and Social Sciences (CHESS)

10:45 AM: Abstract #907 - Interconnection: Is Believing and Seeing Connections in the World & Between the Self, Others and Nature Linked to Well-Being? by Kryschelle Fakir; Mentor: Dr. Amy Canevello, CHESS

11:00 AM: Abstract #908 - Understanding How Diverse Demographics Influence the Communication Consultant Experience and Desired Areas for More Support by Audrey King, Cayla Avant, & Sonia Pacheco Mejia; Mentor: Dr. Heather Bastian, University College

11:15 AM: Abstract #909 - Exploring the Impact of Communication Consultants: An Analysis of Student and Consultant Perspectives by Meenu Murugan & Ysabelle Blaine; Mentor: Dr. Heather Bastian, University College

11:30 AM: Abstract #910 – Evaluating the United States Role in the 1981 Cancún Summit by Ashley Alcivar Conteron; Mentor: Dr. Jurgen Buchenau, CHESS

11:45 AM: Abstract #911 - The Political Economy of Policing by Sofia Fuentes; Mentor: Dr. Martin Shuster, CHESS

12:00 PM: Abstract #912 – Isolation and Resilience: Understanding Loneliness in Aging LGBTQ+ Communities by Angel Medina; Mentor: Dr. Megan Smith, CHESS

12:15 PM: Abstract #913 - Shadows of Intervention: Unveiling U.S. Culpability in the Angolan Famine 1975-2002 by Riley Griffin; Mentor: Dr. Jill Massino, CHESS

12:30 PM: Abstract #914 - Long-Term Side Effect to a Short-Term Solution: Disciplinary Action's Negative Impacts on Future Political Participation by Sasha Sembur; Mentor: Dr. Martha Kropf, CHESS

12:45 PM: Abstract #915 - Examining How to Live Sustainably in the Peruvian Amazon by Alicia Ramirez; Mentor: Dr. Erik Jon Byker, Cato College of Education

1:00 PM: Abstract #916 - Influence of Controlling Images on Black Adolescent Sexuality and Institutional Interactions: A Critical Analysis by Kennedy Brooks; Mentor: Dr. Shanice Jones Cameron, CHESS

Oral Presentation Session C: Health Sciences
Room 263

10:30 AM: Abstract #917 – An Intervention for Peer-lead Sexually Transmitted Infection Education among Older Adults; by Sarah Tesar; Mentor: Dr. Megan Smith, College of Humanities & Earth and Social Sciences (CHESS)

10:45 AM: Abstract #918 - The Influence of Body Weight on HbA1c when Predicting Diabetes in Active Older Adults by Samantha Webb; Mentor: Dr. Trudy Moore-Harrison, College of Health and Human Services (CHHS)

11:00 AM: Abstract #919 - Addressing Mental Health in Older Adult Minorities by Maya Dove; Mentor: Dr. Meredith Troutman-Jordan, CHHS

11:15 AM: Abstract #920 - The Impact of Doula Care on Black Maternal Mortality: A Review of the Literature by AnnaMarie Rohrs; Mentor: Dr. Melinda Adnot, University College (UCOL)

11:30 AM: Abstract #921 - Disability and Literacy Awareness in Patient Education: A Literature Review by Alyssa Cain; Mentor: Dr. Melinda Adnot, UCOL

11:45 AM: Abstract #922 - America's Public Health Crisis: A Transgenerational Analysis of Black Maternal and Infant Mortality by Jordan McDaniel; Mentor: Dr. Melinda Adnot, UCOL

12:00 PM: Abstract #923 - Gender Disparities within Nursing by Zaneta Yanzu; Mentor: Dr. Melinda Adnot, UCOL

Oral Presentation Session D: Applied Sciences
Room 265

10:30 AM: Abstract #924 - Image Edge Detection and Filtering Using Classical Geometric Kernels and Canny by Anubhav Nimesh Bhadoria; Mentor: Dr. Xingjie Li, College of Science

10:45 AM: Abstract #925 - Degradation of Polyfluorinated Substances with nano Zero Valent Aluminum by Emily Hayden; Mentor: Dr. Jordan Poler, College of Science

11:00 AM: Abstract #926 - Characterization of poly(vbTMAC) through Extinction Coefficient and Size at Various Lengths and Solutions by Dhairya Desai;
Mentor: Dr. Jordan Poler, College of Science

11:15 AM: Abstract #927 - Unveiling the Thermal Stability of Sodium ion Batteries using Accelerating Rate Calorimetry by Ean Bass, Reece McCloskey & Michael Chak; Mentor: Dr. Lin Ma, College of Science

11:30 AM: Abstract #928 - Synthesis of Novel Voltage-Sensitive Dyes for the Future of Action Potential Imaging by Katie Hale; Mentor: Dr. Michael Walter, College of Science

11:45 AM: Abstract #929 - Quantum Trajectories of an Electron in Confined Volume by Steven Murphy; Mentor: Dr. Donald Jacobs, College of Science

12:00 PM: Abstract #930 - Investigating Neurophysiological Responses to Emotional Videos: A Multi-Biomarker Study Using the Database of Emotional Videos from Ottawa (DEVO) by Michael Gonzalez & Amber Mossembekker; Mentor: Dr. Vishnu Girishan Prabhu, College of Science

12:15 PM: Abstract #931 - Improving Thermal Imaging as a Tool to Study Waste Heat in *C. elegans* by Kegan Heaney; Mentor: Dr. Susan Trammel, College of Science

12:30 PM: Abstract #932 - Design of a Hybrid Offshore Wind Farm on Lake Michigan by Melissa Zeleznik & Cody Williams; Mentor: Dr. Arun Vishnu Suresh Babu, College of Science

12:45 PM: Abstract #933 - A Mathematical Study of Iterative Methods for Solving Linear Equations by Dominic Kealoha & Fabiola Rojas; Mentor: Dr. Xingjie Li, College of Science

Oral Presentation Session E: Biological Sciences 1
Room 266

10:30 AM: Abstract #934 - Quantification of Aquatic Viruses in Marine Hydrothermal Vent Ecosystems by Ruthie Freedman; Mentor: Dr. Elaine Luo, College of Science

10:45 AM: Abstract #935 - Understanding Salt Adaptation with Metabolomics in Sand Beans by Mark Mistretta; Mentor: Dr. Bao-Hua Song, College of Science

11:00 AM: Abstract #936 - Quercetin as a potential topoisomerase II inhibitor to induce double-stranded DNA breaks in female mice ovaries by Lidia Say; Mentor: Dr. Christine Richardson, College of Science

11:15 AM: Abstract #937 - Screen of Natural Compounds to Identify Those that Produce Chromosomal Translocations in Mouse Embryonic Stem Cells by Elizabeth Toufekoulas; Mentor: Dr. Christine Richardson, College of Science

11:30 AM: Abstract #938 - Investigating the Role of Mincle in Staphylococcal Osteomyelitis by Aiza Noyal; Mentor: Dr. Ian Marriott, College of Science

11:45 AM: Abstract #939 - *Nematostella vectensis* Response to Cell Free Supernatant by Rachel Showers; Mentor: Dr. Adam Reitzel, College of Science

12:00 PM: Abstract #940 - An analysis of the flexural strength of *Parasteatoda tepidariorum* gumfoot line silk by Ella Kellner; Mentor: Dr. Sarah Stellwagen, College of Science

12:15 PM: Abstract #941 - Creating the Model Cell Line for Studying Seckel Syndrome by Sarah Nipper; Mentor: Dr. Junya Tomida, College of Science

12:30 PM: Abstract #942 - The effect of CXCL12-based chemokine heterodimerization on CXCL12-CXCR4 driven breast cancer cell migration by Samuel Schmid; Mentor: Dr. Irina Nesmelova, College of Science

12:45 PM: Abstract #943 - Biodiversity and Community Composition of Macroinvertebrates in Southern Louisiana Saltmarshes: Effects of a Freshwater Diversion by Winnie Yao; Mentor: Dr. Paola López-Duarte, College of Science

Oral Presentation Session F: Biological Sciences 2
Room 267

10:30 AM: Abstract #944 - RIG-I promotes protective type I interferon production by human glial cells during bacterial meningitis by Krishna Majithia;
Mentor: Dr. Brittany Johnson, College of Science

10:45 AM: Abstract #945 - Cytosolic Nucleic Acid Receptor-Mediated Detection of *Staphylococcus aureus* Contributes to Protective Interferon Responses in Primary Murine Osteoblasts by Mary-Kate Key; Mentor: Dr. Brittany Johnson, College of Science

11:00 AM: Abstract #946 - Understanding the Hsp70 Client Code by Ashley Choi;
Mentor: Dr. Andrew Truman, College of Science

11:15 AM: Abstract #947 - Understanding the Role of Hsp70 Phosphorylation on Cell Integrity Signaling in Yeast by Elizabeth Abedi; Mentor: Dr. Andrew Truman, College of Science

11:30 AM: Abstract #948 - Exploring the Role of Farnesylation on the Yeast Co-chaperone Ydj1 by Ainella Rysbayeva; Mentor: Dr. Andrew Truman, College of Science

11:45 AM: Abstract #949 - Targeting Triple-Negative Breast Cancer: IL8-CXCR2 Inhibition and ROS Suppression by Isabele Dimino; Mentor: Dr. Didier Dréau, College of Science

12:00 PM: Abstract #950 - Reactive Oxygen Species and NLRP3 Inflammasome Activation in Macrophages by Kyra Raphael; Mentor: Dr. Didier Dréau, College of Science

12:15 PM: Abstract #951 - Investigating Copy Number Variations of Immune System Genes using Droplet Digital PCR by Nishi Patel; Mentor: Dr. Danillo Augusto, College of Science

12:30 PM: Abstract #952 - Role of METTL3 in Permissiveness of Pancreatic Cancer Cells to Oncolytic Vesicular Stomatitis Virus by Jacob Hawkins;
Mentor: Dr. Valery Grdzelishvili, College of Science

12:45 PM: Abstract #953 - Investigating the Roles of Telomerase RNA (TR) Structural Domains on TR Structure and Telomerase Activity in the Parasitic Protozoan, *Trypanosoma brucei* by Prashant Jha; Mentor: Dr. Kausik Chakrabarti, College of Science

PANEL SESSIONS

12:30 – 1:30 PM

Panel Session: Community Engaged Research
12:30pm-1:30pm - Room 261

Title: Community-Engaged Research: Co-producing Transformative Solutions in Charlotte

Panel Moderator: Dr. Tamara Johnson, Director of urbanCORE

Panel Session Description: Community-engaged research is an approach that requires building collaborative, trusting relationships with Charlotte-area community partners. Research questions and methodologies are often co-constructed, and research results are often used to inform or address societal issues and challenges. Establishing mutually beneficial research relationships with community partners takes time and care. Panelists explain how they navigate challenges and opportunities throughout the research process, and discuss how their work shaped them as scholars.

Panel Members

Jeffrey Wang is a double major in computer science and music, and is one of four community incubator fellows with UrbanCORE working to serve and engage underserved Charlotte communities identified under the Corridors of Opportunity program. This is his first semester as a fellow, during which the program is focusing on the Sugar Creek/I-85 corridor. The fellows are working to build a community engaged public space for youth with a focus on arts and culture. They are also conducting case studies in the area of health and wellness, diversity and inclusion in education/skills development, and multi-use space development. Keeping their influence local, they are working with Julius L. Chambers High School, near UNC Charlotte, to maintain perspectives and engagement from those that call the area home.

Rae Gordon has been involved in an ongoing assessment of Mecklenburg County's food system since 2021 as an OUR research assistant. Through this work, he has used statistical data to highlight the experiences of individuals struggling with food security within the county and presented this to city officials alongside his mentor. This past year, he has assisted in collecting and analyzing community conversations in partnership with local organizations across the city to gain a more in-depth understanding of residents' experiences with, and beliefs about, the food system and food insecurity. He is currently an early entry student into the dual Masters in Public Health and Medical Anthropology program here at Charlotte. He plans to continue addressing health disparities in these programs and beyond and believes that addressing systemic and social determinants of health should be done by highlighting community voices and experiences, creating community partnerships, and continuing advocacy for equity.

Kayla Walker is a third-year undergraduate student majoring in Public Health and Mathematics. Throughout her time at UNC Charlotte, Kayla has worked with the Holistic Opportunity Program for Everyone (HOPE) Initiative, an academic-public health partnership through UNC Charlotte and Mecklenburg County Public Health Department. This project works to integrate behavioral health services in the WIC and Family Planning Clinics to meet the holistic needs of individuals in public health settings. Through this opportunity, Kayla has had the chance to present at local, state, and national conferences and publish a peer reviewed article in the Health Services Research Journal. Kayla hopes to continue additional community-engaged research throughout the rest of her undergraduate career.

Panel Session: Sustainability Research
12:30pm-1:30pm - Room 263

Title: UNC Charlotte at the Forefront: A Panel on Amplifying Local Voices in Climate Change Solutions

Panel Moderators: Surasya Guduru, Mia Jammal, & Krish Karri, UNC Charlotte Student Leaders for the Charlotte Youth Climate Change Symposium (CYCC)

Panel Session Description: in an era where climate change continues its global destruction at an increasing rate, research and advocacy are imperatives. Using an action research methodology (Putman & Rock, 2019), the panel features a discussion among campus organizations focused on climate health, research-informed action, and sustainability. The panel examines multifaceted challenges and opportunities for mobilizing student support towards sustainable environmental actions, and includes an exploration of current sustainability trends, innovative strategies for increasing student engagement, and effective methods of climate-justice advocacy.

Panel Members

Mackenzie Smart and Jessica Martinez are officers in the Sustainable Development Goals Club at UNC Charlotte. Mackenzie Smart graduated with a Bachelor's degree and Summa Cum Laude Honors from UNC Charlotte in May 2021 with a major in Religious Studies and a minor in Legal Studies. She founded The Sustainable Development Goals (SDG) Club in March of 2021. She is currently focused on growing The SDG Club and working with its members on many different educational events. Jessica Martinez is the current President of the SDG Club and a junior at UNC Charlotte.

Randall Grant is part of UNC Charlotte's Office of Sustainability. Randall is a senior at UNC Charlotte majoring in Biology with strong interests in sustainability and environmental science. Randall is a Sustainability Aide with UNC Charlotte's Office of Sustainability and is heavily involved in the development, planning, and implementation of various sustainability initiatives across UNC Charlotte's campus. Randall is also a U360 Business Sustainability Intern with Manomet with the intent to further his interests at the intersection of business and sustainability advocacy. In the future, he intends to play a role in paving the way toward a thriving society that prioritizes eco-consciousness.

Alex Willis is a student leader representing the Undergraduate Public Health Association at UNC Charlotte. Alex is a Public Health major with a minor in Health and Medical Humanities. Alex is a founding member and currently acting president of the Undergraduate Public Health Association. Alex has completed an internship with the Rowan County Environmental Health Department last Fall. After graduation from UNC Charlotte, Alex is preparing to attend The University of South Carolina's Arnold School of Public Health to obtain a Master's in Public Health (MPH) with a focus on infectious disease epidemiology.

CREATIVE ARTS
&
POSTER SESSIONS

10:15 AM – 1:45 PM

Creative Arts Presentations
340 Ballroom, Popp Martin Student Union

Note: Presentations can be viewed on the URC Symposium site. Please search by author's name or abstract number. For more details, please visit: symposium.foragerone.com/urc2024

Session A: 10:15am - 11:15am

Abstract #801 - *George Michael* by Sarah Vojnovich; Mentor: Aspen Hochhalter, College of Arts + Architecture

Abstract #807 - *Angel Hands* by Caroline Walls; Mentor: Jessica 'JB' Burke, College of Arts + Architecture

Abstract #808 - *Faux Bug* (2023) by Maya Hutagalung; Mentor: Jessica 'JB' Burke, College of Arts + Architecture

Abstract #809 - *Wanderings: Italy* by Suzanne Voigt; Mentor: Aspen Hochhalter, College of Arts + Architecture

Session B: 11:30am - 12:30pm

Abstract #804 – *Sam* by Lisa Mirisola; Mentor: Andrew Leventis, College of Arts + Architecture

Abstract #805 - *(in)Visible* by Zoe Turner; Mentor: Aspen Hochhalter, College of Arts + Architecture

Session C: 12:45pm - 1:45pm

Abstract #800 – *Serpent* by Ruby Clemmons; Mentor: John Hairston, College of Arts + Architecture

Abstract #802 – *Disturbing the Fenghuangs* by Hypnos Chhabra; Mentor: Jessica 'JB' Burke, College of Arts + Architecture

Abstract #803 – *Universe Inside of Me* by Jazmine Chance; Mentor: Anna Kenar, College of Arts + Architecture

Abstract #806 – *The Fragility of Memory* by Kelli Crockett; Mentors: Andrew Leventis & Aspen Hochhalter, College of Arts + Architecture

Poster Research Presentations
340 Ballroom, Popp Martin Student Union

Note: Presentations can be viewed on the URC Symposium site. Please search by author's name or abstract number. For more details, please visit: symposium.foragerone.com/urc2024

Session A: 10:15am - 11:15am

Abstract #100 - Communication-aware Multi-Robot Coordination by Ian Gao; Mentor: Dr. Wenhao Luo, College of Computing & Informatics

Abstract #101 - Discounted and Dismissed: The Gender Bias in Pain Management for Women Undergoing IVF Treatment by Quinn Smith;
Mentor: Dr. Margaret Quinlan, College of Humanities & Earth and Social Sciences

Abstract #102 - Investigating and Comparing Sustainable Development Goal #14 in Germany and the USA by Cole Cummings, Banks Russell, and Emmanuel Lemus Murillo;Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #103 - The Paper Chase Program Evaluation by Alexander Willis; Mentors: Dr. Alicia Dahl & Dr. Jessamyn Bowling, College of Health & Human Services

Abstract #104 - Phytochemicals for Sustainable Agriculture and Environment by Haeden Poslinski; Mentor: Dr. Bao-Hua Song, College of Science

Abstract #105 - Navigating the Intersection of Artificial Intelligence and Surgery: A Literature Review by Ishan Patel; Mentor: Dr. Melinda Adnot, Honors College

Abstract #106 - ION (I/O Navigator): Guiding Users to Optimal I/O Performance by Arnav Sareen; Mentor: Dr. Dong Dai & Chris Egersdoerfer, College of Computing & Informatics

Abstract #107 - "A Revolution Begins In A Million Pink Bedrooms:" Riot Grrrl and Feminism in the 1990s by Katelyn Kerr; Mentor: Dr. Jill Massino, College of Humanities & Earth and Social Sciences

Abstract #108 - Centrality Measures in Social Networks by Elif Su; Mentor: Dr. Erik Saule, College of Computing & Informatics

Abstract #109 - Quantifying Microplastic Concentration in Surface Water and Sediments in Urban Stormwater and Beaver Ponds by Jordan Landis; Mentor: Dr. Sandra M. Clinton, College of Humanities & Earth and Social Sciences

Abstract #110 - Investigating and Comparing Sustainable Development Goal #2 in Germany and the United States by Gautam Das, Belmin Ramic, and Trey Alston; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #111 - Prototyping a Distributed yet Coordinated Multi-Drone Network by Davy Hallihan & Robert Thomas; Mentor: Dr. Ran Zhang, William States Lee College of Engineering

Abstract #112 - Understanding the Role of YDJ1 Acetylation in Regulating Protein Translation by Ishaan Koradia; Mentor: Dr. Andrew Truman, College of Science

Abstract #113 - Exploring Cesarean Section Practices: A Comparative Literature Review of South America and the USA by Elisabeth Becker Mentor: Dr. Melinda Adnot, Honors College

Abstract #114 - Tandem Duplications and their Contribution to Variation and Gene Expression in *D. santomea* and *D. yakuba* by Emma Fredericks;
Mentor: Dr. Rebekah Rogers, College of Computing & Informatics

Abstract #115 - “Friends of Camp Greene”: Jewish Life in Charlotte during WWI by Blaire Gardner; Mentor: Dr. Heather Perry, College of Humanities & Earth and Social Science

Abstract #116 - To Tax or Not to Tax?: The Relationships between Tax Policy and Economic Inequality in the U.S. by B Fulton & Nastia Kowalski;
Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #117 - Investigating and Comparing Sustainable Development Goal # 6 in Germany and the United States by Tatyana Torres, Agrani Bhusal, & Aadi Nair;
Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #118 - Off-road Terrain Mapping using Vehicle Inertial Measurements for Unmanned Ground Vehicle Energy Optimal Path Planning by Nguyen Nguyen;
Mentor: Dr. Artur Wolek, William States Lee College of Engineering

Abstract #119 - Obtaining FRET-derived distance constraints for the Sleeping Beauty Transpososome by Matthew Goldstein; Mentor: Dr.Irina Nesmelova, College of Science, School of Data Science

Abstract #120 - The Role of Diet and Exercise in the Treatment of Polycystic Ovarian Syndrome by Sumayyah Elkhouly; Mentor: Dr. Melinda Adnot, Honors College

Abstract #121 - Implementation and Evaluation of Equitable Practices in an Introductory Computer Science Course by Kaitlyn Gosline; Mentor: Dr. Nadia Najjar, College of Computing & Informatics

Abstract #122 - A Continued Assessment of Mecklenburg County's Food System by Rae Hallow-Gordon; Mentor: Dr. Nicole Peterson, College of Humanities & Earth and Social Sciences

Abstract #123 - "Handle with Care": Gender, Balikbayan Boxes, and Filipina Migrants in the United States, 1973-2016 by Noelle McDermott; Mentor: Dr. Ella Fratantuono, College of Humanities & Earth and Social Sciences

Abstract #124 - Investigating and Comparing Sustainable Development Goal #16 in Germany and the United States by Krista Van Dyke, Jada Pickering, and Alex Brito; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #125 - Type 1 Interferons Decrease Differentiation of Primary Murine Osteoblasts by Raina Hemmings; Mentor: Dr. M. Brittany Johnson, College of Science

Abstract #126 - Power and Performance Analysis of AI models on NVIDIA Grace Hopper Superchips by Alvajoy Asante; Mentor: Dr. Tyler Allen, College of Computing & Informatics

Abstract #127 - Actualized, Experiential, Critical Skill Development Modules on Permanent Themes in History by Abigail Leonard; Mentor: Dr. Oscar Lansen, College of Humanities & Earth and Social Sciences

Abstract #128 - Investigating and Comparing Sustainable Development Goal #3 in Germany and the United States by Ghalon Chisley, Asia Reid, and Rafiq Greene; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #129 - Tuberculosis: Unveiling the Biology, Societal Dimensions, and Empirically Informed Interventions by Alex Litovchenko; Mentor: Dr. Adam Johnson, College of Humanities & Earth and Social Sciences

Abstract #130 - The Role of Pattern Recognition Receptors (PPRs) in Detection of Nucleic Acid Nanoparticles (NANPs) in Murine Osteoblasts by Shreshttha Patel; Mentor: Dr. Brittany M. Johnson, College of Science

Abstract #131 - DeGenPrime-Ez: Revolutionizing primer design with accessible GUI by Sophie Tanker; Mentor: Dr. Richard Allen White III, College of Computing & Informatics

Abstract #132 - Urbanization and Salamanders: Confronting Conservation Challenges by Andres Vences; Mentor: Dr. Sara Gagné, College of Humanities & Earth and Social Sciences

Abstract #133 - Investigating and Comparing Sustainable Development Goal 15 in Germany and the United States by Ryan Connors, Nolan Erickson, and Duncan Smith; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #134 - The Myth of Japanese Herd Mentality: A Deeper Look into the Japanese Support of General MacArthur by Jaron Dudley; Mentor: Dr. Dan Du, College of Humanities & Earth and Social Sciences

Abstract #135 - Janus-[3]radialenes as a Redox Active Dynamic Covalent Polymer Building Blocks by Karsten Fronczak; Mentor: Dr. Christopher Bejger, College of Science

Abstract #136 - Predicting Distance Runner Times for 5K and other distances by Jacob Sasser; Mentor: Dr. Doug Hague, School of Data Science

Abstract #137 - Accommodation in the Face of Relational Dissatisfaction: The Role of Insecure Attachment by Gabbie Boutte, Chloe Rollins, Thao Nguyen & Bryan Perez; Mentor: Dr. Amy Canevello, College of Humanities & Earth and Social Sciences

Abstract #138 - Investigating and Comparing Sustainable Development Goal #7 in Germany and the United States by Bernadine Williams, Paul DeGuzman, & John Ratchford; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #139 - Frequency Encoded Detection for Organic Amine Content in Water by Brinda Patel; Mentor: Dr. Laura Casto-Boggess, College of Science

Abstract #140 - DeGenPrime provides robust primer design and optimization unlocking the biosphere by Bryan Fulghum; Mentor: Dr. Richard Allen White III, College of Computing & Informatics

Abstract #141- A Fight for Freedom: Republican Women in the Irish Troubles through the Lens of Second Wave Feminism, 1969-1998 by Jacob Majure; Mentor: Dr. Peter Thorsheim, College of Humanities & Earth and Social Sciences

Abstract #142 - Investigating and Comparing Sustainable Development Goal 5 in Germany and the USA by Natalia Harris & Lucy Yeates; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #143 - Using ASSISTments for College Math: Evaluating the Effectiveness of Supports and Transferability of Findings by Eric Hedgepeth;
Mentor: Dr. Michael Smalenberger, College of Science

Abstract #144 - Exploring Data Eviction on Graphical Processing Units by Taylor Sasser; Mentor: Dr. Tyler Allen, College of Computing & Informatics

Abstract #145 - Trace Metal Scavenging by Hydrothermal Plumes by Mckenna Zelna; Mentor: Drew Syverson, College of Humanities & Earth and Social Sciences

Abstract #146 - Investigating and Comparing Sustainable Development Goal#4 in Germany and the United States by Olivia Visconti, Rhoni Jones, and Ryder Mullis; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #147 - The Advancements in the Mechanism and Sensitivity of Alcohol Sensing Utilizing Dipyridinium Thiazolo[5,4-d]thiazole by Aiden Hawkins; Mentor: Dr. Michael Walter, College of Science

Abstract #148 - Toward Explainable AI: Developing an Interpretable Video Understanding Model for Explainable Human Action Label Prediction by Naveen Vellaturi; Mentor: Dr. Srijan Das, College of Computing & Informatics

Abstract #149 - Investigating Predictors of Age-Based Stereotype Threat in Job-Seeking Adults by Harrison Wagner; Mentor: Dr. Meghan Davenport, College of Humanities & Earth and Social Sciences

Abstract #150 - Investigating and Comparing Sustainable Development Goal #12 in Germany and the USA by Anisha Nannapaneni, Laney Meggs, and Simon Ocsenas; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #151 - Chemical kinetics for hydrolysis of carboxyfluorescein succinimidyl ester by Neena Robinson; Mentor: Laura Casto-Boggess, College of Science

Abstract #152 - Arts Education in the US: An Overview of Impacts, Policy, and Funding by Parth Vyas; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #153 - Photocatalytic Applications and Characterization of Perylenequinone Dyes by Nick Eberwein; Mentor: Dr. Michael Walter, College of Science

Abstract #154 - Understanding Privacy Risks Regarding Deepfake Models by Ashley Bang; Mentor: Dr. Liyue Fan, College of Computing & Informatics

Abstract #155 - Investigating and Comparing Sustainable Development Goal #4 in Germany and the USA by Shawna Blanche, Mentor: Dr. Erik Jon Byker, Cato College of Education

#156 The Obesity Epidemic and its Effects on Muscle Repair and Notch Signaling by Danielle Waters; Mentors: Dr. Susan Arthur, Dr. Melinda Adnot, and Dr. Abbey Fenwick, College of Science

Session B: 11:30am - 12:30pm

Abstract #200 - Facades as a vehicle for cultural expression in Phil Freelon's Architecture by Amanda Marais; Mentor: Dr. Emily Makaš, College of Arts + Architecture

Abstract #201 - Investigating Quality Education in Germany and the USA through the Lens of SDG #4 by Zoie Matthews; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #202 - Regeneration of Desiccant Packets: A Sustainable Approach to Moisture Control by Grayson Barcinas; Mentor: Michael Benjamin, William States Lee College of Engineering

Abstract #203 - Characterization of Genes Involved in UDP-HexNAcA Synthesis by Maisy Olmo; Mentor: Dr. Jerry Troutman, College of Science

Abstract #204 - Childhood Disability, Chronic Illness and Mental Health Services in America: A Literature Review by Madi Adams; Mentor: Dr. Melinda Adnot, Honors College

Abstract #205 - A Comparative Study of Automated Text Summarization with GPT-4 LLM for Analyzing Student Reflections by Nicole Wiktor; Mentor: Dr. Mohsen Dorodchi, College of Computing & Informatics

Abstract #206 - Examining Charlotte's Latina Mothers Employment Status and Related Barriers by Sofia Herrera Acosta; Mentor: Dr. Stephanie Potochnick, College of Humanities & Earth and Social Sciences

Abstract #207 - Investigating Stereotype Threats in School Communities by Naiya Graham; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #208 - Artificial Intelligence / Machine Learning Model Development and Evaluation for Water Utility Applications by Hannah Zeru; Mentors: Dr. Michael Smith & Dr. Nicole Roberts, William States Lee College of Engineering

Abstract #209 - Awareness of Resources Aimed to Support Niners with Chronic Illnesses by Palmer Everett; Mentor: Dr. Aimee Smith, College of Humanities & Earth and Social Sciences

Abstract #210 - Mastering the Game: Leveraging AI to Unravel Player Skill Development by Bryonna Gray*;* Mentor: Dr. Melinda Adnot, Honors College

Abstract #211 - How Mood and Sleep Are Associated with College Students' Academic Procrastination by Molly Kaleskas; Mentor: Dr. Jennifer Langhinrichsen-Rohling, College of Humanities & Earth and Social Sciences

Abstract #212 - Socioeconomic Forces Impacting Biosecurity in Nigeria by Savanna Richardson & Natasha Jariwala; Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #213 - Enforcing Parameter-Efficient Training in Neural Networks by Ethan Nguyen; Mentor: Dr. Christian Kümmerle, College of Computing & Informatics

Abstract #214 - Algorithms for Multi-Robot Collaboration and Coordinations by Philip Smith; Mentor: Dr. Dipankar Maity, William States Lee College of Engineering

Abstract #215 - Evaluation of p53 Peptide Binding Affinity Using Microscale Thermophoresis by Zoe Vette; Mentor: Dr. Irena Nesmelova, College of Science

Abstract #216 - The Analysis of The Medical Mistrust Continuation of the African-American Community by Mariah Manley; Mentor: Dr. Melinda Adnot, Honors College

Abstract #217 - Enhancing Understanding and Analysis of Computer System Architecture through 3D Visualization: Applications in Performance Analysis and Education by Hailey Chen & Lillian Chen; Mentor: Dr. Yonghong Yan, College of Computing & Informatics

Abstract #218 - Arts Participation and Future Outlook Among Youth of Color by Tashawna Wilkins; Mentor: Dr. Vaughn Schmutz, College of Humanities & Earth and Social Sciences

Abstract #219 - Teacher Perceptions of Gifted Curriculum Differentiation by Liliahna Bedolla; Mentor: Dr. Cindy Gilson, Cato College of Education

Abstract #220 - The Dynamics of Latinx Engineering in America by Esai Torres-Tarango; Mentors: Dr. Sherman Mumford & Dr. Cathy Blat, William States Lee College of Engineering

Abstract #221 - NLRP3 Inflammasomes Reduce Macrophage Phagocytosis in Breast Cancer by Shely Acosta; Mentor: Dr. Didier Dréau, College of Science

Abstract #222 - The Relationship Between Mental Health and Pet Ownership by Sophia Call; Mentor: Dr. Melinda Adnot, Honors College

Abstract #223 - Post-monitoring (2022-2024) of Groundwater Levels Along a Restored Piedmont Stream, Reedy Creek, Charlotte, NC by Abigail Jessen; Mentor: Dr. David Vinson, College of Humanities & Earth and Social Sciences

Abstract #224 - RL4Sys: Reinforcement Learning for Systems by Jeffrey Wang; Mentor: Dr. Dong Dai, College of Computing & Informatics

Abstract #225 - Racial Discrimination and the Racial Pay Gap in the U.S. by Kayla Polk & Amaris Vang; Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #226 - Investigating and Comparing SDG #3 Good Health and Well-Being in Germany and the USA by Matthew Baerwolf, Tanner Ackerman, & Andrew Sandlin; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #227 - Analysis of the Gender Gap within Engineering by Lauren Wilkie & Madison Johnson; Mentor: Dr. Melinda Adnot, Honors College

Abstract #228 - A Literature Review on the Correlation between Black Oppression, Financial Hardship, and Chronic Stress in Black Families in the USA by Nazier McIver; Mentors: Dr. Melinda Adnot, Dr. Sonyia Richarson, & A.J. Simmons, University College

Abstract #229 - Investigating and Comparing SDG # 10 in Germany and the USA by Aiden Griffiths, Lori Cabrie, and Eythan Bengel; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #230 - Improvement of Machine Learning-Based Predictive Models for Wastewater Treatment Processes Using Time-Series Influent Data by Justin Logan; Mentor: Dr. Michael Smith, William States Lee College of Engineering

Abstract #231 - From Phage with Love: Endolysins are the Heart of Bacterial Destruction by Chloe Chervenic, Kate Drake, Hala Khabir, & Rachel Showers; Mentors: Dr. Ellen M. Wisner & Tonya C. Bates, College of Science

Abstract #232 - Diversifying Digital Platform Workers: Colorism on Streamer Follower Count by Luis Tejada; Mentor: Dr. Anne-Kathrin Kronberg, College of Humanities & Earth and Social Sciences

Abstract #233 - Investigating and Comparing Sustainable Development Goal #11 in Germany and the USA by Caroline Shannon, Mallory Schwarz, & Darell Sam; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #234 - Microchip Electrophoresis and Droplet Microfluidics: Patterning and Kinetics by Nour Alsharid; Mentor: Dr. Laura Casto-Boggess, College of Science

Abstract #235 - Unraveling the Tail Mysteries: Exploring Minor Tail Protein Length Variation in Arthrobacter Phage Cluster AP by Anthony Padilla, Zoe Griffin, Tyler Ordon, & Wyatt Workman; Mentors: Tonya C. Bates & Dr. Ellen Wisner, College of Science

Abstract #236 - Corporate Landlord Housing and Planning for Climate Adaptation by Ava Oljeski; Mentor: Dr. Michelle Zuñiga, College of Humanities & Earth and Social Sciences

Abstract #237 - Sulfonate Ester Catholyte Synthesis for Aqueous Redox Flow Batteries by George Holevas; Mentor: Dr. Christopher Bejger, College of Science

Abstract #238 - Investigating and Comparing SDG #4 in Germany and the USA by Cornelia Nirean; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #239 - Achieving Smart Photochromism for Oxygen and Amine Sensing with Water-Processable, High Contrast, Dipyridinium Thiazolothaizole Embedded Chromogenic Polymers by Maithili Acharya; Mentor: Dr. Michael Walter, College of Science

Abstract #240 - Selective targeting of Ribonucleotide reductase large subunit by Hsp70 Phosphorylation by Shreya Patel; Mentors: Duhita A. Mirikar & Dr. Andrew Truman, College of Science

Abstract #241 - Coefficient of Thermal Expansion (CTE) and Modal Mineralogy of NC Aggregate Used for Infrastructure Applications by Liam Rogers;
Mentor: Dr. Valerie Reynolds, College of Humanities & Earth and Social Sciences

Abstract #242 - Childhood on Empty Plates: A Comprehensive Literature Review on the Impact of Food Insecurity on Children's Health and Development by Karen Gonzalez-Telon; Mentor: Dr. Trudy Moore-Harrison, College of Health & Human Services

Abstract #243 - Field Amplified Sample Stacking as a Method to Increase Sensitivity of Capillary Electrophoresis Assays for Amino Acids by Claire Trevino;
Mentor: Dr. Laura Casto-Boggess, College of Science

Abstract #244 - Characterization of the human Chaperone-RNR complex by Erica Flores; Mentor: Dr. Chathura Paththamperuma, College of Science

Abstract #245 - Success Through the Struggle: A Tale of Two Centuries by Michael Gaskins; Mentor: Dr. Melinda Adnot, Honors College

Abstract #246 - Trace Detection of Methylxanthine Compounds Using a Portable Raman Platform Coupled with Microfluidics by Cassie Rinkacs;
Mentor: Dr. Laura Casto-Boggess, College of Science

Abstract #247 - Ancient climate change and human responses across the Mediterranean by Wyatt Hicks, Amber Smith, and Kasey Grams; Mentor: Dr. Patricia Fall, College of Humanities & Earth and Social Sciences

Abstract #248 - Iterative Methods for Solving Linear Systems and Modeling Traffic on I-485 by Fabiola Rojas & Dominic Kealoha; Mentor: Dr. Xingjie Li, College of Science

Abstract #249 - Promoter Pursuit: Hunting for Hidden Signals in Phage DNA by Isha Jain, Caitlyn Bolling, Andres Vences, and Caelan Walsh;
Mentors: Dr. Ellen Wisner & Tonya C. Bates, College of Science

Abstract #250 - Exploring Insurance System Frameworks for CCS (Children Cancer Survivors) by Duc Nguyen; Mentor: Dr. Melinda Adnot, Honors College

Session C: 12:45pm - 1:45pm

Abstract #300 - Postcolonialism and Salvage Tourism in the Eastern Band of the Cherokee Nation by Celia Castaldo; Mentor: Dr. Emily Makaš, College of Arts + Architecture

Abstract #301 - A Study on Workers' Career Advancement and Workplace Experiences about the Effects of Artificial Intelligence Integration in Technology by Elizabeth Akinfenwa; Mentor: Dr. Melinda Adnot, Honors College

Abstract #302 - Black Education and Community in Albemarle, North Carolina: The Kingville Project (1898-1967) by Makayla Brooks; Mentor: Dr. Sonya Ramsey, College of Humanities & Earth and Social Sciences

Abstract #303 - Effective Interventions for Students with Emotional Behavioral Disorders in Elementary Classrooms: A Systematic Review by Jordan Rierson; Mentor: Dr. Kelly Anderson, Cato College of Education

Abstract #304 - A Vision-Based Ping-Pong Ball Anemometer by Cedric Davis; Mentor: Dr. Artur Wolek, William States Lee College of Engineering

Abstract #305 - The Effects of Obesity and Notch on Skeletal Muscle by Paige Sigmon; Mentor: Dr. Susan Arthur, College of Health & Human Services

Abstract #306 - Inflammasome Inhibition and Breast Tumor Apoptosis by Jenna Venditti & Heven Siyum; Mentor: Dr. Didier Dréau, College of Science

Abstract #307 - Resisting Plantation Presbyterianism: Black Agency in the Antebellum United States by Lauren McMillan; Mentor: Dr. Jill Massino, University College

Abstract #308 - Histories of New Media: The Contemporary Discourse of Digital Arts by Sydney Carmer; Mentor: Dr. Jae Emerling, College of Arts + Architecture

Abstract #309 - Funds To Finish™: Enabling Advisors to Guide Students: Ensuring Financial Readiness for Graduation by Meelad Doroodchi; Mentor: Dr. Elise Demeter, College of Computing & Informatics

Abstract #310 - Foraging Behavior of Semi-Free Ranging *Lemur catta* and *Varecia rubra* at the Lemur Conservation Foundation by Kyla Kelly; Mentor: Dr. Lydia Light, College of Humanities & Earth and Social Sciences, College of Science

Abstract #311 - Investigating and Comparing Sustainable Development Goal #1 in Germany and the United States by Kendal Moses, Ciara Dix & Ben Cassanos; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #312 - Dynamic Behavior of a Kinematic, Gravity-closed, XYθ-Compliant Baseplate Mount by Sania Khan; Mentor: Dr. Jimmie A. Miller, William States Lee College of Engineering

Abstract #313 - Racial Disparities in Emergency Department Disposition Among Patients with ASD by Michael Gonzalez; Mentor: Dr. Mara Hollander, College of Health & Human Services

Abstract #314 - The Desensitization and Secondary Trauma Medical Workers Contend by Alexis McNeilis; Mentor: Dr. Melinda Adnot, Honors College

Abstract #315 - Ten Works: A Critique of UNC Charlotte's Art Collection and its Practices by Jonah Sanderson; Mentor: Dr. James Frakes, College of Arts + Architecture

Abstract #316 VideoLLM for Understanding Activities of Daily Living in Elderly Care by Sindhu Gadiraju; Mentor: Dr. Srijan Das, College of Computing & Informatics

Abstract #317 - A Literature Review on the Interaction Between Culture and City Zoning Ordinance and Regulations by Duncan Bryson; Mentors: Dr. Melinda Adnot, Dr. Shen-en Chen, and Dr. Katherine Idziorek, University College

Abstract #318 - Investigating Technological Play Theory: Learning in the "Flipped Classroom" by Lori Glavan; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #319 - How is a woman's sexual and mental wellbeing affected after being a victim of sexual assault? by Khai Reaves; Mentor: Dr. Melinda Adnot, Honors College

Abstract #320 - Elucidation Reassortment in Hantavirus by Courtney-Grace Neizer; Mentors: Dr. Rick White & Dr. Alex Dornburg, College of Computing & Informatics

Abstract #321 - How Accessible are Resources to Undergraduate Students at the University of North Carolina at Charlotte? by Arianna Lomonico; Mentor: Dr. Aimee Smith, College of Humanities & Earth and Social Sciences

Abstract #322 - Investigating and Comparing Sustainable Development Goal #3 in Germany and the United States by Hayes Brogdon, Jack Brezac, & Nick Hamilton; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #323 - Human-Oriented Performance Optimization for Virtual Walkways by Batman Whiteside; Mentor: Dr. Lim Churlzu, William States Lee College of Engineering

Abstract #324 - Examining Spiritual, Eating, and Pain-related Affect Regulation Factors in Predicting Irritable Bowel Syndrome Symptom Severity among US College Students by Ava Grace Lee; Mentor: Dr. Jennifer Webb, College of Science

Abstract #325 - Loneliness: Impact on College Students' Academic Performance, Unique Challenges Faced by Low-Income Students, and What Colleges Can Do by Carter Fleming; Mentor: Dr. Melinda Adnot, Honors College

Abstract #326 - Social Media Impact: Analyzing Public Perception Shifts of NICU Nurse in News Coverage by Allie Theisen; Mentor: Dr. Margaret M. Quinlan, College of Humanities & Earth and Social Sciences

Abstract #327 - Untangled: Addressing the Impact of Hair Discrimination in Performance in Schools and the Workplace by Savannah Powell; Mentor: Dr. Melinda Adnot, Honors College

Abstract #328 - Improving Computer Science Retention with BRIDGES by Christian Klepper; Mentor: Dr. Kalpathi Subramanian, College of Computing & Informatics

Abstract #329 - Bird-Window Collision Risk Assessment by Ty Sokolowski; Mentor: Dr. Sara Gagné, College of Humanities & Earth and Social Sciences

Abstract #330 - The Expression, Purification, and Characterization of Select CXCL4 Mutants by Patrick van Ravesteyn; Mentor: Dr. Irina Nesmelova, College of Science

Abstract #331 - A Literary Analysis of Urban Homesteading for Sustainable Living by Josie Sheeler; Mentor: Dr. Melinda Adnot, Honors College

Abstract #332 - Archeology and Stable Isotopes in Western Mediterranean in Prehistory: Data from Iberia by Valeria Mulero Gonzalez; Mentor: Dr. Luca Lai, College of Humanities & Earth and Social Sciences

Abstract #333 - Large-Scale Entity Matching for the Advisor by Davis Spradling; Mentor: Dr. Erik Saule, College of Computing & Informatics

Abstract #334 - Period Parity: A Literature Review by Olivia Gortva, Jianaa Ghosh, & Anyah Wallace; Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #335 - Investigating and Comparing Sustainable Development Goal #13 in Germany and the United States by Alec Peay, Sammi Gentry, & Neel Panajkar; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #336 - Combined Offshore Wind and Wave Energy Resource Assessment by Anthony Grancagnolo & Patrick Hultberg; Mentor: Dr. Saffeer Khan, William States Lee College of Engineering

Abstract #337 - Unprecedented Job Loss and Recovery During the Early Pandemic by Thomas Hartman & Kaleb Gomez; Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #338 - Biosynthetic Production of *Campylobacter jejuni* Sugars in *Escherichia coli* for Library Generation by Claire Moneghan; Mentor: Dr. Jerry Troutman, College of Science

Abstract #339 - A Literature Review of the Effects of Religion on the Well-being of American Adolescents by Dalton Yandle; Mentor: Dr. Melinda Adnot, Honors College

Abstract #340 The Impacts of Pharmaceutical Companies in the U.S. by Maddy Davis & Taylor Blackwood; Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Abstract #341 - The Impact of Role Asymmetry on Linguistic Alignment in Collaborative Tasks by Venus Kajangu, Samihan Nimbalkar, & Ava Grace Lee; Mentor: Dr. Alexia Galati, College of Humanities & Earth and Social Sciences

Abstract #342 - Impact of Beaver Dam Analogs on Suspended Solids and Sediment Size Distribution in a North Carolina Foothill Stream by Carlos Escobar; Mentor: Dr. Sandra Clinton, College of Humanities & Earth and Social Sciences

Abstract #343 - Investigating Early-Childhood Education by Yahaira Corza; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #344 - Examining the Educational Benefits of Outdoor Education by Mariana Gracia Garza; Mentor: Dr. Erik Jon Byker, Cato College of Education

Abstract #345 - Microbial Dynamics in Agricultural Land Restoration and Soil Fertility by Areena Moshawi & Sida Mohamed; Mentor: Dr. Sharon Bullock, College of Science

Abstract #346 - The Impact of Ageism Among Healthcare Workers and Investigation of Successful Interventions: A Literary Review by Larkyn Derrick;
Mentor: Dr. Melinda Adnot, University College

Abstract #347 - Writing Mechanics vs "Good" Writing by ScottLynn Graves;
Mentor: Kristina Duemmler, College of Humanities & Earth and Social Sciences

Abstract #348 - Educational Development with Technology: A Literature Review by Mya Allen; Mentor: Dr. Melinda Adnot, Honors College

Abstract #349 - Analyzing the Mood Affects of College Students due to Music by Sophia Alizadeh; Mentors: Dr. Anne-Kathrin Kronberg & Dr. Megan Smith, College of Humanities & Earth and Social Sciences

Abstract #350 - Phage Hunters: The Discovery of Phage AWGoat Using *Arthrobacter globiformis* as a Host Bacterium by Wyatt Workman;
Mentors: Dr. Sharon Bullock & Dr. Michelle Pass, College of Science

Abstract #351 - Securing ARM Binaries with Model-Checking by Kausika Manivannan; Mentors: Dr. Meera Sridhar & Dr. Harini Ramaprasad, College of Computing & Informatics

Abstract #352 - Optimizing Campus Transportation: A Physarum Polycheplem Solution by Shreyas Vimaldev; Mentor: Dr. Belinda Parker, William States Lee College of Engineering

Abstract #353 - Roanie Revelation: Uncovering a Hidden Gem in Phage Isolation by Caitlyn Bolling & Caelan Walsh; Mentor: Dr. Sharon Bullock, College of Science

ABSTRACTS

Presentations can be viewed on the URC Symposium site. Please search by author's name or abstract number. For more details, please visit: symposium.foragerone.com/urc2024

Abstract: 100

Communication-aware Multi-Robot Coordination
Ian Gao

Mentor: Dr. Wenhao Luo, College of Computing & Informatics

This study presents an innovative approach to analyzing Wi-Fi signal strength across a structured grid within a real-world workspace, utilizing a Limo Robot for data collection. Conducted between January 21st and January 25th, 2024, the research involved mapping a 9x11 grid, comprising 93 distinct data points, with the aid of an interactive heatmap visualization. The grid was meticulously designed with stickers placed 30 units apart both horizontally (deltaX) and vertically (deltaY), incorporating two obstacles to simulate real-world complexities. Certain grid points were intentionally omitted to showcase the capability of conditional rendering within the visualization tool.

The Limo Robot, central to this experiment, was remote controlled and navigated through the grid, avoiding the sticker denoting the router's location, to measure Wi-Fi signal strength at each point. This process facilitated a detailed spatial analysis of Wi-Fi coverage. The resultant data is accessible through an interactive heatmap, where clicking on any grid point reveals two corresponding images: a standard photo and a 3D render, illustrating the precise location and signal strength measurement.

This research contributes significantly to the field of wireless network optimization in physical spaces, offering a novel methodology for assessing signal distribution and identifying potential areas of signal weakness or interference. Through the integration of robotics, and interactive data visualization, the study sets a new precedent for empirical environmental analysis, with broad implications for improving Wi-Fi connectivity in complex environments.

Special code(s): Sustainability Research

Abstract: 101

Discounted and Dismissed: The Gender Bias in Pain Management for Women Undergoing IVF Treatment

Quinn Smith

Mentor: Dr. Margaret Quinlan, College of Humanities & Earth and Social Sciences

Worldwide, between eight and fourteen percent of all heterosexual couples of childbearing age experience infertility; however, women who experience pain during in vitro fertilization (IVF) treatment, or pain in general, are not taken seriously. Sixty-five percent of female patients feel doctors take their pain less seriously because they are female. Eighty-four percent feel they have been treated differently by doctors because of the patients' sex. Forty-nine percent feel doctors are less inclined to prescribe opioid pain medication to them because they are female. This research study examines the reasons behind women's pain being discounted even after 40-plus years in the practice of IVF in Reproductive Endocrinology and Infertility (REI). Through a qualitative thematic analysis, we will analyze a *New York Times* five-part narrative podcast, The Retrievals, where dozens of women seeking to become mothers came to a fertility clinic at Yale and did not receive sedative pain medication during treatment due to a nurse stealing the fentanyl. The implications of this study suggest that healthcare practitioners need to be more aware of their implicit biases and ensure that they provide equitable pain management to all patients, regardless of perceived gender expectations. Healthcare systems must implement policies and guidelines to ensure that patients receive adequate pain management and that healthcare providers are held accountable for biases or discriminatory practices. Additionally, further research is needed to understand better the reasons behind the gender bias in pain management for women undergoing IVF treatment and to develop effective strategies to address it. Overall, this study highlights the need for healthcare systems to be more inclusive and responsive to the needs of all patients, particularly those who are more vulnerable to gender bias and discrimination.

Abstract: 102

Investigating and Comparing Sustainable Development Goal #14 in Germany and the United States

Cole Cummings, Banks Russell, and Emmanuel Lemus Murillo

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #14 Life Below Water. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #14? What are the differences? To what degree are the countries on track to make progress on SDG #14 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #14 related to conserving and sustainably using the oceans, seas, and marine resources for sustainable development by the 2030 goal year.

Special code(s): Global Research

Abstract: 103

The Paper Chase Program Evaluation

Alexander Willis

Mentors: Dr. Alicia Dahl and Dr. Jessamyn Bowling, College of Health & Human Services

Throughout a student's undergraduate journey, new knowledge, skills, and abilities are constantly being developed; however, there seems to be a lack of experience-driven opportunities such as research involvement. Common barriers to research involvement at the undergraduate level include the availability of mentors, time, funding, and competing priorities. Existing literature shows that undergraduate research and other high-impact practices (HIP) provide positive outcomes, such as critical thinking, communication skills, and collaboration. Additionally, undergraduate research opportunities can increase students' competitiveness and experience when being considered for higher education purposes (e.g., scholarships, graduate school) or research careers. When paired with the HIP of collaborative writing, students gain critical skills in communication and team-based science. The Paper Chase Program is a professional development training experience focusing on a collaborative approach to manuscript development and publication designed to expedite and streamline the writing process. Teams of student and faculty coauthors collaboratively participate in all aspects of publication (writing, editing, revising, submission) within a set period (e.g. four days consecutively working uninterrupted). With the goal of team diversity in mind (gender, degree program, research experience), the examination of competitive applications was key to the selection process. In 2023, after over three years of program implementation at UNC Charlotte, an evaluation was conducted by graduate students unaffiliated with the Paper Chase program. The evaluation included semi-structured interviews with past participants who were undergraduate students, graduate students, and faculty. The interviews were analyzed via thematic analyses. After the evaluation was conducted, a continuous improvement plan was established. Findings indicate a range of immediate and long-term effects of participation including individual attitudes and skills, along with interpersonal skills. Future undergraduate research program offerings should lean on the supportive elements of this program, such as providing student stipends for effort, interdisciplinary projects, and mentorship.

Abstract: 104

Phytochemicals for Sustainable Agriculture and Environment
Haeden Poslinski

Mentor: Bao-Hua Song, College of Science

In the face of escalating global temperatures, the agricultural industry needs more sustainable strategies to combat increasing pest persistence while meeting the demands of the growing population. Phytochemicals offer a promising alternate solution to synthetic pesticides, which has the potential to improve crop yields, but also provide pest specificity that avoids harming wildlife. Organic farming may benefit in maintaining its organic status with the addition of phytochemical biocontrol to reduce losses caused by persistent pathogens. By harnessing the broad diversity of secondary metabolites, resistance against fungi, bacteria, insects, nematodes, and weeds is possible. The scope of phytochemical-based pesticidal activity extends beyond acute toxicity to encompass endocrine disruption, sensory inhibition, and infertility among targeted pests. Because of their versatility, phytochemicals are accessible to both large plantations and small farms, as many application techniques do not necessitate extensive processing. Phytochemical biocontrol can be established during various stages of cultivation to prevent infestation. Seed coatings or cakes composed of phytochemicals promote pest resilience prior to planting, while essential oils and plant extracts safeguard mature plants. Ingenious strategies such as cover cropping, intercropping, and green manure enable the direct transfer of phytochemicals from the source plant to the host. Phytochemical biocontrol may also be integrated as a hybridized practice with both organic and conventional techniques to maximize profitability and sustainability. In summary, phytochemicals represent an underutilized source for organic biocontrol, which can revolutionize the agriculture industry by providing a sustainable, environmentally friendly alternative that ensures safety for consumers, farmers, and wildlife.

Special code(s): Global Research

Abstract: 105

Navigating the Intersection of Artificial Intelligence and Surgery: A Literature Review
Ishan Patel

Mentor: Dr. Melinda Adnot, Honors College

Integrating artificial intelligence (AI) into surgery presents a promising avenue for enhancing diagnostic and therapeutic practices, yet challenges persist in advancing this technology in a surgical setting. Despite strides made in AI-based platforms for medical imaging, robot-assisted laparoscopic surgery, and anesthetic calculations, AI for surgery remains elusive due to limitations in existing optimization approaches and potential ethical issues that arise from utilizing such tools on patients. This literature review investigates the feasibility of utilizing AI to optimize surgery, particularly in aligning 3D images, assisting surgeons with breakthrough techniques, and highlighting certain areas of the body that surgeons have a hard time seeing while operating at the same time. Preliminary research reveals that leveraging an AI agent matches and sometimes outperforms current state-of-the-art methods in accuracy and robustness for aligning images in patient screenings and diagnoses. These findings highlight the potential of AI-driven image registration techniques to revolutionize medical imaging, offering insights into addressing long-standing challenges and paving the way for more effective utilization of AI in surgical settings. Additionally, it highlights the importance of continuous ethical considerations in the deployment of AI technologies in patient care, emphasizing the need for ongoing revisions to ethical codes to accommodate the evolving landscape of machine learning systems and technology. This review contributes to understanding the transformative impact of AI in a surgical environment while emphasizing the importance of ethical frameworks in harnessing its full potential.

Special code(s): Global Research, Honors Research

Abstract: 106

ION (I/O Navigator): Guiding Users to Optimal I/O Performance
Arnav Sareen

Mentors: Dr. Dong Dai & Chris Egersdoerfer, College of Computing & Informatics

High Performance Computing (HPC) applications, bounded by their computational and Input/Output (I/O) efficiency, rely on the user to make complex decisions in designing their applications to approach optimal performance. However, in the landscape of both homogeneous and heterogeneous systems with many tiers of hardware specifications and software abstractions, the ideal path toward optimal performance becomes convoluted. Previous approaches to this problem have guided users on a static path to performance optimization using binary problem classification via expert-set thresholds, which cannot account for the inherent complexity of overlapping problems, the relative severity of identified performance issues and necessitates users to have an intricate understanding of the feasible I/O issues potentially plaguing their applications. In this project, we propose I/O Navigator (ION), a system that utilizes contextual reasoning and the extensive background knowledge of pre-trained Large Language Models (LLMs) to identify and diagnose the root causes of I/O performance deficiencies as well as provide useful suggestions towards improved I/O performance. Preliminary results indicate that given various application trace logs, ION can accurately pinpoint the root causes of overlapping I/O performance issues and provide a methodical set of analyses justifying such conclusions, enabling users to comprehend their systems' deficits better while also leveraging LLM-generated solutions to guide them towards improved hardware utilization. ION demonstrates the utility of LLMs in aiding users to achieve optimal performance across a multitude of HPC environments and their malleability to excel at domain-specific tasks.

Special code(s): Honors Research

Abstract: 107

"A Revolution Begins In A Million Pink Bedrooms:" Riot Grrrl and Feminism in the 1990s

Katelyn Kerr

Mentor: Dr. Jill Massino, College of Humanities & Earth and Social Sciences

This research examines riot grrrl: a movement that used punk music as a conduit for social change and female empowerment. Riot grrrl encouraged girls to express their frustrations and anger through music and challenged societal norms, protesting for political action. By using punk music and drawing inspiration from prior feminist movements, riot grrrl represents a unique intersection between two research areas scholars deem separate. This research uses riot grrrl to combine the scholarship of both punk and feminist movements to showcase the gains and blindspots in two significant social movements. The punk and feminist movements made great advancements such as bringing systemic racism and gender discrimination to the forefront of social discussion. While punk and feminism made these advancements, both struggled to be intersectional in their approach. By studying this tension this research complicates scholarship that views punk and feminism as either successes or failures. This research uses riot grrrl as a microcosm for both the broader punk and feminist movements to explore how lack of intersectionality causes division and instability in sociopolitical movements. Lastly, this research also presents questions about ways political activism can include diverse voices, what it means to be an intersectional movement, and how uniting different communities can increase social impact.

Special code(s): Honors Research

Abstract: 108

Centrality Measures in Social Networks
Elif Su

Mentor: Dr. Erik Saule, College of Computing & Informatics

In an interconnected world, social media platforms and public forums act as dynamic catalysts, facilitating global communication, connectivity, and the widespread dissemination of information. This research aims to investigate user engagement dynamics in the popular social media platform, Reddit, to help achieve a personalization of the content within the best interest of the users optimizing their experience. In particular, we aim to determine, when deciding to post, whether users engage with a thread as opposed to another user. While it has been shown that social networks have community structure, it is still unclear where that community structure stems from. Leveraging the Reddit API, we are able to access a large scale dataset in order to analyze comments, replies from various subthreads all across the platform. By closely examining user behavior through the mined data gathered from specific subthreads we aim to draw nuanced patterns within the user activity for quantitative data.

Abstract: 109

Quantifying Microplastic Concentration in Surface Water and Sediments in Urban Stormwater and Beaver Ponds

Jordan Landis

Mentor: Dr. Sandra M. Clinton, College of Humanities & Earth and Social Sciences

Microplastics impact both human and ecological health and have been quantified across a diversity of freshwater ecosystems. Ponds are a common feature used in urban areas to treat stormwater runoff and protect stream ecosystems; however, recent research has questioned the efficiency of stormwater ponds to remove emerging contaminants of concern, including microplastics. Urban beaver ponds are a natural alternative to stormwater ponds and may be able to abate microplastic transport by providing a longer residence time due to their unique flow pattern. A longer residence time could contribute to increased microplastic settlement by increasing opportunities for interaction with organic matter and microbes. The overall goal of this project is to observe the number of microplastics in surface water and sediments in urban stormwater and beaver ponds. Surface water and sediment samples will be collected in the pond and in-line with stream flow using bulk water sampling and a gravity core for extracting sediments. Surface water samples will be used to quantify organic matter and microplastic counts. Organic matter will be measured as total organic carbon (TOC) and microplastic counts will be used to derive stream loading. Microplastics in surface water and sediment samples will be prepared through density separation, oil extraction, and filtration to produce paper filters for microplastic quantification. Microplastics will be quantified by hand counting plastic fibers and fragments retained on the paper filter using a white light and a Dino-Lite fluorescent microscope, respectively. Results from this study will generate more understanding towards microplastic transport in urban streams.

Special code(s): Urban-Charlotte Research

Abstract: 110

Investigating and Comparing Sustainable Development Goal #2 in Germany and the United States

Gautam Das, Belmin Ramic, and Trey Alston

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #2: Zero Hunger. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for SDGl #2. The main goal of this SDG is to reduce the number of undernourished people around the world by 2030. What are the differences? To what degree are the countries on track to make progress on SDG #2 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #2, which is to end all forms of hunger and malnutrition by the 2030 goal year.

Special code(s): Global Research

Abstract: 111

Prototyping a Distributed yet Coordinated Multi-Drone Network
Davy Hallihan, Robert Thomas

Mentor: Dr. Ran Zhang, William States Lee College of Engineering

As unmanned aerial systems become more commonplace and are found in more complex industry use cases, their control systems have gradually become less manageable. Many control systems opt to centralize a network of drones around one device, which can create a single failure point and require excessive computational resources. This research project will explore the possibility of distributing control amongst a network of drones, with each able to make independent decisions and coordinate with other devices to complete tasks together efficiently without interference. The subject drones will take local observations using sensors and take in transmissions from other drones and use this data to make decisions on how to behave and move to best complete their tasks. This is accomplished by first engineering drones with computational capacity for independent decision making, and creating a communication system through which they can effectively coordinate actions. Then, experimentation was done with communications and control schema that can utilize the freedom of distributed decision-making. This experimentation was performed with tasks such as searching for targets across an area. The results are a compilation of findings about the practicality and possibility of such a network of drones. The products and findings of this project have future applications in coordinated drone use, such as search and rescue, event filming, package delivery, and site surveys.

Abstract: 112

Understanding the Role of YDJ1 Acetylation in Regulating Protein Translation
Ishaan Koradia

Mentor: Dr. Andrew Truman, College of Science

Ydj1 is a critical co-chaperone of Hsp70 that plays a role in protein folding and stress responses in budding yeast. Although Ydj1 has been extensively studied, there is little understanding on the impact of post-translational modifications such as acetylation on Ydj1. We created a yeast strain expressing mutations in 6 Ydj1 acetylation sites to prevent acetylation (6KR) or mimic acetylation (6KQ) and compared the protein interactions of 6KR and 6KQ using mass spectrometry. Over 30% of Ydj1 interactions were impacted by acetylation including proteins involved in translation. Our study also identified the differential behavior of large and small ribosomal subunits upon Ydj1 acetylation suggesting that modification of Ydj1 may be important for ribosomal assembly/disassembly. Translational fidelity is essential for cellular function, ensuring accurate protein synthesis. A key function of the 40S complex is to scan the mRNA 5’UTR for the AUG start codon. Here we are studying how Ydj1 acetylation influences 40S activity by checking the fidelity of translation initiation using a dual luciferase system in which the firefly luciferase ORF begins with the non-conical start codon UUG, and Renilla luciferase has the control AUG. Overall, this work should provide mechanistic insight to how protein translation is tightly regulated by molecular chaperones.

Abstract: 113

Exploring Cesarean Section Practices: A Comparative Literature Review of South America and the United States

Elisabeth Becker

Mentor: Dr. Melinda Adnot, Honors College

The rising prevalence of cesarean section deliveries globally emphasizes the need for a comprehensive understanding of regional variations in childbirth practices. This review conducts a comparative analysis of cesarean section practices between South America and the United States, aiming to interpret the sociocultural, and health care system factors contributing to diverging trends in maternal healthcare. Through an examination of published articles and data, in my preliminary research, it becomes evident that South American countries, notably Brazil, exhibit higher cesarean section rates compared to the United States; however, I would like to further investigate the maternal and neonatal outcomes directly influenced by this practice. The disparities in cesarean section practices cause many implications for maternal and neonatal health outcomes such as: morbidity and mortality rates. These outcomes are influenced by healthcare policies, cultural norms, and access to obstetric care as well as cultural attitudes towards medical interventions during childbirth. In the evolving healthcare field, ethical considerations surrounding maternal autonomy, informed consent, and medical necessity in the decision making of cesarean section are important topics of conversation revealing cultural differences between South America and the United States. This literature review aims to highlight the importance of birth interventions and policy reforms to address disparities in maternal healthcare in order to improve maternal and neonatal health outcomes globally. By completing a review of previous research, data, and cultural insights, this study contributes to a nuanced understanding of the interactions between sociocultural dynamics, healthcare systems, and childbirth practices.

Special code(s): Global Research

Abstract: 114

Tandem Duplications and their Contribution to Variation and Gene Expression in *D. santomea* and *D. yakuba*

Emma Fredericks

Mentor: Dr. Rebekah Rogers, College of Computing & Informatics

The question of genetic response to shifting selective pressures and genetic variation's contribution to phenotypic changes during rapid habitat change is among the biggest topics in evolutionary theory. Here, we observe tandem duplication structural variants in *D. santomea* and *D. yakuba,* two Drosophila species inhabiting island São Tomé, to understand these unique mutations' impact on variation and gene expression. Tandem duplications were first identified from Illumina DNA-Seq data and corrected for partial inbreeding through Hidden Markov Model. Tandem duplications in both *D. santomea* and *D. yakuba* strains were clustered and observed on a site frequency spectrum (SFS) to observe conserved tandem duplications over strains. Future work includes coverage correction, calculating allele frequency differences between the two species strains, and evaluating tandem duplications' influence on the expression of nearby genes or complete de novo gene formation. This in-depth analysis of structural variation in local adaptation on São Tomé provides a foundation for gaining future insights into evolutionary responses under changing selective pressures. By understanding how tandem duplications result in phenotypic changes, we can better understand how rapid evolution can reshape populations in nature.

Abstract: 115

“Friends of Camp Greene”: Jewish Life in Charlotte during WWI
Blaire Gardner

Mentor: Dr. Heather Perry, College of Humanities & Earth and Social Sciences

On April 7th, 1917, the United States entered WWI, and this resulted in major changes across the U.S. The U.S. federal government erected military training camps in selected cities, including Charlotte, N.C., for soldiers to be trained in combat. Charlotte training camp, Camp Greene, opened in September of 1917. Prior research into the camp has examined the camp itself, but for this project, I want to examine the parts of Camp Greene and WWI-era Charlotte that are not discussed enough, specifically the Jewish community. I aim to recover the lost history of the Charlotte Jewish community and the Charlotte chapter of the Jewish Welfare Board. I will be utilizing primary sources such as *Trench and Camp* and *The Charlotte Observer.* Using keywords such as *Camp Greene*, *temple*, *Hebrew*, and *service* in virtual and physical archives, I am looking for information on events planned at Camp Greene organized by Jewish-based organizations. Through this information, knowledge about the impact of this camp on its Jewish inhabitants as well as the Jewish people of Charlotte will be revealed. I am looking at census records from *The American Jewish Yearbook* for population information regarding the Jewish inhabitants in Charlotte, NC and the annual reports of the Jewish Welfare Board. As a result of WWI and Camp Greene, Jewish-based organizations such as the Jewish Welfare Board and the Jewish civilians in Charlotte assembled at the West Seventh synagogue to fulfill the needs of Jewish soldiers training at Camp Greene.

Special code(s): Community Engaged Research, NC Research, Urban - Charlotte Research

Abstract: 116

To Tax or Not to Tax? The Relationships between Tax Policy and Economic Inequality in the US

B Fulton & Nastia Kowalski

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

This project reviews research on how and why tax policies affect economic inequality and alternative solutions for unequal wealth between social classes. Our literature review draws upon analysis studies, comparative research, and academic articles to shed light on the multifaceted correlation between tax policies and the prevailing economic inequality that the US still faces today. The socioeconomic factors that we learned in our detailed research include homeownership inequality, historical taxes, and the Gini coefficient measurement, as well as past, present, and future public opinion. The Gini coefficient or Gini index is a common measurement for income inequality, going from zero to one; zero represents equality while one represents inequality. To further understand this, one of the important things that we found out about taxation is that taxes can come in three main forms Progressive, Proportional, and Regressive taxes, which all affect social strata differently. During our extensive research on these three types of taxes, we focused on Progressive taxes, which are taxes that implement a higher tax rate on the rich and a lower tax rate on the poor. Based on previous research, we conclude that one of the main solutions is implementing Progressive taxes on the rich to help the poor. Coming up with this major and effective solution means that the exponential tax gap between the wealthy and the less wealthy would diminish.

Abstract: 117

Investigating and Comparing Sustainable Development Goal # 6 in Germany and the United States

Tatyana Torres, Agrani Bhusal, and Aadi Nair

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) # 6: Clean Water and Sanitation. SDG #6 aims to ensure everyone has access to clean water and sanitation by 2030, focusing on improving water quality and providing universal access to safe drinking water. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for SDG #6?. What are the differences? To what degree are the countries on track to make progress on SDG # 6 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and the creation of knowledge together. In our research, we report comparative findings. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #6, pertaining to universal access to safe water and sanitation and improvement of water quality by the 2030 goal year.

Special code(s): Global Research

Abstract: 118

Off-road Terrain Mapping using Vehicle Inertial Measurements for Unmanned Ground Vehicle Energy Optimal Path Planning

Nguyen Nguyen

Mentor: Dr. Artur Wolek, William States Lee College of Engineering

Autonomous ground vehicles (AGVs) are widely used to explore areas that are too dangerous or difficult for humans to reach, like the surface of other planets and underground mines. AGVs also have applications in working alongside humans in outdoor rugged terrain for military, scientific, and commercial applications. Common ground vehicle missions include helping carry gear/instrumentation, retrieving samples, and/or recording footage for scientists and engineers to gain more insight about areas of interest. To improve the efficiency and robustness of AGVs performing such tasks it is important to consider factors such as terrain elevation and slope and their impact on vehicle stability, performance, and power consumption. In this research, our objective is to implement an algorithm that enables an autonomous ground vehicle (Clearpath Jackal) to generate outdoor terrain maps using IMU, gyro, GPS, and depth map data. This data will then be used to visualize the physical details of the terrain surface and augment an existing Digital Elevation Model (DEM) with locally gathered data. The first task is to configure the platform to collect the sensor data in both manual and autonomous modes in outdoor environments. The system will be configured to collect data primarily from the IMU, gyro, GPS, and 360 LiDAR with an emphasis on minimizing storage space, collection time, and maximizing battery life. The second task will be to create a pipeline that ingests the platform’s sensor data and augments an existing DEM using regression models in Python. The pipeline will additionally visualize the augmented map and the vehicle’s path. This project explores enhancing the resolution of digital elevation maps. These maps will enable the terrain to be considered when planning paths through the mapped region, making the vehicle's movement faster and more reliable. The future aim is to integrate our data collection and processing pipeline into the motion planning and mapping stack on the AGV, enabling automated onboard terrain mapping and terrain aware path planning.

Abstract: 119

Obtaining FRET-derived distance constraints for the Sleeping Beauty Transpososome
Matthew Goldstein

Mentor: Dr. Irina Nesmelova, College of Science, School of Data Science

Sleeping Beauty (SB) transposon is currently undergoing human clinical trials for gene therapy and is widely used in genetic engineering. It consists of the transposon DNA and the transposase enzyme that catalyzes the excision and insertion of DNA segments within the genome, thereby delivering new genetic information. These reactions occur within the SB transpososome, a nucleoprotein complex containing two transposase enzymes and two ends of the transposon DNA. Understanding the molecular mechanism of the SB transposon requires knowledge of the structural organization of the SB transpososome, which is currently unavailable. We seek to build a structural model of the SB transpososome using distance restraints acquired by using a Förster resonance energy transfer (FRET) experiment. FRET efficiency depends on the distance of a donor fluorophore to an acceptor fluorophore, where energy is transferred from the donor to the acceptor. By measuring FRET efficiency, we will be able to calculate distances between strategically positioned donor and acceptor fluorophores and use these distances in molecular modeling to construct the transpososome structural model.

Special code(s): Global Research

Abstract: 120

The Role of Diet and Exercise in the Treatment of Polycystic Ovarian Syndrome
Sumayyah Elkhouly

Mentor: Dr. Melinda Adnot, Honors College

According to the World Health Organization, Polycystic Ovarian Syndrome (PCOS) affects approximately eight to thirteen percent of reproductive aged women worldwide, and a separate 70 percent of cases go undiagnosed. Polycystic ovarian syndrome is the most common cause of infertility in the female population globally, and is associated with health conditions and symptoms that impact female health and wellbeing negatively. The conventional treatment for this hormonal condition is medication, which a woman becomes tethered to for a lifetime as a means of curbing her symptoms. This literature review examines the impact of lifestyle interventions, specifically exercise and diet, on the treatment and healing of PCOS. The goal of this literature review is to identify the ways in which a diagnosed individual can pursue a treatment route different from medication that will address the root cause of the problem and work towards healing the individual holistically. In preliminary research, I find that diets low in processed sugars and fat and high in whole food content work to decrease the potency of symptoms in the diagnosed individual. Also, preliminary research suggests that women who consistently exercise at a moderate to vigorous intensity are less likely to experience severe PCOS symptoms. The contribution of this literature review is to show that there are other means of treating polycystic ovarian syndrome that are not limited to traditional medicinal practices. These findings suggest that there are perhaps more effective and lasting mechanisms of treatment for a condition that affects a large portion of women worldwide.

Abstract: 121

Implementation and Evaluation of Equitable Practices in an Introductory Computer Science Course

Kaitlyn Gosline

Mentor: Dr. Nadia Najjar, College of Computing & Informatics

Within computer science education lack of diversity is a major issue. Increased participation and student success can be encouraged by adopting equitable pedagogical and grading practices. The lack of evaluation of equitable practices within the context of undergraduate computer science education leads to less adoption of said practices. This study examines four equitable practices within the context of undergraduate computer science education and how the implementation links with student success. To analyze the impact of the equitable practice we implemented the four practices in a large undergraduate introductory computer science course and report on how the practices impacted students' perception of their confidence, performance, and sense of belonging. We report on the results of a survey of student feedback enrolled in the course in the Fall of 2023. Our results show that the students valued these practices and perceived a positive impact on their confidence, performance, and sense of belonging. This study is a step in a larger project to assess how these practices and constructs are perceived among various student groups. This study emphasizes the positive impact equitable practices have on students' perceptions in computer science courses.

Abstract: 122

A Continued Assessment of Mecklenburg County's Food System
Rae Hallow-Gordon

Mentor: Dr. Nicole Peterson, College of Humanities & Earth and Social Sciences

The ongoing collaborative effort in Mecklenburg County to assess and reduce food insecurity titled "State of the Plate", has examined statistical trends in food insecurity through survey data, and analyzed interviews and surveys with organizational leaders within the food system through earlier phases of this research. In the current phase, we spoke directly with community members to gain more perspective on what barriers individuals who are food insecure feel affect them the most, with the aim of attracting a diverse group of participants from various backgrounds to discuss their thoughts on what the food system needs and their current beliefs on healthy eating. Small focus groups began in March 2023, and continued until July, with 7 total events and 25 participants joining us. These "community conversations" were recorded and transcribed for clarity and coded for recurring themes. This data highlights recurring narratives of marginalized groups feeling separated from access to the food system due to cultural and historical associations for marginalized communities that elicits a distrust of new resources, lack of education on said resources as well as nutrition, and cultural barriers for those unfamiliar with the current available produce offered by resources, among other obstacles. Additionally, results suggest the potential behavioral and emotional effects of food insecurity for many participants demonstrate themes consistent with the concept of survival mode. We are working to communicate the results from this study with community members, organizations, and policy leaders, with the hope of receiving recommendations for dissemination, both reliable and novel, from diverse academic perspectives that are suitable to the needs of our collaborators and our participants in addition to current infographic modalities.

Special code(s): Community Engaged Research, NC Research, Urban-Charlotte Research

Abstract: 123

"Handle with Care": Gender, Balikbayan Boxes, and Filipina Migrants in the United States, 1973-2016

Noelle McDermott

Mentor: Ella Fratantuono, College of Humanities & Earth and Social Sciences

For the URC, I will present my Honors thesis, which focuses on the imperialism and economic influences of Filipinas' migration to the United States through the lens of economics, gender, and emotion. I examine the migration process and how Filipina migrants maintain connections with relatives in the Philippines by sending them *balikbayan* boxes. *Balikbayan* is composed of two Tagalog words. *Balik* means "to return" and *bayan* means nation, country, or home. Filipinos fill these *balikbayan* boxes with various household, personal, and luxury goods that recipients typically cannot afford or access themselves. *Balikbayan* boxes are a tangible expression of care for Filipinos. Historians have analyzed Filipino migration to the United States and the important role remittances play in transnational families (families with family members living in multiple nations) since many migrants have family members still residing in their country of origin. My contribution to the scholarship centers on not only *balikbayan* boxes but also Filipina women's experiences in the US. Filipina migrants assume an economic and emotional responsibility for their families/children. Additionally, I find that the Philippine government promoted an emotional "call to action" by regulating and promoting the sending of *balikbayan* boxes. Using oral histories with Filipinos and Philippine government documents, I further current scholarship by placing oral histories of Charlotte Filipinos in conversation with previously archived oral histories of Californian Filipinos. By creating and analyzing these Charlottean Filipino oral histories, I expand previous definitions of the Filipino diaspora and the "New South."

Special code(s): Global Research, Honors Research, NC Research

Abstract: 124

Investigating and Comparing Sustainable Development Goal #16 in Germany and the United States

Krista Van Dyke, Jada Pickering, and Alex Brito

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #:16 Peace, Justice and Strong institutions. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #16? What are the differences? To what degree are the countries on track to make progress on SDG # 16 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #16, promoting peaceful and inclusive societies for sustainable development, providing access to justice for all and building effective, accountable, and inclusive institutions at all levels by the 2030 goal year.

Special code(s): Global Research

Abstract: 125

Type 1 Interferons Decrease Differentiation of Primary Murine Osteoblasts
Raina Hemmings

Mentor: Dr. M. Brittany Johnson, College of Science

Osteomyelitis is inflammation of the bone due to bacterial or fungal infection. The bacterium, *Staphylococcus aureus* is the causative agent of approximately 80% of osteomyelitis cases. Introduction of bacteria to bone tissue from trauma, surgery, or prosthetic devices/implants results in dysregulation of bone homeostasis, net bone loss, and significant patient morbidity. Current treatment includes systemic antibiotics and surgical debridement of necrotic tissue. Despite treatment approximately 40% of patients suffer from recurrent and persistent infections, highlighting the urgency for further investigation of osteomyelitis pathology to identify alternative treatment strategies. It is now appreciated that resident bone cells including the bone building cell type, osteoblasts initiate responses to *S. aureus* and contribute to net bone loss. Interestingly, our lab has identified the type I interferon, IFN-β, as a novel potential regulator of bone homeostasis. Our lab has previously demonstrated that IFN-β is produced by osteoblasts following *S. aureus* infection. Currently, the role of IFN-β in osteoblast differentiation is not fully characterized. Here, we investigated the hypothesis that IFN-β directly affects osteoblast differentiation. Isolated primary murine osteoblasts will be grown in the absence or presence of IFN-β for 10 days and differentiation assessed by alkaline phosphatase staining and western blot analysis. Our results indicate treatment of precursor cells with IFN-β significantly reduced alkaline phosphatase staining at 6, 8, and 10-days. These data indicate IFN-β treatment negatively affects osteoblast differentiation. Ongoing studies will examine additional markers of osteoblast maturation following IFN-β treatment and in the context of *S. aureus* infection. Importantly, expanding our knowledge of factors that contribute to osteoblast differentiation may identify novel points of intervention during osteomyelitis.

Abstract: 126

Power and Performance Analysis of AI models on NVIDIA Grace Hopper Superchips
Alvajoy Asante

Mentor: Dr. Tyler Allen, College of Computing & Informatics

The fast growth of artificial intelligence (AI) technologies has prompted the creation of specialized hardware to fulfill the processing demands of increasingly sophisticated models. Among these advances, the NVIDIA Grace Hopper Superchips stand out as a viable solution, with high-performance capabilities optimized for AI applications. In this study, we conduct a comprehensive examination of the power efficiency and performance characteristics of AI models running on NVIDIA Grace Hopper Superchips. Our study focuses on benchmarking LLM's on the Grace Hopper architecture. We investigate various factors impacting power consumption, including model complexity, batch size, and precision requirements. Additionally, we evaluate the scalability and resource utilization of the Superchips across different model sizes and parallelization strategies. Through extensive experimentation and measurement, we provide insights into the trade-offs between computational power, energy consumption, and model accuracy on the Grace Hopper platform. Our findings not only contribute to understanding the capabilities of NVIDIA's latest hardware but also offer guidance for optimizing AI model deployment to maximize performance while minimizing energy usage.

Abstract: 127

Actualized, Experiential, Critical Skill Development Modules on Permanent Themes in History

Abigail Leonard

Mentor: Dr. Oscar Lansen, College of Humanities & Earth and Social Sciences

Themes in global history have been examined and recorded by historians since the first humans had the capability to create historical records by documenting events. Through looking at these primary sources left behind from past historical events, researchers [typically in the form of Ph.D. students or candidates] are able to collect a plethora of data and primary sources used in their area of study and curate those sources into a curriculum for a collegiate level course. The purpose of the research is to determine what themes are the most relevant to global history through actualized, experiential, critical skill development modules and develop those themes into functional classroom curricula. While the primary focus of this research is on curating curriculum for the collegiate level HIST 1512 course, the eventual goal of this research is to implement this thorough curricula, curated through primary source work and other fellow contributors [interviews from professors made into databases], into something that is readily available for middle grade and high school educators. With access to curricula curated by researchers with access to primary sources and collegiate level educators, middle grade and high school educators are better equipped to begin teaching themes in global history.

Abstract: 128

Investigating and Comparing Sustainable Development Goal #3 in Germany and the United States

Ghalon Chisley, Asia Reid, and Rafiq Greene

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #: 3 Good Health and Well-being, which is about ensuring healthy lives and promoting well-being for all at all ages. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #3? What are the differences? To what degree are the countries on track to make progress on SDG # 3 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG 3 by the 2030 goal year.

Special code(s): Global Research

Abstract: 129

Tuberculosis: Unveiling the Biology, Societal Dimensions, and Empirically Informed Interventions

Alex Litovchenko

Mentor: Dr. Adam Johnson, College of Humanities & Earth and Social Sciences

Background: Tuberculosis (TB), caused by Mycobacterium tuberculosis, continues to be a leading infectious killer, with a global impact concentrated in Southeast Asia, Africa, and the Western Pacific. Despite declining incidences in regions like the United States, the disease poses significant public health challenges due to its complex pathology and socio-cultural determinants.

Method: This study synthesized the literature on disease biology, transmission, symptomatology, and the dual nature of TB infection—latent and active, focusing on the adaptability of TB bacilli and the difficulty in managing the disease due to its varied stages. The review was conducted through the lens of social determinants, including stigma, socioeconomic conditions, healthcare infrastructure, cultural practices, societal inequalities, and existing frameworks for action.

Results: The study results underscored the role of empirically informed interventions such as Directly Observed Therapy (DOT), Short-Course Chemotherapy, and Active Case Finding for their efficacy in prevention, diagnosis, treatment, and control. The other conclusions included the importance of treating latent TB infection and integrating TB and HIV care, and the recommendations for action by governments, healthcare systems, and communities were provided to enhance TB control programs and facilitate active case finding, infection control measures, and community engagement.

Conclusions: TB's persistence in the global health landscape calls for an integrative approach that combines an understanding of its biology with a strategic response to its societal implications. The recommended actions aim for comprehensive control and eventual elimination of TB, highlighting the need for collaborative efforts, increased awareness, and evidence-based interventions.

Abstract: 130

The Role of Pattern Recognition Receptors (PPRs) in Detection of Nucleic Acid Nanoparticles (NANPs) in Murine Osteoblasts.

Shreshttha Patel

Mentor: Dr. Brittany M. Johnson, College of Science

Osteomyelitis is an infection of bone caused by bacteria, which results in progressive inflammatory tissue damage and osteonecrosis. 50,000 cases occur in the United States alone each year. The primary causative agent of osteomyelitis is *Staphylococcus aureus*, accounting for 80% of all cases. Current treatments for osteomyelitis include surgery to remove infected and necrotic bone tissue and antibiotic treatment. However, osteomyelitis remains difficult to treat due to the ability of *S. aureus* to survive and proliferate within resident bone cells. Additionally, the growing threat of antibiotic resistant strains has necessitated greater understanding of *S. aureus* pathogenesis and the exploration of novel therapeutics. Nucleic acid nanoparticles (NANPs) are one novel candidate. NANPs are a versatile molecular platform composed of nucleic acids including DNA, RNA, and modified nucleic acids that can be rationally designed to self-assemble into a variety of planar or 3-dimensional shapes including cubes, rings, and fibers. Importantly, they can be engineered for the coordinated delivery of therapeutic agents into target cells. Notably, NANPs can be applied as immunomodulatory agents. Resident bone cells express pattern recognition receptors (PRRs) that can identify the nucleic acid composition of NANPs thereby stimulating potentially protective innate immune responses. In this study, we will investigate the hypothesis that NANPs stimulate increased expression of nucleic acid PRRs by resident bone cells which contributes to enhanced immunomodulatory effects. Here, we will assess bone cell expression of the endosomal nucleic acid sensors, toll-like receptor 3, 7, 8, and 9, and the cytosolic nucleic acid sensors, retinoic acid-inducible gene 1 (RIGI), cyclic GMP-AMP synthase (cGAS), and zipcode-binding protein 1 (ZBP1) following NANP delivery via western blot analysis. Importantly, results from these preliminary studies will inform our ongoing research, which seeks to examine the ability of functionalized NANPs containing antimicrobial components to initiate protective immune responses and kill intracellular *S. aureus*.

Abstract: 131

DeGenPrime-Ez: Revolutionizing primer design with accessible GUI
Sophie Tanker

Mentor: Richard Allen White III, College of Computing & Informatics

Polymerase chain reaction (PCR) is the world's most important molecular diagnostic with applications ranging from medicine to ecology. PCR can fail because of poor primer design. Nearest-neighbor thermodynamic properties, picking conserved regions, and filtration via penalty of oligonucleotides form the basis for good primer design. DeGenPrime-Ez is a user-friendly graphical user interface that creates high quality PCR primer design based on DeGenPrime [1]. Our interface can utilize multiple sequence alignment formats and direct sequences, expanding the target range for a single primer set. Primer design and refinement is based on thermodynamic properties, filtration metrics, penalty scoring against degenerate bases, and conserved region finding of any proposed primer. It has filters for degeneracy, repeated k-mers, relative GC content, and temperature. Minimal penalty scoring is included according to secondary structure self-dimerization metrics, GC clamping, tri- and tetra-loop hairpins, and internal repetition. DeGenPrime-Ez is written with Tkinter and CustomTkinter APIs with accessibility in mind. Our program provides customizable interface formatting via pre-packaged JSON files which promotes accessibility for neurodivergent and/or colorblind individuals**.** The GUI is easily accessible to scientists without a computational background, and output is customizable. DeGenPrime-Ez unlocks the tree of life with a level of accessibility not previously seen in other tools.

[1] Fulghum BW, Tanker S, White III RA. 2023. https://doi.org/10.1101/2023.08.11.553048

Abstract: 132

Urbanization and Salamanders: Confronting Conservation Challenges
Andres Vences

Mentor: Dr. Sara Gagné, College of Humanities & Earth and Social Sciences

Continuous urbanization in and around cities leads to a decline in biodiversity and ecosystem functions. This has led to a growing desire among researchers to understand the effects of urbanization on biodiversity. However, not all groups of animals have been systematically included in this effort – amphibians, for example, are understudied. Amphibians are considered an indicator taxon in the sense that their occurrence reflects the health of the ecosystem they inhabit. For example, stream salamanders are indicators of stream ecosystem health, especially in urban and urbanizing watersheds where impervious surfaces and human activities may significantly impact stream health. My research objectives are to 1) review the literature of the effects of urbanization on salamander stream communities in the context of a field study in Mecklenburg County, USA, and 2) review conservation planning efforts aimed at amphibians in urban and urbanizing watersheds. The methodology used for the literature review will constitute the use of Web of Science, a database that allows me to access various research articles. I will be using keywords like: Salamand*, urban*, land cover, land change, and impervious cover. The data will consist of relevant sources which will then be summarized and synthesized. I also aim to address the knowledge gaps of salamanders within the broader literature. The data for the literature review consists of 8 articles found within the WebOfSciences database. The results of this research will help inform local conservation of salamander populations.

Abstract: 133

Investigating and Comparing Sustainable Development Goal 15 in Germany and the United States

Ryan Connors, Nolan Erickson, and Duncan Smith

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) 15: "Life on Land". The main research questions for our international comparative study are: What are the similarities between Germany and the United States related to target goals for Sustainable Development Goal 15? What are the differences? To what degree are the countries on track to make progress on SDG 15 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and the creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG 15 by the 2030 goal year.

Special code(s): Global Research

Abstract: 134

The Myth of Japanese Herd Mentality: A Deeper Look into the Japanese Support of General MacArthur

Jaron Dudley

Mentor: Dr. Dan Du, College of Humanities & Earth and Social Sciences

Japan has long been characterized as a culturally homogenous nation. This characterization became most troubling following the conclusion of World War II, where it took the form of believing the Japanese to be culturally subservient to authority and having herd mentality. Already used as an explanation for the Japanese populace's reception to the militarist government during World War II, the explanation of cultural homogeneity only became more convenient when the Japanese populace also positively viewed General Douglas MacArthur's and the United States' military occupation of Japan, who had just been their adversary. Such a simplistic characterization is problematic in its efforts to broadly paint a population, especially in such a negative light. Therefore, it is essential to challenge this characterization by taking a holistic view of Japan leading up, during, and immediately following World War II. This thesis will extensively draw on the words and experiences of normal Japanese civilians themselves, contextualized by the broader events taking place. Such an approach will illuminate the faults of the characterization, instead demonstrating the nuance of Japanese thought before, during, and after World War II. Most importantly, this thesis will argue that the positive reception to General MacArthur was due to the merit of his reconstruction and reforms in the eyes of the Japanese themselves in contrast to the sheer devastation brought during the war, rather than a herd mentality and blind adherence to authority.

Special code(s): Honors Research

Abstract: 135

Janus-[3]radialenes as a Redox Active Dynamic Covalent Polymer Building Blocks
Karsten Fronczak

Mentor: Dr. Christopher Bejger, College of Science

Dynamic covalent polymers have become a topic of interest due to their ability to respond to external stimuli. Polymers are typically seen as static materials, but the introduction of dynamic bonds adds responsiveness and adaptability to these materials. These attributes can allow for materials to repair themselves from mechanical and thermally induced damage. Many dynamic covalent linkers that have been developed can respond to changes in temperature, pressure, and mechanical straining. However, self-healing materials that respond to electrical stimuli remain rare. Polymers that can self-heal under electrical and/or redox conditions are desirable for future electronics, including applications in electric skin, wearable sensors, and portable energy storage. Our group has been investigating radialene compounds for use as organic catholytes in aqueous redox flow batteries (RFBs). Certain radialenes exhibit redox reversibility, good stability, and undergo dynamic dimerization. Thus, they are candidates for use in electrical-responsive self-healing polymers. We have found that ester-substituted radialene radicals undergo reversible dimerization to generate sigma (σ) dimers upon oxidation. The Janus-[3]radialene compound features two [3] radialene units attached by a flexible covalent bond. This compound can be synthesized using a modified Knoevenagel condensation using ethylene glycol dicyanoacetate as the precursor. This poster will detail our progress towards the synthesis of the Janus-[3]radialene compounds with various length glycol chains used to link the two radialenes. All new radialene compounds will be characterized via NMR and IR spectroscopies. The electrochemical properties will be analyzed using cyclic voltammetry. Spectroelectrochemical studies will also be performed.

Abstract: 136

Predicting Distance Runner Times for 5K and other distances
Jacob Sasser

Mentor: Dr. Doug Hague, School of Data Science

This research project aims to use a high school student's track and field and cross-country results up to 5000 meters and try to predict an individual student's 5000-meter distance time. Through this research project, I hope to give cross-country and track athletes more clarity in knowing what their predicted time would be in the 5000-meter distance. Predicting a runner's time for different distances has been around for over one hundred years, with multiple different approaches, some approaches try to predict a runner's time for only one specific distance, whilst others try to allow the runner to choose the distance that they want to predict their time for. The research project will be conducted by taking runner times for multiple distances from the cross country and track and field seasons from all high schools in North Carolina from the past six years. We will then employ many different prediction algorithms and compare them to see which one produces the 5000-meter distance times with the least variance. I hope to show the different ways of predicting runner times and highlight the least and most effective methods. Through this research, my goal is to assist runners in their training. Knowing a runner's predicted time for a certain distance helps the runner know what their strengths and weaknesses are. Even though my research specifically lies in predicting the 5000-meter run, I hope to be able to expand my research into all distances that a runner could want.

Special code(s): Community Engaged Research, NC Research

Abstract: 137

Accommodation in the Face of Relational Dissatisfaction: The Role of Insecure Attachment

Gabbie Boutte, Chloe Rollins, Thao Nguyen, and Bryan Perez

Mentor: Dr. Amy Canevello, College of Humanities & Earth and Social Sciences

Attachment styles play a significant role in shaping how people behave in times of relational dissatisfaction (Shi, 2003). Accommodation theory describes 4 ways people respond to dissatisfaction within relationships: exit, neglect, loyalty, and voice (Rusbult et al., 1991). Avoidant attachment is associated with distancing from their partners in times of distress, which is in opposition to loyalty and voice. Anxious attachment is associated with seeking out reassurance from partners in times of distress, which is in opposition to neglect and exit. Anxious attachment may predict voice and loyalty depending on consciousness and agreeableness, respectively. We hypothesized that avoidant attachment would be positively related to neglect and exit, and negatively related to loyalty and voice. Anxious attachment was hypothesized to be negatively related to neglect and exit. Anxious attachment was also hypothesized to be positively related to loyalty for those higher in agreeableness, and voice for those higher in conscientiousness. People in romantic relationships (*N*=164) completed measures of attachment, accommodation, and personality. Avoidant attachment had a moderate positive relation to exit and neglect, and a moderate negative relation to voice, which supported our hypotheses. There was no association between avoidant attachment and loyalty. Anxious attachment was unrelated to neglect, and positively related to exit. Conscientiousness did not moderate the relation between anxious attachment and voice; agreeableness did not moderate the relation between anxious attachment and loyalty. These findings indicate that avoidant attachment is more predictive of accommodation in response to dissatisfaction than anxious attachment.

Abstract: 138

Investigating and Comparing Sustainable Development Goal #7 in Germany and the United States

Bernadine Williams, Paul DeGuzman, and John Ratchford

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #7: Clean and Affordable Energy. The main research question for our international comparative study is: What are the similarities between Germany and the United States related to target goals for Sustainable Development Goal # 7? By 2030, the goal is to guarantee that everyone has access to modern, affordable, dependable, and sustainable energy. This entails increasing access to electricity in developing nations, enhancing energy efficiency, and encouraging the use of renewable energy sources. Our second question is: Will the SDG #7 be met in the two countries by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and the creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #7 Ensuring access to affordable, reliable, sustainable, and modern energy for all by the 2030 goal year.

Special code(s): Global Research

Abstract: 139

Frequency Encoded Detection for Organic Amine Content in Water
Brinda Patel

Mentor: Dr. Laura Casto-Boggess, College of Science

Space exploration, Antarctica, and the bottom of the ocean all have one thing in common. The samples taken from these expeditions are low in quantity. How can scientists perform different experiments with these limited samples? They make the sample sizes required for their experiments miniscule, but accuracy, sensitivity, and selectivity still need to be accounted for. Droplet microfluidics and fluorescence detection provides the missing solution by multiplexing, where a single channel gets split into multiple channels. This increases the number of cases to better represent the population from a small amount of samples. The droplet microfluidics will focus on trying to separate a sample into different samples by using a compound with a different polarity. The fluorescence detection will focus on using water with a fluorescent dye, known as fluorescamine, to check if the technique is sensitive to the low concentrations of organic amine contaminants. These theories will be put into practice in this study by developing a method of assessment that tests droplet microfluidic performance with an Arduino board to enhance measurement accuracy by focusing on sensitivity and selectivity.

Special code(s): Global Research

Abstract: 140

DeGenPrime provides robust primer design and optimization unlocking the biosphere
Bryan Fulghum

Mentor: Dr. Richard Allen White III, College of Computing & Informatics

Polymerase chain reaction (PCR) is the world's most important molecular diagnostic with applications ranging from medicine to ecology. PCR can fail because of poor primer design. The nearest-neighbor thermodynamic properties, picking conserved regions, and filtration via penalty of oligonucleotides form the basis for good primer design. DeGenPrime is a console-based high quality PCR primer design tool that can utilize MSA formats and degenerate bases expanding target range for a single primer set. Our software utilizes thermodynamic properties, filtration metrics, penalty scoring, and conserved region finding of any proposed primer. It has degeneracy, repeated k-mers, relative GC content, and temperature range filters. Minimal penalty scoring is included according to secondary structure self-dimerization metrics, GC clamping, tri- and tetra-loop hairpins and internal repetition. We compared PrimerDesign-M, DegePrime, ConsensusPrimer, and DeGenPrime on acceptable primer yield. PrimerDesign-M, DegePrime, and ConsensusPrimer provided 0%, 11%, and 17% yield respectively for alternative iron nitrogenase (*anfD*) gene target. DeGenPrime successfully identified quality primers within the conserved regions of the T4-like phage major capsid protein (*g23*), conserved regions of molybdenum-based nitrogenase (*nif*), and its alternatives vanadium (*vnf*) and iron (*anf*) nitrogenase. DeGenPrime provides a universal and scalable primer design tool for the entire tree of life.

Abstract: 141

A Fight for Freedom: Republican Women in the Irish Troubles through the Lens of Second Wave Feminism, 1969-1998

Jacob Majure

Mentor: Dr. Peter Thorsheim, College of Humanities & Earth and Social Sciences

This thesis analyzes the paths that led many Republican women to feminism during the Irish Troubles (1968-1998). Beginning with the Battle of the Bogside in 1969, Republican women rebelled against oppression from governing protestants. The first chapter analyzes the role that women played early in the Troubles. It focuses on Bernadette Devlin's maiden speech to parliament, her book *The Price of my Soul*, and the ways that many Republican women joined in political protest and paramilitary action. The second chapter shows the ways that imprisoned women experienced sexist treatment and even gendered violence. Through these experiences and the increased educational opportunities that arose because of the implementation of "special category" status, many Republican women's feminist views became concrete. While many Republican women experienced sexist treatment throughout their lives, it was not until their imprisonment that they became fully concrete in their feminist ideals. This thesis utilizes interviews conducted by Azrini Wahidin, Miranda Alison, and Robert White, coupled with primary source writings from the prominent Republican figure, Bernadette Devlin. Analysis of these sources shows that many Republican women developed feminist views due to their experiences in the Irish Troubles.

Special code(s): Honors Research

Abstract: 142

Investigating and Comparing Sustainable Development Goal 5 in Germany and the United States

Natalia Harris and Lucy Yeates

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #5: Gender Equality. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal 5 “achieve gender equality and empower all women and girls”? What are the differences? To what degree are the countries on track to make progress on SDG 5 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday’s (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG 5 “achieve gender equality and empower all women and girls” by the 2030 goal year.

Special code(s): Global Research

Abstract: 143

Using ASSISTments for College Math: Evaluating the Effectiveness of Supports and Transferability of Findings

Eric Hedgepeth

Mentor: Dr. Michael Smalenberger, College of Science

Online homework systems have become integral to college algebra education, offering immediate feedback and a range of tutorial supports that foster student autonomy and encourage a cycle of learning that involves attempting, receiving feedback, and reattempting tasks. These systems have shown to be popular among students at various educational levels, providing motivation through the ability to complete assignments online. Notably, the no-cost system ASSISTments has demonstrated promising results in enhancing student learning and the effective use of formative feedback through large-scale studies in middle and high school settings. Research highlights the system's potential in supporting learning with various "Best so far" supports, such as video versus text hints, worked examples versus hints, and single versus multiple template questions, all of which have been linked to positive learning outcomes. This evidence suggests a strong basis for adapting ASSISTments for undergraduate education, indicating its potential to significantly impact learning outcomes at this level.

Abstract: 144

Exploring Data Eviction on Graphical Processing Units

Taylor Sasser

Mentor: Dr. Tyler Allen, College of Computing & Informatics

Programming for Graphical Processing Units or "GPU" systems presents unique challenges, particularly in the realm of data management. The introduction of managed memory in recent years has significantly alleviated these challenges by enabling seamless data transfer across devices, thus simplifying the development process for programmers. However, this convenience often comes at the cost of reduced performance. This paper gives an exploratory analysis aimed at understanding managed memory within GPU systems by examining page faults, and the implementation of various caching algorithms to mitigate the performance drawbacks associated with managed memory. The study begins by contextualizing the difficulties inherent in GPU programming, and why managed memory is such an appealing choice for many scientists. Managed memory, is an automated data transfer between the host Central Processing Unit or "CPU" and the device (GPU), reduces programming complexity but introduces performance penalties. To address these challenges, our research investigates the correlation between page faults, memory access patterns, and the performance of caching algorithms implemented within GPU systems. Our methodology involves the development, evaluation, and performance testing of several caching algorithms across a variety of problem sets, including real-world applications. The ultimate goal of this is to be able to classify programs based on fault data, and then switch to a suitable caching algorithm which can preload data onto the GPU, reducing the likelihood of a page fault.

Abstract: 145

Trace Metal Scavenging by Hydrothermal Plumes

Mckenna Zelna

Mentor: Dr. Drew Syverson, College of Humanities & Earth and Social Sciences

Research focused on hydrothermal vent fluid chemistry is commonly conducted to investigate metal concentrations of pristine vent fluid that has not mixed with seawater. However, hydrothermal plume particles, which form when vent fluids and seawater mix, are less frequently studied. These plume particles effectively scavenge and remove biologically important trace metals from vent fluids fluxing from the ocean crust to Earth's oceans. As such, this research aims to evaluate the effects of plume particles on ocean chemistry on a global scale. The question this research answers is: How important globally does hydrothermal plume particle formation have an effect on the net flux of metals from high-temperature, metal-rich fluids venting from mid-ocean ridge hydrothermal systems, and does this process affect the trace metal inventory of Earth's oceans? The research was conducted through data compilation and comparison of trace mineral/Fe ratios for endmember fluids with trace mineral/Fe ratios for plume data. The data was collected from numerous scholarly articles which investigate a variety of hydrothermal fields. Including samples from a variety of hydrothermal systems is important since hydrothermal fields are diverse in rock type, chemistry, and temperature. Monte Carlo simulations were performed to estimate the amount of trace metals that are scavenged by hydrothermal plume particles globally and evaluate the contribution of vent fluids delivering trace metals to Earth's oceans. Trace metals are scavenged very effectively during hydrothermal plume formation along Earth's mid-ocean ridge system. The net flux of trace metals delivered by vent fluids to seawater is significantly less than past estimates that did not take into account plume formation and scavenging. This study will allow a deeper understanding of the effects of hydrothermal plume particles on marine chemistry across a variety of hydrothermal systems, therefore furthering knowledge of oceanic chemistry dynamics.

Special code(s): Global Research

Abstract: 146

Investigating and Comparing Sustainable Development Goal#4 in Germany and the United States

Olivia Visconti, Rhoni Jones, and Ryder Mullis

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #4: Quality Education, which seeks to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for SDG # 4? What are the differences? To what degree are the countries on track to make progress on SDG #4 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #4 in order to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by the 2030 goal year.

Special code(s): Global Research

Abstract: 147

The Advancements in the Mechanism and Sensitivity of Alcohol Sensing Utilizing Dipyridinium Thiazolo[5,4-d]thiazole

Aiden Hawkins

Mentor: Dr. Michael Walter, College of Science

Alcohol sensing can be used for applications including breathalyzer tests, unwanted side products in organic synthesis, and industrial purposes. Dipyridinium thiazolo[5,4-d]thiazole (TTz) is a water soluble, rigid, highly planar, heterocyclic molecule that is electrochromic, electrofluorochromic, and photochromic. In water, (TTz2+) absorbs at 400 nm causing it to look yellow; upon a single electron reduction, the absorbance shifts to 610 nm (TTz•+), which looks purple, and adding one more electron will shift the absorbance to 710 nm (TTz0), causing a blue color. This absorbance shift is easily reversible as TTz will readily give up the electrons it gained if introduced to an oxidizing agent. During amine sensing, light was utilized to excite the molecule to a higher energy state, allowing for the reductions to take place. This sensing application of TTz can be modified for alcohols with the addition of a base and removing of light. Within this reaction, TTz gains an election, leading to an electronic change much like the change present in amine sensing or photochromism. This change is accompanied by an apparent color change from yellow to purple or blue instantly. This study is an exploration into the mechanism, sensitivity, and environmental influence of this reaction with varying alcohols. The mechanism will be tracked with data from High Performance Liquid Chromatography (HPLC) and Nuclear Magnetic Resonance Spectroscopy (NMR). The sensitivity and environmental changes will be tracked with Ultraviolet-Visible Spectroscopy (UV-Vis). This study will also serve as an advancement in alcohol sensing and the capabilities of TTz.

Special code(s): Honors Research

Abstract: 148

Toward Explainable AI: Developing an Interpretable Video Understanding Model for Explainable Human Action Label Prediction

Naveen Vellaturi

Mentor: Dr. Srijan Das, College of Computing & Informatics

In a recent incident at a South Korean vegetable packaging plant, an AI-powered industrial robot was involved in a fatal accident, highlighting the critical intersection of artificial intelligence and workplace safety. These AI systems employ advanced computer vision algorithms to interpret video data, aiming to recognize human actions and intentions accurately. Despite their efficacy in predicting human action labels from video inputs, the lack of transparency and explainability in these models raises significant concerns regarding their reliability in real-world scenarios. A model might classify an input video as depicting *a person drinking water*; however, the accuracy of this classification is secondary to understanding the model's rationale. Prior work predominantly focuses on natural images, learning interpretable embeddings by mapping visual representations to a conceptual layer and linearly aggregating these embeddings for prediction, but, encounters challenges, including information leakage and semantic inaccuracies. This work proposes an interpretable video model that can automatically learn concepts based on the use case, leveraging a large language model like GPT-4, and model these concepts spatio-temporally to predict human action labels. Concepts per frame are learned using a vision-language model. Subsequently, the spatio-temporal relationships among the per-frame concepts are analyzed using an interpretable graph reasoning layer, which incorporates the concepts as nodes, learnable edges, and linear transformations to predict action labels. This results in a self-interpretable video model, with a linear mapping from per-frame concepts to its predictions, with potential applications in monitoring the elderly in smart homes, patient care in healthcare settings, and human-robot interactions.

Abstract: 149

Investigating Predictors of Age-Based Stereotype Threat in Job-Seeking Adults
Harrison Wagner

Mentor: Dr. Meghan Davenport, College of Humanities & Earth and Social Sciences

Research has shown that people hold stereotypes that older workers possess a lower ability to learn and have less potential for skill development (Posthuma & Campion, 2009). Although this is a prevalent stereotype, people of all ages can experience age-based stereotype threat, defined as the feeling of being “at risk of confirming a self-relevant negative group stereotype” (Lamont et al., 2021; Steele & Aronson, 1995). Previous research on stereotype threat has found that multiple identities can buffer the experience of stereotype threat, such as college student identity buffering the experience of gender-based stereotype threat around math (Rydell & Boucher, 2010). The present study investigates whether job applicants experience more age-based stereotype threat when pursuing higher-income occupations and whether age moderates this relationship. People whose desired occupations have a higher average income are hypothesized to report less stereotype threat overall. Younger job-seekers are hypothesized to show a less strongly negative relationship, while older job-seekers are expected to show a more strongly negative relationship. Unemployed, job-seeking adults ages 18-60 were recruited via Prolific for a survey. Participants reported their desired occupation, age, and level of age-based stereotype threat (Kulik et al., 2016). Participants’ desired jobs will be matched to occupation (SOC) codes via the O*NET, an occupational classification system, to find the median income for each occupation (Dahlke & Harris, 2023). Hypotheses will be tested using linear regression. The predictors of stereotype threat are crucial to understand because it is known to lead to negative job attitudes (Von Hippel, 2019).

Abstract: 150

Investigating and Comparing Sustainable Development Goal #12 in Germany and the United States

Anisha Nannapaneni, Laney Meggs, and Simon Ocsenas

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #12: Responsible Consumption and Production. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #12? This SDG recognizes the resources that our planet has provided and the harm associated with the rate at which these resources are being consumed. What are the differences? To what degree are the countries on track to make progress on SDG #12 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #12: Responsible Consumption and Production by the 2030 goal year.

Special code(s): Global Research

Abstract: 151

Chemical kinetics for hydrolysis of carboxyfluorescein succinimidyl ester
Neena Robinson

Mentor: Dr. Laura Casto-Boggess, College of Science

A fluorescent dye used in biological and biochemical research is called carboxyfluorescein succinimidyl ester, or CFSE. It is a member of a category of dyes known as fluorescein, which exhibits high fluorescence in the presence of light. When CFSE is hydrolyzed, the ester bond inside the molecule is broken when water is present. A carboxylic acid and a primary amine are formed as a result of a water molecule's nucleophilic attack on the ester group's carbonyl carbon during the process. The hydrolysis kinetics for CFSE in aqueous buffers were investigated. The reaction kinetics are monitored over time using UV-absorbance at a specific wavelength characteristic to the hydrolyzed dye. The rate of hydrolysis is determined by analyzing the change in absorbance over time. This rate was determined as a function of pH in a range of alkaline buffer conditions. Initially, CFSE appears orange in color and turns green after hydrolysis. This means that absorbance at 525 nm (green) decreases as the hydrolysis reaction proceeds. To simplify observation of kinetics, reactions were carried out in buffered solutions to maintain constant [OH-] throughout the duration of the reaction such that hydroxide consumed by the hydrolysis reaction is negligible. The rate constant observed under such conditions is thus first order with respect to dye concentration and can be determined by plotting ln[CFSE] vs. time. The individual rate order of the reaction with respect to CFSE was temperature dependent.

Abstract: 152

Arts Education in the US: An Overview of Impacts, Policy, and Funding
Parth Vyas

Mentor: Dr. Erik Jon Byker, Cato College of Education

The purpose of this presentation is to describe and report the design and functionality of US arts education programs in grades K-12 in the context of public schooling and education. This presentation serves relevance in defining historical elements and current debates that have contributed to the relevance of using arts education in policy and programs to develop students' sense of identity, sociality, and productivity in modern American society. The following research questions were explored: (1) What are the statistics related to arts-related funding in US public schools? (2) What are the experiences and challenges faced by the arts-related teachers in the United States education system? (3) What are policies and programs to help support the Arts in schools? (4) What are the research findings related to the impact of these programs? This study examines the listed research questions through the scope of a literature review research design methodology. In relation to the research questions, the presentation reports on findings including the synergistic relationship that has been established between student's work ethic and productivity in the American workforce and economy, as well as the conflicts low funding in arts programs has served on test scores and learning methods. Furthermore, the research expands upon the benefits of the seamless integration of arts with academic content to enhance students' creativity, understanding, and social-emotional well-being. The research concludes with a discussion and personal reflection regarding the value of inquiry and conducting literature review-style research from a wide variety of sources.

Abstract: 153

Photocatalytic Applications and Characterization of Perylenequinone Dyes
Nick Eberwein

Mentor: Dr. Michael Walter, College of Science

In recent years, the field of photoredox catalysis has proven that highly conjugated organic dyes work as excellent photocatalysts as demonstrated by Dr. David MacMillan who won the 2021 Nobel Prize in Chemistry. Organic photocatalysts utilize the absorbance of light to generate a singlet excited state which can facilitate a series of single-electron-transfer (SET) steps. Perylenequinone (PQ) dyes, derived from mushrooms, have been previously used as photosensitizers in photodynamic therapy and as anticancer agents for melanoma skin cancer cells. Recent work by UNC-Greensboro has led to the successful isolation of various dyes, all from the same mushroom species. The Walter Lab at UNC-Charlotte has demonstrated that these isolated perylenequinone dyes such as ent-Shiraiachrome A, hypocrellins and hypomycins also work as photocatalysts (yield = 40-60%). Here, the photophysical properties of PQ dyes will be examined including, but not limited to, redox potentials, quantum yields, fluorescent lifetimes, and maximum absorbance. An imine alkylation reaction using various alkylated potassium trifluoroborate molecules will be used to model the photocatalysis reactions. The photoreactor used in these experiments is designed with the ability to control light wavelength, duration, and intensity. Preliminary data suggests the PQ dyes exhibit higher yields when exposed to more than one wavelength of light (yield = 87.10%). This data suggests that the singly-reduced PQ dyes are also a photoactive species capable of catalyzing the reaction in tandem. This dual-wavelength photocatalysis via two oxidation states of the same photocatalyst has not previously been reported.

Special code(s): Honors Research, PKP Member, Sustainability Research

Abstract: 154

Understanding Privacy Risks Regarding Deepfake Models
Ashley Bang

Mentor: Dr. Liyue Fan, College of Computing & Informatics

The rise of AI generated images opens more doors for privacy risks related to the training data in which the generated images are derived from. There is evidence of images reconstructed by diffusion models, ie. Stable Diffusion, presenting to be nearly identical to those from the training set. The images in this training set are publicly available and consist largely of natural images. A concern not yet addressed is the efficacy of this data extraction being conducted on sensitive data in specific domains, e.g., medical imaging, investigating whether or not similar results would uphold for them. Furthermore, state-of-the-art generative models are considered, namely Denoising Diffusion Probabilistic Models (DDPM), as they also have the potential for such privacy risks. To study the use case including both of these factors, retinal images were used as the real training sets for the images generated by DDPM with varying degrees of layering and quality to test the extraction efficacy. Upon deducing the presence of nearly identical images with larger datasets, the possibility for privacy risks exist for sensitive data and vulnerabilities of this should be studied further in regards to preventative measures against privacy attacks.

Special code(s): Global Research

Abstract: 155

Investigating and Comparing Sustainable Development Goal #4 in Germany and the United States

Shawna Blanche

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #4: Quality Education. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities? What are the differences? To what degree are the countries on track to make progress on SDG # 4 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities by the 2030 goal year.

Special code(s): Global Research

Abstract: 156

The Obesity Epidemic and its Effects on Muscle Repair and Notch Signaling
Danielle Waters

Mentors: Dr. Susan Arthur, Dr. Melinda Adnot, and Dr. Abbey Fenwick, College of Science

The obesity epidemic can be described as a domino effect. It can lead to a series of interconnected events such as sedentary behavior and the development of other diseases contributing to early mortality. 42.2% of adults in America are clinically obese, with numbers on the rise after the global pandemic of COVID-19, resulting in more people working from home, decreasing daily movement activity. The obesity-associated sedentary lifestyle negatively impacts skeletal muscle quality. The causes and mechanisms of the relationship between obesity and poor muscle quality are not well studied. The focus of this research is to understand how obesity reduces skeletal muscle quality. If not corrected in earlier stages, patients with obesity face the risk of losing their mobility with age due to the reduction of Notch Signaling, a contributor to poor muscle repair. Notch Signaling is a pathway that assists in the regeneration of muscle cells in the body. When the muscle is unable to regenerate, due to lack of movement in patients with obesity, health conditions such as muscle atrophy are amplified with age. This literature review examines previous investigations conducted, by conveying the contributing factors of obesity, and how these factors negatively impact skeletal muscle regeneration while shedding light on ways to combat the epidemic. Obesity inversely affects the quality of life for patients with the disease by reducing more activities of daily living, leading to a more sediment lifestyle. This results in increasing health risks, higher costs for patient care, and earlier mortality rates.

Special code(s): Honors Research

Abstract: 200

Facades as a vehicle for cultural expression in Phil Freelon's Architecture
Amanda Marais

Mentor: Dr. Emily Makas, College of Arts + Architecture

Phil Freelon was an American architect known well for creating architecture that was more sensitive to its occupants and context than to its particular utility. He designed architecture for the individual by incorporating ideas significant to African American culture that reveal the influence a cultural context has on a building. As an intern for the UNCC Freelon Exhibition Team, I have compiled a record of what I have learned this semester. As the exhibition team has determined, one of Phil Freelon's strategies involved the "skin" of the building. Through the use of "material, color, and pattern," buildings' facades reflect and celebrate cultural resonance. This work is situated within the context of the ongoing discourse on the role themed architecture has in cultural expression–being conscious of what has come before and facilitating what will come next. The UNCC Freelon Exhibition project has involved a comprehensive analysis of the envelope of various museums and cultural facilities in Phil Freelon's architectural portfolio; using their resources, this study hones in on three of their studied buildings that demonstrate the ways Freelon articulated intent. The material choices and their connection to context are examined for the Regional Lewis Museum in Baltimore, Maryland; the color choices and their reflection of skin tones are examined for the Center for Civil & Human Rights in Atlanta, Georgia; finally, the facade patterning and its significance to the cultural expression of music history of Motown Museum in Detroit, Michigan. The project aims to represent my new understanding of how heritage can enrich architectural expression. The outcomes of this project are expected to celebrate Phil Freelon's intent and encourage the architecture that resonates with its users' cultural identities and the site's history.

Special code(s): Urban-Charlotte Research

Abstract: 201

Investigating Quality Education in Germany and the United States through the Lens of SDG #4

Zoie Matthews

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #4: Quality Education. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities? What are the differences? To what degree are the countries on track to make progress on SDG # 4 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities by the 2030 goal year.

Special code(s): Global Research, Sustainability Research

Abstract: 202

Regeneration of Desiccant Packets: A Sustainable Approach to Moisture Control
Grayson Barcinas

Mentor: Dr. Michael Benjamin, William States Lee College of Engineering

Desiccant packets are widely employed in packaging and storage applications to absorb excess moisture. The sheer volume of discarded desiccant packets have contributed to the growing levels of landfill waste and new material resources, raising sustainability concerns. Contrary to their single-use image, desiccant packets are able to be regenerated after reaching full saturation, where water molecules can no longer be absorbed. Regeneration allows for desiccant packets to be reusable, but bridging the gap between existing research and consumer accessible methodologies is crucial for its widespread adoption. The present study examines various regeneration methods of different desiccant types, including silica gel, indicating silica gel, clay, and molecular sieves (N=120). Desiccant regeneration was tested using a microwave, dehydrator and toaster oven. To assess regeneration efficiency over time, the desiccants were weighed after removal from packaging and then again after heating. The advantages and limitations associated with each method were analyzed while considering factors like environmental impact, energy consumption, total time, and cost. Results indicated that the dehydrator was the most effective regeneration method, with a 0% packet destruction rate. Removing the desiccants from packaging prior to regeneration can eliminate the issues with rupturing using the microwave and toaster oven, but also results in package waste. If widely adapted, regeneration could lower desiccant costs while simultaneously reducing landfill waste. However, the implications associated with implementing sustainable upcycling pathways must be explored more first.

Special code(s): Sustainability Research

Abstract: 203

Characterization of Genes Involved in UDP-HexNAcA Synthesis
Maisy Olmo

Mentor: Dr. Jerry Troutman, College of Science

Vibrio cholera is a pathogen that causes the often fatal diarrheal disease we know as cholera. Cholera is prevalent in developing countries where water sanitation is poor, as cholera bacteria is expelled in human feces. In the Troutman lab, research will be conducted on the predicted epimerase and dehydrogenase proteins, Vibrio polysaccharide gene A (vpsA) and Vibrio polysaccharide gene B (vpsB), respectively. Both genes are identified components in the production of the monosaccharide that's part of the Vibrio polysaccharide biofilm, which is crucial in bacterial survival and its ability to attach to and infect human hosts. To study these proteins, vps genes are cloned and expressed in E. coli expression cells and the cells will be lysed to isolate the proteins. High-performance liquid chromatography, immobilized metal affinity chromatography, SDS-PAGE, and Western blotting will be used. Lastly, in-vitro assays are performed to characterize the vps nucleotide sugar modification enzymes. This research will contribute to the overall characterization of vps proteins and their role in the biosynthesis systems of Vibrio polysaccharides.

Special code(s): Global Research

Abstract: 204

Childhood Disability, Chronic Illness and Mental Health Services in America: A Literature Review

Madi Adams

Mentor: Dr. Melinda Adnot, Honors College

Mental health advocacy is on the rise in the United States, but many are unaware how adverse childhood experiences (ACEs) can affect the developing mind. In this project, I examine how the ACEs of chronic illness and disability lead to the increased need for pediatric mental health services. This literature review examines data on the current mental health crisis and services available for our nation's youth, while focusing specifically on the negative mental health effects of disability and chronic illness during developmental years. In my preliminary research, I have found that a majority of children will experience some type of ACE, and these ACEs are associated with poor mental health and chronic conditions, as well as struggles with social development. Disability and chronic illness is considered an ACE and comes with its own set of challenges like bullying and isolation for any age, but especially for the mind of a child. Children's mental health has been deemed a public health crisis in America due to the impact of these disorders on youth and their families. These findings suggest that there is a need for increased mental health services in our schools and communities that are affordable and easily accessible for all individuals, regardless of their cultural identity or ability status. American institutions responsible for the care of children can do a better job at providing outreach and counseling services to our youth to improve mental health outcomes for many.

Special code(s): Honors Research

Abstract: 205

A Comparative Study of Automated Text Summarization with GPT-4 LLM for Analyzing Student Reflections

Nicole Wiktor

Mentor: Dr. Mohsen Dorodchi, College of Computing & Informatics

Knowledge extraction from human generated text has been applied to many real world areas to help with finding useful information as soon as possible. In the domain of education, efficiently summarizing and analyzing students' periodic feedback and reflections can provide key insights for instructors to improve the overall course experience throughout a semester. Extracted insights can help instructors quickly grasp the main struggles and challenge areas where students need more support. This research aims to explore the effectiveness of different automated text summarization techniques in processing student reflections, starting from the basic summarization algorithms such as TextRank to more advanced recent models of the LLM-based approaches. We investigate how variations in algorithms as well as parameters of algorithms can influence the quality and relevance of summaries. For example, a research question could be "how does the change in the 'temperature' parameter impact the generated summaries by GPT-4?". Furthermore, our study investigates and compares the quality of text summaries generated from different topic modeling techniques such as BERTopic and GPT-4's own topic modeling capabilities in categorizing key themes from student reflections. Quantitative metrics such as METEOR and ROGUE scores as well as qualitative analysis such as subjective expert analysis will be used to assess and compare these techniques.

Abstract: 206

Examining Charlotte's Latina Mothers Employment Status and Related Barriers
Sofia Herrera Acosta

Mentor: Dr. Stephanie Potochnick, College of Humanities & Earth and Social Sciences

Charlotte is an area where the Latino and immigrant population continues to increase, but also an area that is struggling to adapt to this growing demographic. Latina mothers are a population that statistically has the lowest participation in the workforce compared to other demographics. This disparity must be addressed as it affects their health, their children's access to opportunities, and their access to upward mobility. The purpose of this project is to identify Charlotte Latina mothers' overall employment opportunities and barriers related to childcare. It is worth noting that within these mothers' cultures, familial obligations commonly override other obligations. Through the collaboration with Camino Research Institute (CRI), this subproject will utilize secondary survey data from their Social Determinants of Health Program Participant In-Take Form to gather information about Latina mothers' employment status and related strengths and barriers. The data analyzed consists of employed versus unemployed rates of Latina mothers, prominent areas of employment, ages of employed versus unemployed Latina mothers, and common effects of related barriers such as mental health challenges. The results gathered through a community-driven research approach will be demonstrated through a 1-page report geared towards employment and childcare stakeholders that CRI and UNCC team networks find appropriate. This information will encourage these stakeholders to expand their knowledge regarding this growing population and a common challenge they face. Additionally, the information will motivate them to increase employment opportunities and accessibility to childcare services to promote the well-being of Latina mothers and families.

Special code(s): Community Engaged Research, Urban-Charlotte Research

Abstract: 207

Investigating Stereotype Threats in School Communities
Naiya Graham

Mentor: Dr. Erik Jon Byker, Cato College of Education

The purpose of this presentation is to describe and report on the stereotype threats in educational settings that are affecting minority students. The paper situates this topic in the context of public schooling and education in the United States. The paper is topical and important because it addresses the potential decrease in academic achievement for minority students and how stereotype threats are present in American K-12 schools. The following research questions are investigated in this paper: 1) What are stereotype threats in schools? 2) How do stereotypes and biases affect the educational experiences of minority students? 3) What are the research findings related to those effects? 4) What are strategies to help address stereotype threats? The paper examines these research questions using a literature review research design methodology. In relation to the research questions, the paper reports on findings, which include racial biases in teachers, strategies that help combat stereotype threats, and racial disparities in educational settings. The paper concludes with a discussion and personal reflection about the value of inquiry and conducting literature review type of research.

Special code(s): Community Engaged Research, Honors Research

Abstract: 208

Artificial Intelligence / Machine Learning Model Development and Evaluation for Water Utility Applications

Hannah Zeru

Mentors: Dr. Michael Smith & Dr. Nicole Roberts, William States Lee College of Engineering

Artificial intelligence (AI) / machine learning (ML) has many modern applications in various fields, allowing people to process and analyze data at never before seen speeds. One field where this incredible tool is underutilized is within the water sector, especially wastewater treatment plants. There is potential for ML-based models to help save energy costs and streamline the process of treating wastewater by predicting important wastewater parameters. Our project is investigating the relevant parameters, or characteristics, of wastewater treatment data to identify opportunities for improvement (e.g., more accurate process knowledge). We also want to increase the accuracy of current machine learning models being used in this industry, if possible, which could potentially be done by observing and updating relevant parameters. To do this, we are looking at sample wastewater treatment data and testing models to find the most effective methods. As we test models, we are also checking the parameters to see what needs to be updated and what is working. By doing this repeatedly and analyzing the results, we can see what is most effective for measuring water quality and what is unnecessary to the process. By doing this, we hope to achieve a better understanding of wastewater treatment data and more accurately predict wastewater quality for current and future uses. While the use of machine learning within wastewater treatment plants is relatively new, there are many possible applications. Improving any part of the process helps reduce costs and optimize the wastewater treatment process performance.

Abstract: 209

Awareness of Resources Aimed to Support Niners With Chronic Illnesses
Palmer Everett

Mentor: Dr. Aimee Smith, College of Humanities & Earth and Social Sciences

Background: The knowledge of on and off-campus resources is vital to the development and success of students with chronic medical conditions. For the purpose of our study, a medical diagnosis is considered chronic if the student has to visit a healthcare provider at least four times per year for management related to their illness. Examples include cancer, diabetes, HIV/AIDS, and cystic fibrosis. The ability to function in the same capacity as a student without a chronic medical condition is difficult, especially without resources to provide assistance . This study aims to report on awareness of and access to resources for students with chronic illnesses. Methods: A resource list was created with four categories based on location: University of North Carolina at Charlotte (UNCC), Charlotte/North Carolina, elsewhere in the United States, and outside of the United States. An online survey was administered to UNCC students with a chronic condition, and they were asked about their awareness of support resources and access to those resources.

Expected results: We will report survey results including percentages of students who were using resources and who were aware of resources. Conclusions: We hope to improve awareness and access to services among UNCC students with chronic medical conditions. Making this information easily accessible to those that have a chronic illness can make receiving support easier, faster, and more reliable, and may help these students succeed in school. Living with a chronic illness can negatively impact goals, aspirations, and future plans if adequate resources are not provided.

Special code(s): Community Engaged Research, Sustainability Research

Abstract: 210

Mastering the Game: Leveraging AI to Unravel Player Skill Development
Bryonna Gray

Mentor: Dr. Melinda Adnot, Honors College

This literature review will analyze optimal strategies in pool and billiards using game theory principles by considering competitive interactions and decision-making dynamics within various billiard games. The topic will be connected to machine learning and AI by focusing on software designs that help with key gameplay actions like stroke, direction, stance, cue-ball control, and decision-making to enhance player skills. Due to the difficulty of executing such techniques, mastering the tactics and strategies of pool and billiards can take years. However, with the help of robotic and intelligent decision systems, players with a variety of proficiency levels show improvement after incorporating such methods. The goal of this literature review is to learn how different software programs, developed to improve a player's dexterity, help induce strategies and certain abilities within their skill set. The plan is to explore the effectiveness of these programs in enhancing overall gameplay performance and skill acquisition. Exploring the effectiveness of these programs in enhancing players' overall gameplay performance and skill acquisition will give insight into their potential to not only improve individual player performance but also contribute to the broader understanding of skill development in billiards and inform the design of future training tools and methodologies. In the initial stages of this inquiry, it is shown that modeling systems and simulations can achieve great results by multiple users of such developed programs. These observations propose that using machine learning and AI developed systems is beneficial for players who are looking to play in a competitive environment.

Special code(s): Honors Research

Abstract: 211

How Mood and Sleep Are Associated with College Students' Academic Procrastination

Molly Kaleskas

Mentor: Dr. Jennifer Langhinrichsen-Rohling, College of Humanities & Earth and Social Sciences

College students are known to experience depression, anxiety, stress, sleep problems and academic pressures. In the current study, the focus is on how negative mood and sleep relate to academic procrastination, as greater procrastination is associated with poorer academic performance among college students (Wong et al., 2013). These relationships will be considered among college students, and separately for college men and women. Specifically, this study is designed to consider the relationship both negative mood and sleep (separately and in conjunction) have on academic procrastination. A sample of 870 undergraduate students responded to a survey asking about mood symptoms, sleep behaviors, and attitudes toward procrastination. Measures used were the Depression Anxiety Stress Scale, the PROMIS (with two sleep problem subscales), and the Academic Procrastination Scale Short Form. Results indicate the prevalence of mood disturbance and sleep issues are substantial with 44% of students reporting out of the normal range for depression, 47.8% for anxiety, and 34.6% for stress. As expected, mood problems and sleep disturbances are related with a significant correlation of .62. Furthermore, in line with prediction, the interaction between both sleep concerns and mood problems predicted academic procrastination accounting for 7% of the variance and the model also held for females at 7% and males at 6%. This helps to show that not only are college students struggling with feelings for negative mood and sleep problems but that the interaction of the two can predict procrastination, which in turn, is a likely pathway to reduced academic wellbeing.

Special code(s): Honors Research

Abstract: 212

Socioeconomic Forces Impacting Biosecurity in Nigeria

Savanna Richardson and Natasha Jariwala

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Biosecurity has historically focused on economic growth and benefit, often neglecting the public health implications. Biosecurity has also had positive economic effects in other countries. However, this approach overlooks the complex interplay between economic conditions and public health risks. Recognizing this gap, our current research examines the relationship between Nigeria's financial conditions, its vulnerability to biological threats, and the associated response costs. Logging and the illegal exploitation of tree species are only a few of the threats that Nigeria has to face. This shift in focus provides a more holistic understanding of biosecurity within the broader socio-economic context. As Africa's largest economy, understanding how Nigeria's economic health affects its ability to combat biological threats provides essential insights into global health security dynamics. Nigeria's financial crisis, defined by oil dependence, high unemployment rates, and substantial debt, potentially worsens its vulnerability to biological threats. Research indicates that economic constraints significantly impact healthcare infrastructure, impacting personnel training, equipment availability, and emergency preparedness measures, potentially inflating costs for responding to biological threats. Some ways that infrastructure can be better is by improving electricity, roads, clean water, and improved sanitation facilities. According to the research, a strong economy is critical for effective biosecurity measures since it allows for more vital healthcare facilities and faster reaction mechanisms. This study emphasizes the relevance of economic health in developing biosecurity measures, arguing that strengthening Nigeria's economy could improve the country's capability to handle biosecurity threats, breaking the cycle of increased susceptibility and rising costs.

Abstract: 213

Enforcing Parameter-Efficient Training in Neural Networks
Ethan Nguyen

Mentor: Dr. Christian Kümmerle, College of Computing & Informatics

With the proliferation of large deep learning models, techniques to reduce model size while retaining performance are crucial for deployment to minimize global carbon footprints and ecological impacts, whilst enabling greater access to AI tech. We propose a regularization term during training to promote low-rank structure, enabling model truncation with minimal impact on accuracy or training time. Our method provides a unique perspective to efficiently capture the richness of data, leading to faster convergence and smaller models. Overall, this work investigates methods like sparsity and structured optimization to develop more memory-efficient models, evaluating techniques on computational and data efficiency against the current state-of-the-art.

Special code(s): Global Research, Sustainability Research

Abstract: 214

Algorithms for Multi-Robot Collaboration and Coordinations
Philip Smith

Mentor: Dr. Dipankar Maity, William States Lee College of Engineering

Simulation technology allows for testing robots in realistic scenarios without physically operating a robot. This brings a tremendous opportunity to successfully test algorithms and validate and evaluate their performance in a wide variety of realistic scenarios in a relatively short time. This project will focus on leveraging **Gazebo** and **ROS2**, two widely used simulation platforms for robotics testbeds. The project will simulate partial information target defense games as studied in a recent work by the mentor. Additionally, the project will implement other variations of the algorithms and/or environmental conditions such as the ones discussed in other research. The goal of this project is to investigate how the performance (measured by the intruder capture rate) differs between the simulation outcome and the theoretical prediction in real-world scenarios. In the simulated games, there are one to infinitely many attackers and current research includes only one defender. In these simulations, the defender knows the attacker's location only when the attacker is within a range of the target, and the attacker only knows the defender's location when the defender is within the attacker's sensing region. This represents a partial information game, which is highly challenging to analyze and simulate. Through extensive simulations, we would be able to monitor the performance of our algorithms (designed for the best target defense strategy) when we vary the parameters such as attacker's speed and sensing radius, as well as different attack strategies. These target defense games mostly have applications to military and defense situations including coast line guarding and border defense. Designing better protection algorithms allows for safer zone and better automated defense.

Abstract: 215

Evaluation of P53 Peptide Binding Affinity Using Microscale Thermophoresis
Zoe Vette

Mentor: Dr. Irena Nesmelova, College of Science

The tumor suppressor protein, P53, is a regulatory protein that is found in the nucleus of the cell and functions to maintain regulatory cell division and halts the production of cells with damaged or mutated DNA by forcing apoptosis to prevent cancer formation. Mutations to the P53 gene within the human body lead to the development and spread of cancerous cells. Microscale thermophoresis, or MST, is a biophysical assay that measures peptide binding affinity by monitoring binding-induced changes in the motion and structure of fluorescent molecules along a controlled temperature gradient. The purpose of this work is to utilize MST to analyze interactions between P53 and various peptides that were designed computationally to bind P53 and block its signaling interactions with cellular partners found in cancers in nearly every cell type. After peptides are constructed and diluted through serial dilution, MST determines the fluorescent intensity in 16 capillaries to verify the homogeneity of samples and then proceeds to determine the relative fluorescence within the temperature gradient to finally conclude if the binding is present and determine the binding affinity. The overarching goal of this experiment is to verify computational predictions of the P53 binding affinity. Experimentally determined binding affinities will be used to inform the next iteration of the computational design of peptides with higher binding affinity to P53. Ultimately, our results will aid in the development of cancer-prevention drugs.

Special code(s): Global Research

Abstract: 216

The Analysis of The Medical Mistrust Continuation of the African-American Community.

Mariah Manley

Mentor: Dr. Melinda Adnot, Honors College

The African-American community's medical mistrust is a defining characteristic of the healthcare experience that has caused this way of thinking to go through generations. Despite the introduction of health policies and laws that aim to reduce racial disparities, research shows persistent health disparities that advance the notion that the healthcare system is not safe for African Americans. The statistics on the black maternal mortality rates and the decline of black mental health cause the conversation to be highlighted, further causing empathy to be given to the African-American community. However, as the years go on in the United States of America laws and policies are in place to ensure the safety of African Americans, yet the practice is still an unsafe area. The goal of this literature review is to further examine how medical mistrust in the African American community has grown in the last 10 years., without the emphasis on medical history in the past for African Americans, but how in the last 10 years more funding has gone to research to unravel the health disparities, racism and outdated medical textbooks that have aided in medical mistrust in the African-American community. These findings give insight as well as a more sympathetic approach to medical mistrust and how even though the United States of America is becoming a safer environment for African Americans, the health field is an area that still lacks that safety.

Special code(s): Honors Research

Abstract: 217

Enhancing Understanding and Analysis of Computer System Architecture through 3D Visualization: Applications in Performance Analysis and Education

Hailey Chen and Lillian Chen

Mentor: Dr. Yonghong Yan, College of Computing & Informatics

In the field of computer science, computer system architectures are notoriously complex and difficult to understand. This creates a need for visualization to better educate and communicate with individuals who lack technical knowledge of such systems. However, existing educational diagrams and visualization software for performance analysis of computer architectures are limited and only exist in 2D. This research presents a novel approach to visualizing computer system architecture using 3D visualization tools like OpenGL. 3D computer system visualization has the potential to be more effective than 2D visualization as complex computer architecture concepts such as memory hierarchies and data buses can be represented in an immersive and interactive manner, serving as a valuable learning tool for students and professionals alike. Moreover, the application of 3D visualization can explore new performance analysis techniques like parallel processing alongside computer system visualization. The approach is to visualize the computer components, memory hierarchy, and interconnecting bus architecture in 3 dimensions by using Java with OpenGL. This allows for intuitive exploration of the architecture from different angles, providing a hands-on experience. Users can also gain a deeper understanding of both the high-level and low-level architecture depending on their needs. This innovative approach can bridge the gap between theoretical knowledge and practical application in computer architecture education. Our study proposes to first visualize computer system architecture in 2D before transitioning to a 3D representation using OpenGL to illustrate in further detail components such as the CPU, GPU, and memory hierarchy.

Abstract: 218

Arts Participation and Future Outlook Among Youth of Color
Tashawna Wilkins

Mentor: Dr. Vaughn Schmutz, College of Humanities & Earth and Social Sciences

Previous studies have found that arts education of children can increase empathy, create social bonds, and improve their behavior and critical thinking skills. All of these benefits can contribute to a positive future outlook for youth. I want to explore the impact of participation in arts-based programs on these benefits and others, with a focus on future outlook, for youth of color. The term future outlook refers to the perception that one has of their time ahead and any expectations they may have about what they can accomplish. A young person's future outlook can shape how they go about their life, including the decisions they make and the beliefs they uphold. Having a positive future outlook means that a person has high hopes for their future, believes they can achieve their goals, and they are not limited by their present situation. By contrast, having a negative future outlook means that a person has little to no hope for their future, they may see little use in seeking educational or professional advancement because it will not help change their circumstances or achieve their goals. Future outlook can be influenced by many different factors, including race, gender, socioeconomic status, and more. I want to explore whether participation in arts-based programs is one of these factors. Through qualitative interviews with youth of color who participate in arts-based programs, I look to explore their perception of these programs, their future outlook, and how these two factors are related to each other. During analysis, I am looking for sentiments or phrases that relate to the aforementioned benefits of arts education: empathy, social bonds, behavior, critical thinking skills, and future outlook. Understanding what factors influence the future outlooks of youth of color could provide solutions for improving social mobility for people of color and beginning to break generational barriers.

Special code(s): Community Engaged Research

Abstract: 219

Teacher Perceptions of Gifted Curriculum Differentiation
Liliahna Bedolla

Mentor: Dr. Cindy Gilson, Cato College of Education

Curriculum differentiation refers to the process of adapting instruction to meet the individual needs of a diverse student population. Although this concept can be traced back to the early 20th century, it wasn't until the formation of special classes for academically advanced students when gifted curriculum differentiation obtained notability. This research project aims to study teachers' perceptions regarding differentiation of gifted curriculum. Prior research suggests that teachers' perceptions of differentiating curriculum for gifted students were positive as well as implementing student-centered curriculum. We aimed to collect data through peer-reviewed academic articles to further explore educators' perceptions of differentiated curriculum. Results indicate that teachers' believe differentiating instruction has positive effects on students, but they have difficulty with implementation.

Abstract: 220

The Dynamics of Latinx Engineering in America
Esai Torres-Tarango

Mentors: Dr. Sherman Mumford & Dr. Cathy Blat, William States Lee College of Engineering

As the United States takes the forefront of engineering advancement in today's society, individuals of diverse backgrounds have joined this wave of innovation. However, many of the Latinx community have had to go through numerous trials and tribulations to even get the chance to share their ideas. The goal of this research is to emphasize the intricate journey of those who seek a career in the American engineering industry and articulate what needs to be done to offer greater opportunities for future generations. This literature review will examine prior research on the development of the Latinx community within the American engineering profession and depict the difficulties experienced. Hence, one should be able to identify the reforms necessary to improve the experience of the Latino community within the American engineering community. It is noteworthy that the research to be conducted will focus on first-generation individuals coming from undocumented families. For the most part, statistics indicate that the Hispanic population who are already involved in the engineering industry come from being the first in their families to attend college and obtain that opportunity to immerse themselves into the profession. The overall contribution of this literature review is to accentuate the story of those Latinx who took a chance and gained a role in the American engineering field and commence developing solutions to provide the younger generation with an opportunity to innovate the world.

Special code(s): Honors Research

Abstract: 221

NLRP3 Inflammasomes Reduce Macrophage Phagocytosis in Breast Cancer.
Shely Acosta

Mentor: Dr. Didier Dréau, College of Science

Triple-negative breast cancer has a 65% overall 5-year survival rate and is poorly responsive to currently available therapies. Immunotherapy stimulates the patient' own anti-tumor immune system and have demonstrated effectiveness in several cancers. Indeed, immunotherapy targeting immune checkpoints combined with neoadjuvant treatments are recommended for patients with TNBC. Nevertheless, clinical improvements remain modest and limited to a subset of patients with TNBC highlighting the need for new immunotherapy targets. Our investigations support the role of NLRP3 inflammasome activation in stroma cells, especially macrophages, in the generation of a local pro-inflammatory microenvironment that favors breast tumor progression. Here, using J774 murine macrophages, we assessed whether the tumor microenvironment promote NLRP3 activation. Briefly, J774 were incubated in the presence of known inflammasome activators LPS and ATP alone or along with the secretions of 4T1 breast tumor cells in the presence of the NLRP3 inhibitor MCC950. Following incubations, cells and supernatants were collected as assessed for protein expression. In similar conditions, the macrophage phagocytic abilities were tested using fluorescent beads. Our results demonstrate inflammasome activation, increased pro-inflammatory protein secretions following J774 macrophages activation with the LPS and ATP combination but also in the presence of 4T1 secretions alone or supplemented with ATP. Moreover, inflammasome activation led to significantly decreased phagocytosis. Interestingly, treatment with the NLRP3 inflammasome inhibitor reverted the phagocytosis inhibition promoted by both LPS and ATP and secretions of 4T1 breast tumor cells. Taken together, these findings support further assessment of the targeting of inflammasome activation to prevent breast cancer.

Special code(s): Honors Research

Abstract: 222

The Relationship Between Mental Health and Pet Ownership
Sophia Call

Mentor: Dr. Melinda Adnot, Honors College

Research demonstrates that pet ownership contributes to an increase in positive mental health for the owner, yet little is known about how the elderly population may benefit from owning an animal, specifically during a period of isolation such as the Covid-19 pandemic. This literature review examines the relationship between pet ownership, mental health, and loneliness in the elderly population. In my preliminary review of studies, researchers discovered that there is a major positive correlation between having a companion animal and the elderly population's health, with specific research being conducted during the Covid-19 pandemic. Researchers also observed that there is not only the mental health benefit of owning a pet, but also a physical health benefit. These findings suggest that it is important for elderly people who may be experiencing isolation due to illness or other circumstances, to consider adopting an animal to provide them comfort and companionship. The contribution of this literature review shows that it is important for the elderly population to have access to companion animals and it also supports previous research that owning a pet is beneficial for the majority of the population. There is also potential for a continuation of research that may suggest how the animal companion population itself may benefit from this research in the way that if facilities such as retirement homes were to incorporate pets, then shelter animals could have a greater chance of being removed from the shelter and finding a permanent home.

Special code(s): Honors Research

Abstract: 223

Post-monitoring (2022-2024) of Groundwater Levels Along a Restored Piedmont Stream, Reedy Creek, Charlotte, NC

Abigail Jessen

Mentor: Dr. David Vinson, College of Humanities & Earth and Social Sciences

Water restoration efforts are vital for maintaining the balance of ecosystems. They help replenish water sources, restore natural hydrological processes, protect habitats, and ensure a clean water supply for human communities. Healthy aquatic ecosystems contribute to climate regulation, carbon sequestration, and flood mitigation, underlining the importance of water restoration for environmental resilience and sustainability. Our study focuses on the stream restoration efforts at Reedy Creek (2017-2019) and their impact on groundwater dynamics, a critical factor influencing the ecosystem's health. Hydrologic and ecological recovery can take years after a major restoration project. Specifically, this OUR project reports post-monitoring results from 2022-2024, complementing data collection dating to 2014. The surrounding groundwater underwent significant changes due to the restoration project, as the stream channel was raised vertically closer to the floodplain surface. Understanding these changes is crucial for assessing the restoration effort’s success and planning future initiatives in similar environments. In this project, we conducted a comprehensive analysis of groundwater levels and temperature throughout the Reedy Creek restoration efforts. We deployed HOBO pressure transducers and temperature loggers, known for their high accuracy and real-time data logging capabilities, in 6 well sites in upland and riparian areas. Our data revealed a significant shift in the fluctuations patterns of water level and temperature. Pre-restoration, these fluctuations were sporadic and post-restoration, they showed a correlation with seasonal variations. This shift provides valuable insights into the effects of restoration efforts and the distinct behaviors of groundwater. These findings can inform effective strategies for future ecological restoration initiatives.

Special code(s): Sustainability Research, Urban-Charlotte Research

Abstract: 224

RL4Sys: Reinforcement Learning for Systems
Jeffrey Wang

Mentor: Dr. Dong Dai, College of Computing & Informatics

The advancement of deep reinforcement learning (Deep RL) has enabled computers to beat top champions at problems as advanced as the board game Go. Once regarded as impossible, the winning steps taken by AI models like AlphaGo have been scrutinized by professional players around the world, revolutionizing the game with previously-undiscovered strategies. Work has begun by countless researchers to apply these same Deep RL models to other problems, in the hopes that novel strategies may be found and applied in other situations where a human might not be as thorough. Researchers must rewrite their own codebases in order to work with current RL algorithms. There is a need for a framework which is able to supply these Deep RL models, allowing others to simply connect their current system code with effective and efficient RL algorithms. For example, Deep RL can be used to improve the performance of computer systems, including job scheduling to maximize processor efficiency and data structures to minimize memory usage. In this research topic, we are working to implement a Deep RL framework which is designed to optimize various systems with minimal manual efforts from the developers. We plan to template learning agents which run in a server-client design to improve accessibility on lower-powered systems. We also build visualizations through the Gym framework. As this project matures and gains usage, the RL4Sys framework will increase accessibility and development speed to system performance researchers; the framework may also be extended to cater to problems beyond computer systems.

Special code(s): Honors Research

Abstract: 225

Racial Discrimination and the Racial Pay Gap in the U.S.
Kayla Polk and Amaris Vang

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Racial discrimination remains a prominent social issue that the U.S. continuously struggles to overcome. Racial discrimination impacts the workforce resulting in pay disparities. Pay disparities limit economic growth and potentially reduce the gross domestic product (GDP), leaving many citizens to struggle as inflation rises. in 2022, the household income of Hispanics was $11,780 lower, and Black income was $21,720 lower than the average of all races. Understanding this inequality, including the historical influences involving the Jim Crow laws and redlining, brings awareness to disparities within the labor market. Racial discrimination may not always be the cause of these wage differences, but it can be shaped by other variables such as structural discrimination like education, and geographical differences similar to the cost of living. Our goal is to answer the question: How does racial discrimination affect the racial pay gap in the U.S.? We aim to promote the understanding and awareness of the racial discrimination within income disparities by examining articles and data on race to comprehend the ongoing impact. Additionally, we will analyze how societal structures like the arrangement and roles of families may contribute to this continuing inequality. By shedding light on the racial income disparity, we hope to achieve a more profound knowledge of this divide and illustrate it.

Abstract: 226

Investigating and Comparing Sustainable Development Goal #3 Good Health and Well-Being in Germany and the United States

Matthew Baerwolf, Tanner Ackerman, and Andrew Sandlin

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #3: Good Health and Well-Being. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #3 Good Health and Well-Being? What are the differences? To what degree are the countries on track to make progress on SDG #3 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #3 Good Health and Well-Being by the 2030 goal year.

Special code(s): Global Research

Abstract: 227

Analysis of the Gender Gap within Engineering
Lauren Wilkie and Madison Johnson

Mentor: Dr. Melinda Adnot, Honors College

The percentage of women in the engineering field in the United States is 16.7% as of 2023 (Meiksins & Layne, 2022). Despite apparent efforts to increase gender diversity in the profession, the gender gap within the field of engineering persists. Other science, technology, engineering, and mathematics (STEM) fields attract and retain more women (physical sciences), but engineering significantly lags. This literature review will examine some factors contributing to this disparity, including the history and societal view of the engineering field. Development from K-12 to college environments and career outcomes will be inspected. Recently, increasing efforts have been made in K-12 education to include and push women into STEM/engineering careers. Within the college environment, enrollment/retention rates and personal experiences will be presented. Topics within personal experience will predominately explore discouragement, and whether it is felt by peers, professors, or self-inflicted. Additionally, the social/cultural aspect of engineering will be inspected - do women struggle to find a sense of belonging within the engineering major, and do they tend to gravitate to a certain field of engineering. In the workforce, career development will be examined; topics from this include salary, career outcome, promotion rates, and Principles and Practice of Engineering (PE)/Fundamentals of Engineering (FE) passing rates. The contribution of this literature review will be to comprehensively examine and identify core reasons why women are a minority within the engineering field. The combined research will serve as a platform for how to mitigate issues women face within the field of engineering.

Meiksins, P & Layne, P. (2022, April 5). *Women in: Analyzing 20 years of Social Science Literature - Society of Women Engineers*. Magazine. https://magazine.swe.org/lit-review-22/

Special code(s): Honors Research

Abstract: 228

A Literature Review on the Correlation between Black Oppression, Financial Hardship, and Chronic Stress in Black Families in the United States

Nazier McIver

Mentors: Dr. Melinda Adnot, Dr. Sonyia Richarson, & A.J. Simmions, University College

The prevalence of chronic stress within Black households has been shown to be significantly higher than that among their white counterparts. This problem can be linked to a series of domino-effect impacts from prejudice and discriminatory treatment towards Blacks within the United States. These unethical treatments have inflicted generational financial traumas which implemented limitations on the overall financial wellbeing of Black households. These two significant factors are directly linked to the occurrence of chronic stress, within the Black community. The objective of this research is to dive deeper into the question: What role has Black oppression played in financial hardship within Black households, and how does this correlate with the occurrence of financial chronic stress across generations? A literature review will be conducted to explore forms of prejudiced activities that have restricted the financial mobility within Black households, creating a generational impact of financial traumas. The objective is to provide evidence supporting the theory that financial literacy correlates with the occurrence of chronic stress. This study highlights the importance of mental health awareness within black families and recognizes factors that have created emotional and financial traumas that transcended generations. It is crucial that efforts and conversations are being made to help make the topic of mental health issues less taboo and ensure easier access to medical resources. Lastly, emphasizing the importance of financial literacy empowers both current and future generations with the knowledge to make informed decisions, fostering monetary stability, reducing stress, and improving overall quality of life.

Special code(s): Honors Research

Abstract: 229

Investigating and Comparing Sustainable Development Goal # 10 in Germany and the United States

Aiden Griffiths, Lori Cabrie, and Eythan Bengel

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #: 10 Reducing Inequalities. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal # 10 which focuses on reducing the inequalities within and among the countries around the world? What are the differences? To what degree are the countries on track to make progress on SDG # 10 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #10 which focuses on reducing the inequalities within and among the countries around the world by the 2030 goal year.

Special code(s): Global Research

Abstract: 230

Improvement of Machine Learning-Based Predictive Models for Wastewater Treatment Processes Using Time-Series Influent Data

Justin Logan

Mentor: Dr. Michael Smith, William States Lee College of Engineering

Wastewater treatment involves several processes which are difficult to accurately model and predict. Having accurate models of these processes is important for making control decisions, predicting treatment outcomes, and predicting the amount of energy used by the process. In recent literature, there have been several studies which investigate the possibility of using machine learning-based models for prediction or control of various wastewater treatment processes. One potential short-coming of some of these studies is that oftentimes, machine learning models used in the studies are trained using only the present or most recent measured value of influent water parameters. This study seeks to improve upon the usage of machine learning models for predicting wastewater treatment processes by training machine learning models using time-series versions of the input variables. Instead of training the models to predict the future aeration intensity of a wastewater plant's air blowers based only upon present-time values of influent water parameters, the models are trained using a combination of the present values of the influent water parameters and a certain time range of historical values, called a sliding window. Using influent total suspended solids (TSS), and chemical oxygen demand (COD), five types of machine learning models are trained to predict the one-hour future aeration intensity of air blowers in a wastewater plant's aeration tank based on a window size ranging from the present value up to eight hours. It is expected that after an optimal window size is determined for each model, higher predictive accuracy will be attained than that which is possible using present values alone.

Abstract: 231

From Phage with Love: Endolysins are the Heart of Bacterial Destruction

Chloe Chervenic, Kate Drake, Hala Khabir, and Rachel Showers

Mentors: Dr. Ellen M. Wisner & Tonya C. Bates, College of Science

Bacteriophages are highly diverse viruses that infect bacterial hosts. Bacteriophages must be able to lyse from their bacterial host in order to reinfect a new host for continued proliferation. Endolysins are enzymes that encode peptidoglycan hydrolases which target the cell wall layers of gram-positive bacterial cells, resulting in bacterial lysis. Investigation of the biochemical properties, location, length, and sequence make-up of endolysins gives insight into the phylogenies of phages along with possible applications of bacteriophages in the medical field. Essential research has been allocated to the process of lysis and the components needed for it, like endolysins. However more specific analysis is needed of the comparative aspect of lytic phages that have different hosts. In this study, we aim to explore endolysin similarities by using NCBI BLAST and Gepard to compare phages in the same or different clusters and host types. NCBI BLAST will be used to comparatively analyze syntenic regions of endolysins, while Gepard generates dot plots to observe correlations regarding endolysins and various phage hosts. We predict that bacteriophages within the same host type will have greater similarities in endolysin placement within the genome, the number present, and sequences that phages from different hosts use. Building upon research on the many facets of endolysins, including their mechanisms and components, resulting in phylogenetic trees or medical advancements in bacterial drug resistance, is the purpose of this research of endolysins in bacteriophages, comparatively analyzing relationships between phages.

Abstract: 232

Diversifying Digital Platform Workers: Colorism on Streamer Follower Count
Luis Tejada

Mentor: Dr. Anne-Kathrin Kronberg, College of Humanities & Earth and Social Sciences

Digital platforms, such as the global live streaming platform Twitch, are becoming locations of full-time work. With this shift in digital marketplaces, audiences can curate their feed and choose to support streamers by following their channel or through financial support. Previous research has shown that people of color who stream on Twitch are likely to be subjected to racial and discriminatory language, actions, and social exclusion based on the audience's perception of their race. In many regions of the world, colorism, which is discrimination against those with darker skin tones rather than against racial categories, is a more influential discriminator than racism. Yet, we know little about how colorism can influence audience's consumption of digital materials. This project examines the relationship between skin color and the number of followers that a Twitch streamer has by performing bivariate and multivariate regressions of a random sample of streamers (N = 2750) from Twitch activity logs and from manually coded skin color data. Based on previous research, I expect streamers with darker skin tones to have fewer followers. The results of this study may contribute to a better understanding of the influence of colorism on digital platforms, which can lead to the creation of more equitable online spaces.

Abstract: 233

Investigating and Comparing Sustainable Development Goal #11 in Germany and the United States

Caroline Shannon, Mallory Schwarz, and Darell Sam

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #:11 Sustainable Cities and Communities. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #11 which concerns the livelihood of communities by providing the public with greener and safer alternatives. What are the differences? To what degree are the countries on track to make progress on SDG #11 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #11 which concerns the livelihood of communities by providing the public with greener and safer alternatives by the 2030 goal year.

Special code(s): Global Research

Abstract: 234

Microchip Electrophoresis and Droplet Microfluidics: Patterning and Kinetics
Nour Alsharid

Mentor: Dr. Laura Casto-Boggess, College of Science

Lab on a chip technology is an evolving field that allows us to quantify micro to nano volumes of analyte. At the Casto Analytical lab, we are designing microdevices to perform benchtop reactions at the microscale purposed for high sensitivity ultra trace detection. Droplet microfluidics utilize segmented flow to create nanoscale aliquots of microliter sample volumes. Droplet size and reproducibility are manipulated by controlling channel geometry and flow rates of immiscible liquids. Creating nanoscale sample volumes allows us to maximize measurement information and certainty from limited collected sample amounts. High sensitivity detection is afforded using fluorescence detection. Fluorescent probes can be incorporated into droplet systems and merged with sample containing droplets for targeted analysis. To maximize sensitivity, it is prudent to fully characterize and optimize the labeling reaction. My work is concerned with characterization of the labeling reaction using both benchtop methods and microchip electrophoresis (ME). ME is a microfluidic analog to capillary electrophoresis, a separation technique that utilizes an electric field to facilitate movement of charged analytes. Here, polydimethylsiloxane (PDMS) is cast into 3D printed molds to create microchannel architectures and sealed off with a glass slide using a plasma oxidation process to permanently bond PDMS to the glass. Sample components are then injected into the channel and separated using ME. The appearance or disappearance of separation peaks over time or under a range of conditions reveals information about the fluorescent conjugation reaction.

Abstract: 235

Unraveling the Tail Mysteries: Exploring Minor Tail Protein Length Variation in *Arthrobacter* Phage Cluster AP

Anthony Padilla, Zoe Griffin, Tyler Ordon, and Wyatt Workman

Mentors: Tonya C. Bates & Dr. Ellen Wisner, College of Science

Bacteriophages, also known as phages, are viruses that have the ability to infect bacteria and are the most abundant organisms found on Earth. The tail of a phage has many functions such as penetration of the cell, injection of the genome, and finally establishing infection within bacteria. Minor tail proteins (MTPs) play an essential role in tail assembly and are host-specific, which means that the length of the tail correlates with the type of host it infects. The purpose of this study is to compare the length and physiological characteristics of minor tail proteins within the *Arthrobacter* phage cluster AP. We will look at fused MTPs found in certain phages such as AWGoat, a phage from subcluster AP4, along with SilentRX (AP4). We will compare them to phages that have MTPs that are non-fused and smaller in length such as BruhMoment (AP3) and Beagle (AP2). In order to accomplish this we plan to use multiple programs which include PhagesDB, Phamerator, NCBI BLAST, and HHPred. Through this analysis, we aim to investigate differences between MTP sizes, function, and host specificity among phages found in AP subclusters. We expect to find changes in host specificity driven by the altered function of fused MTPs. By performing a more in-depth study, our investigations look to improve our understanding of minor tail proteins in *Arthrobacter* phages and their potential use in bacterial pathogen monitoring and detection, along with their potential uses in phage therapy as a weapon to combat antibiotic-resistant bacteria.

Abstract: 236

Corporate Landlord Housing and Planning for Climate Adaptation
Ava Oljeski

Mentor: Dr. Michelle Zuñiga, College of Humanities & Earth and Social Sciences

The primary objective of this research was to analyze where corporate landlord housing (CLH) is located in the City of Charlotte and investigate how they are being developed in terms of climate adaptation. Corporate landlord housing refers to residential units, such as houses or apartments, that are occupied by tenants but owned by an institutional investor rather than an individual. Given the growing concern for threats of climate change, how new housing like CLH is built matters for reducing sprawl and mitigating greenhouse gas emissions. This study seeks to pinpoint where CLH is most prominent, recent trends, and explore how single-family homes (attached and detached) are being built with climate adaptation indicators at the forefront (e.g., access to transit, solar panels, tree canopy, etc.). To date, there has not been an analysis of Charlotte CLH and how they are being built to mitigate the impacts of climate change. Charlotte particularly faces threats of flooding, heat island effects, poor air quality, and loss of tree coverage. Using geocoding and geospatial mapping tools, we determined the spatial distribution of CLH. This thematic choropleth map was compared to distributions of household income and neighborhood demographics. A visual survey was also conducted using Google Earth to identify concentrations of CLH subdivisions and make observations of climate adaptation indicators. Initial GIS analysis shows us that the highest concentrations of CLH align with Charlotte's, "the arc and wedge", highlighting disparities by race and income. Three out of the five neighborhoods with the most CLH units aligned with slightly lower household income and higher distributions of People of Color (POC). This research will provide Charlotte city planners with insights regarding climate adaptation. Recommendations include ensuring future development takes into consideration climate adaptation to ensure we reduce the threats of climate change.

Special code(s): Urban-Charlotte Research

Abstract: 237

Sulfonate Ester Catholyte Synthesis for Aqueous Redox Flow Batteries
George Holevas

Mentor: Dr. Christopher Bejger, College of Science

Aqueous redox flow batteries (RFBs) store energy in chemical bonds and transfer this energy as electricity. This occurs through redox reactions involving two molecules dissolved in water, the anolyte and the catholyte. RFBs bear great importance in a world where fossil fuels and other limited sources of energy are dwindling and are being replaced with renewables. Previous studies have focused on improving catholytes by making them more soluble in water. More soluble catholytes can store more energy. In this study, a catholyte containing highly soluble sulfonic acid functional groups will be synthesized. The catholyte molecule has two components, the redox active core ([3]radialene) and substituents with electron withdrawing groups that were synthesized via a Steglich esterification reaction. Three forms of the catholyte (mono, bis, and tris) will be synthesized and will be characterized in terms of solubility and redox capabilities via cyclic voltammogram tests. The new catholytes will be characterized using NMR and IR spectroscopies. The compounds will also be electrochemically analyzed using cyclic voltammetry and bulk electrolysis experiments. Finally, laboratory flow cell cycling studies will be explored.

Special code(s): Honors Research

Abstract: 238

Investigating and Comparing Sustainable Development Goal #4 in Germany and the United States

Cornelia Nirean

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #4: Quality Education. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #4, aiming to ensure an inclusive, equitable, and high-quality education? What are the differences? To what degree are the countries on track to make progress on SDG # 4 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte, including Zoie Matthews, Shawna Blanche, Tori Moore, and Will Shaver and students at the PH Ludwigsburg in Germany, including Fabio Di Marco, Jonas Dittrich, and Medine Dogan. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #4 to ensure an inclusive, equitable, and high-quality education by the 2030 goal year.

Special code(s): Global Research, Sustainability Research

Abstract: 239

Achieving Smart Photochromism for Oxygen and Amine Sensing with Water-Processable, High Contrast, Dipyridinium Thiazolothaizole Embedded Chromogenic Polymers

Maithili Acharya

Mentor: Dr. Michael Walter, College of Science

The development of efficient sensors for the detection of amines is crucial due their high toxicity and widespread presence in illicit drugs, heavy metals, and other harmful chemicals/gases. Furthermore, sensors for the detection of oxygen are also in high demand for various applications in biomedical, smart packaging, and environmental industries. Dipyridinium thiazolo(5,4-d)thiazole (TTz) and its derivatives are water soluble compounds that when incorporated into polyvinyl alcohol (PVA)/borax films, exhibit fast ($^{2+}$, to purple TTz^{*+}, and blue TTz^{0} by illumination with light. The reversibility of the electron reduction is also primarily observed in the presence of oxygen (O_2). However, in oxygen lacking environments, this visible reversibility is drastically slowed showing the oxygen sensing capability of the films. Additionally, the TTz polymer can easily photo-oxidize the presence of primary, secondary, and tertiary amines producing selective fluorescence quenching and a different color change depending on the distinct oxidation potential of each amine. Overall, the unique characteristics of TTz demonstrates exceptional sensitivity to oxygen and amines with high contrast of photochromism and photofluorochromism, making the TTz-embedded polymer promising candidates for versatile applications.

Abstract: 240

Selective targeting of Ribonucleotide reductase large subunit by Hsp70 Phosphorylation

Shreya Patel

Mentors: Duhita A. Mirikar and Dr. Andrew W. Truman, College of Science

Yeast cells respond to genotoxic stress by activating a well-conserved signaling cascade that comprises of Mec1, Rad53 and Dun1. A major effector of this pathway is transcription and activation of the ribonucleotide reductase (RNR) complex which is made up of four subunits, Rnr1, 2, 3 and 4. RNR activity is critical for the synthesis of new DNA bases and is required for both DNA replication and repair. Previous studies from our lab have demonstrated that RNR is client of the molecular chaperone Hsp70 in yeast and mammalian cells. There is growing evidence that phosphorylation of molecular chaperones (the chaperone code) impact chaperone function by altering client binding, ATPase activity and co-chaperone interaction. In this study we queried the impact of Hsp70 phosphorylation on the RNR complex in yeast. We screened 146 yeast strains expressing mutations in Hsp70 phosphorylation sites (73 phospho-mutants and 73 phospho-mimics) for sensitivity of well characterized RNR inhibitor Hydroxyurea (HU) and identified 13 phosphorylation sites important for the cellular resistance to HU. To determine the impact of these sites on the RNR complex, we examined RNR subunit abundance via Western Blotting. Interestingly, the steady state levels of RNR1 and RNR3 were substantially decreased in 80% of the mutants screened. Our current working model is that many of the Hsp70 phosphorylation sites lie on the interaction surface between RNR and Hsp70 and may represent a way to regulate for cells to rapidly alter RNR activity. We hope to test this theory in yeast and mammalian cells using cross-linking mass spectrometry (XL-MS). These studies may provide a novel anticancer therapeutic strategy based on controlling Hsp70 phosphorylation.

Abstract: 241

Coefficient of Thermal Expansion (CTE) and Modal Mineralogy of NC Aggregate Used for Infrastructure Applications

Liam Rogers

Mentor: Dr. Valerie Reynolds, College of Humanities & Earth and Social Sciences

North Carolina's diverse geological landscape, shaped by ancient tectonic processes, offers a unique tapestry of rocks that contribute significantly to the aggregate production industry, a vital component in concrete used for construction. This research focuses on understanding the coefficient of thermal expansion (CTE) of North Carolina aggregates, exploring the mineralogical composition of rocks used for aggregate production and its implications for long-term stability of concrete. Concrete with a higher CTE is prone to premature cracking and deterioration. Aggregate comprises roughly 60 to 70% of concrete. Therefore, the primary objective of this study is to determine whether a relationship exists between modal mineralogy and concrete CTE and whether future estimates of concrete CTE can be predicted from aggregate modal mineralogy. Modal mineralogy will be determined using the point count method for 17 samples from construction sites in North Carolina. Published mineral CTE values will be combined with modal mineralogy to calculate a weighted average of CTE for each rock. These modeled values will be compared with measured rock values, which range from 5.112 to 9.119 (10-6m/m°C). Feldspar is the most abundant mineral found within samples ranging from 60-85% of the rock. Minerals found within the samples have CTE values that range from 11.1 to 36.0 (10-6m/m°C). The abundance of feldspar (13.8 10-6m/m°C) and mafic minerals (biotite, hornblende, and pyroxene) primarily determines the overall calculated CTE values in plutonic igneous rocks. This project seeks to bridge mineralogy/petrology with construction engineering sciences, providing valuable insights into whether aggregate mineralogy influences concrete stability over time.

Special code(s): Honors Research

Abstract: 242

Childhood on Empty Plates: A Comprehensive Literature Review on the Impact of Food Insecurity on Children's Health and Development

Karen Gonzalez-Telon

Mentor: Dr. Trudy Moore-Harrison, College of Health & Human Services

Poverty affects many individuals worldwide, and while there is much talk about how to fix or reduce its effects, less is said about the extent of these effects, specifically on children. The lack/limitation of resources can be detrimental to the development of children, mainly in their quality of life and cognitive development, which ultimately affects their adolescence and early adulthood. This literature review looks at previous studies to research the impact of food insecurity on children's physical, cognitive, and behavioral development in the United States and how it affects their quality of life. Preliminary research shows that household food insecurity is linked to significantly worse general physical health in children with a lifetime of asthma diagnosis and depressive symptoms. Children from food-insecure homes were found to develop chronic and acute health problems at a higher rate compared to children from food-secure homes. Despite having higher rates of past medical care and emergency department use, they have limited access to quality healthcare. Food insecurity is also linked with having lower cognitive skills in young children. All these factors lead to difficulty in achieving adult success and thus can lead to a cycle of poverty that affects society. By looking at not only the effects of food insecurity on children but also their extent and impact on these young lives, pediatricians, teachers, and policymakers can consider these when working with children of this demographic and focus on reducing these effects.

Special code(s): Honors Research

Abstract: 243

Field Amplified Sample Stacking as a Method to Increase Sensitivity of Capillary Electrophoresis Assays for Amino Acids

Claire Trevino

Mentor: Dr. Laura Casto-Boggess, College of Science

The search for life on potentially habitable planets is an area of both scientific interest and great technical challenge. The Casto-Boggess lab works towards the development of compact on-chip instrumentation that is capable of consistently performing low waste, reproducible, and highly sensitive experiments on complex solutions. The goal of this research is to identify and quantitate potential biosignatures, like amino acids, with high sensitivity and from limited sample mass. Few analytical techniques are as capable of highly sensitive aqueous phase detection as capillary zone electrophoresis (CZE). CZE, a technique that separates solutes based on size and charge, can consistently resolve multiple amino acids, especially when paired with laser-induced fluorescence detection. By selectively labelling trace amounts of amino acids in solution using a fluorescent probe, it is possible to detect nanomolar and picomolar concentrations of amino acids. Enhanced detection sensitivity can also increase the confidence in measurements to determine the presence or lack of biosignature compounds. Field-amplified sample stacking can be employed by creating an electrolyte differential between the analyte plug and the run buffer that surrounds it. This forces the analyte plug to be focused into a smaller section of the capillary, resulting in sharper peaks and higher signal-to-noise ratio. My work instigates the impact of experimental conditions on this enhancement to determine the optimized FASS-CZE conditions for maximum sensitivity in a highly selective and reliable amino acid detection assay.

Abstract: 244

Characterization of the human Chaperone-RNR complex
Erica Flores

Mentor: Dr. Chathura Paththamperuma, College of Science

Ribonucleotide reductase (RNR) is a key enzyme in the synthesis of DNA and a well-validated therapeutic target for a variety of diseases, including cancer. The human RNR complex is composed of R1, R2, and R2B subunits. Our previous work identified the Hsp90, Hsp70, and DNAJA1 molecular chaperone proteins as key regulators of RNR stability and activity in yeast and mammalian cells. Although the chaperone-dependency of RNR is previously identified, the exact nature of the chaperone-RNR interactions or the structural insights remain unknown. Therefore, in this study we set out to characterize the chaperone-RNR complex and to identify novel approaches to disrupt this interaction via small molecules or modulation of chaperone phosphorylation. We expressed human Hsp90, Hsp70, DNAJA1, R1, R2 and R2B proteins and purified these proteins using muti-step purification on an AKTA PURE FPLC system. We are currently assessing the direct interactions of pairwise combinations of these proteins using in-vitro pull-down assays. The positive interactions will be further characterized via cross-linking mass spectroscopy and structure resolving by CryoEM.

Special code(s): Honors Research

Abstract: 245

Success Through the Struggle: A Tale of Two Centuries
Michael Gaskins

Mentor: Dr. Melinda Adnot, Honors College

Although we are in a time of diversity, equity, and inclusion, Black people and the Black experience in America are stigmatized by the historical legacy of slavery, Jim Crow, and gang culture. It is because of the emphasis on oppression that many Americans believe that oppression is the Black experience and are blinded to the many successes of African Americans. Throughout history there have been innumerable successful African Americans lost between oppression, but this literature review seeks to find the true experience. The goal of this literature review is to shed light on the true Black experience in the United States, going beyond the narrative of slavery, Jim Crow, and gang culture, highlighting the inventions, culture-changes, and achievements through oppression in the United States. This literature review will examine the Black experience in America through the lenses of Frederick Douglass and Shirley Chisholm. In preliminary research, I find that more often than not, African American history, research, and studies have been done on the hardships of the race and community. These findings suggest that there is an overemphasis on the negatives of African American history and very rarely are the positives given, posing a negative narrative on the Black experience in America. The contribution of this literature review is to highlight two individuals who I believe embody the Black experience in the United States, in hopes that future literature and history begin to share the prominence alongside the pain.

Special code(s): Honors Research

Abstract: 246

Trace Detection of Methylxanthine Compounds Using a Portable Raman Platform Coupled with Microfluidics

Cassie Rinkacs

Mentor: Dr. Laura Casto-Boggess, College of Science

Integrating surface-enhanced Raman spectroscopy (SERS) with microfluidics can serve as a next-generation detection technology and a powerful tool in analytical chemistry. Raman is a vibrational spectroscopy that reveals information about chemical structures. SERS leverages a special property observed in noble metal nanoparticles known as localized surface plasmon resonance (LSPR) to enhance Raman signals which are inherently weak. Combining SERS detection with microdevices offers great potential for fast detection, good reproducibility, and high sensitivity. Combining these technologies with analytical separation mechanisms boosts measurement selectivity and offers the potential to further enhance detection sensitivity for a particular compound within a complex sample matrix. Our research aims to design new tools for trace detection of drug compounds at rapid, sensitive, and selective levels while using a portable Raman platform coupled with microfluidic separation analogs to offer portability and automation. While many separation modalities utilize optical detection, chemical identification is limited to comparison with reference standards. Incorporating Raman spectroscopy enables structural determination of sample components. Three compounds (caffeine, theobromine, and theophylline) that are very similar in structure have been chosen to illustrate the inherent selectivity of Raman detection methods. This will be important for identification of detected drug compounds in the field to prevent false identification in field measurements which could be life or death measurement scenarios. Here, we present our progress towards building a portable microfluidic module with online SERS detection. Target compounds were analyzed using conventional micro-Raman spectroscopy to use as a performance standard for our portable device.

Abstract: 247

Ancient climate change and human responses across the Mediterranean
Wyatt Hicks, Amber Smith, and Kasey Grams

Mentor: Dr. Patricia Fall, College of Humanities & Earth and Social Sciences

The purpose of this research project is to better understand the natural and cultural landscapes of the first civilizations across the Mediterranean in addition to analyzing environmental changes and their associated human responses. While there have been many different analyses of pollen in the Mediterranean, this project will gain a better understanding as previous research has only given insight into about 8,000 years before the present (bp), and this project will analyze a core that is from as much as 25,000 bp at Lake Sabazus. This links the paleoclimate record of the last ice age and modern times in the Mediterranean, of which there are very few records. This will give insight into human responses to environmental changes from the first civilizations in the Mediterranean. Additionally, instead of only conducting a pollen analysis this project will detail the depositional environment of Lake Sabazus. To do this we are analyzing 3 soil cores from Lake Sabazus, with the deepest being 21 meters deep. In the analysis, we make use of particle size analysis, loss on ignition, and pollen analysis every 10 cm to determine temporal changes in the environment and human responses to those changes. With this understanding of past cooling and warming cycles in the Mediterranean, we can better understand current trends of warming. We are expecting to see a shift in the soil makeup of the core as ancient climate change has historically shifted the thermo-Mediterranean climate as well as the depositional environment of Lake Sabazus.

Special code(s): Global Research

Abstract: 248

Iterative Methods for Solving Linear Systems and Modeling Traffic on I-485
Fabiola Rojas and Dominic Kealoha

Mentor: Dr. Xingjie Li, College of Science

Iterative methods such as Jacobi, Gauss-Seidel, and Successive Over-Relaxation (SOR) are fundamental tools in solving large systems of linear equations across various scientific fields. Their use of matrix multiplication instead of matrix inverse makes them ideal for solving large systems quickly. Our research explores the factors of each method that define their respective strengths, limitations, and convergence behaviors to understand how these methods address drawbacks encountered when performing matrix operations by hand, as well as how they can be used in real world applications. After implementing each method by hand to understand how the algorithms work, we developed a Python program that assesses a user-given matrix based on each method's specific convergence criteria. The program compares the spectral radii of all three methods and chooses to execute whichever will yield the fastest convergence rate. Our research revealed the importance of mathematical modeling and understanding specific properties of the coefficient matrix. We observed that Gauss-Seidel is usually the most efficient method because it is faster than Jacobi and doesn't have as strict requirements as SOR. We applied the knowledge we gained to a traffic flow model of I-485. After creating a program that generates the matrix for this model, we were able to iteratively approximate the flow of cars through neighboring exits using data from the N.C. Department of Transportation. This information shows which areas are the most congested and can be used to inform future infrastructure development.

Special code(s): Urban-Charlotte Research

Abstract: 249

Promoter Pursuit: Hunting for Hidden Signals in Phage DNA

Isha Jain, Caitlyn Bolling, Andres Vences, and Caelan Walsh

Mentors: Dr. Ellen Wisner and Tonya Bates, College of Science

Promoters are DNA regulatory regions that attract transcription factors, thereby initiating the synthesis of proteins. Located upstream of a start codon, these sequences recruit and bind the factors that initiate transcription. Bacteriophages, the most abundant organisms on Earth, depend on promoters to initiate transcription of operons, the functional units into which their genes are grouped. Despite their fundamental role, tools and studies are limited for identifying promoters within bacteriophage genomes. Our research explores promoter characteristics using bioinformatic tools such as DNA Master, PhagesDB, BLAST, Phamerator, PhagePromoter, PhaGAA, and HHPred. We anticipate that a promoter can indicate gene and operon characteristics such as function and genomic location. In this research, we will use DNA Master and PhagePromoter to identify potential promoters in the bacteriophages of focus: AWGoat, SilentRx, and BruhMoment. HHPred and BLAST will be used to analyze the function of genes found in an operon. DNA Master is an exploratory program that will be used to explore gaps in the genome. We predict that closely related phages will have similarities in their promoter sizes and general locations within the genome. Promoter identification could be used to aid in the annotation of gene functions in bacteriophages before protein crystallization is performed in a lab. Furthermore, this research offers a universally applicable approach to promoter identification in countless other bacteriophages. By unlocking the language of promoters, we gain a deeper understanding of these ubiquitous life forms, paving the way for advancements in various fields, from phage therapy to synthetic biology.

Abstract: 300

Postcolonialism and Salvage Tourism in the Eastern Band of the Cherokee Nation
Celia Castaldo

Mentor: Dr. Emily Makaš, College of Arts + Architecture

It is well established that early colonization decimated Native American populations through disease, genocide, and forced displacement. These effects linger and reverberate throughout generations of Indigenous Americans, and as a result of colonization their unique cultures have been lost, hybridized, and homogenized. This research uses the theoretical frameworks of salvage tourism and postcolonialism to investigate the ways that the Eastern Band of Cherokee Indians (EBCI) represent and attempt to revitalize their culture and work towards sovereignty under the effects of settler colonialism utilizing the 1950 drama “Unto These Hills” as a means of demonstrating these theoretical frameworks and how they relate to the EBCI. Salvage tourism is a complex theory that involves the commodification of Native American histories and culture for non-Native audiences. It raises important questions about the relationship between cultural heritage and the impacts of settler colonialism on Native communities. Postcolonial theory is a critical approach - often associated with British colonies in India and Africa, that identifies the social, cultural, political, and economic implications of colonialism and examines the ongoing effects of colonial power structures even after formal colonial rule has ended. It is a complicated and divisive theoretical approach, especially in the realm of Native American studies, this is by no means a comprehensive analysis of the use of postcolonial theory in relation to Native American studies. For the purpose of this work, I am primarily drawing upon postcolonial works by Homi Bhabha and Jyotirmaya Tripathy.

Special code(s): Community-Engaged Research, Global Research, NC Research

Abstract: 301

A Study on Workers' Career Advancement and Workplace Experiences about the Effects of Artificial Intelligence Integration in Technology

Elizabeth Akinfenwa

Mentor: Dr. Melinda Adnot, Honors College

This study explores the complex connections that exist between the advancement of worker's careers, their workplace experiences, and the integration in Artificial Intelligence (AI) into technology. Given the rapid pace at which AI technologies are developing and influencing many industries, it is critical to comprehend how these technologies will affect the workforce. This research aims to clarify the complex impacts of AI integration on workers' career paths and their general workplace conditions through a thorough analysis. Utilizing a blended technique approach, both subjective and quantitative information will be gathered from different examples of workers across various industries. The analysis will incorporate different aspects, such as work functions, skills need, work fulfilment, and opportunities for career growth. Besides, the review will examine the complex experiences of workers in AI enhanced settings, testing into expected difficulties and benefits caused by this advancement in technology. This research aims to provide knowledge that can guide workforce development programs, policies regarding human resources, and company tactics by clarifying the complex relationship between workers' career advancement and AI integration. Its ultimate goal is to add to a comprehensive knowledge of how AI technology shapes the modern work workplace and provides the groundwork for a mutually beneficial partnership between technical innovation and human capital.

Special code(s): Honors Research

Abstract: 302

Black Education and Community in Albemarle, North Carolina: The Kingville Project (1898-1967)

Makayla Brooks

Mentor: Dr. Sonya Ramsey, College of Humanities & Earth and Social Sciences

Uncovering Kingville, North Carolina's once-forgotten history reveals a vibrant African American community that navigated challenges during post-Reconstruction, segregation, and the Civil Rights era. Through thorough research and unwavering dedication, the rich history of Kingville and its schools is illuminated. This narrative sheds light on the resilience, determination, and community initiatives within African American communities, addressing historical gaps in Southern African American schools and communities, and showcasing the stories of marginalized rural communities. This thesis emphasizes community-driven endeavors like the Kingville Project, which aims to preserve and celebrate the heritage of the Kingville community, empowering future generations with the knowledge and resources needed to shape their destinies.

Special code(s): Community-Engaged Research, North Carolina Research

Abstract: 303

Effective Interventions for Students with Emotional Behavioral Disorders in Elementary Classrooms: A Systematic Review

Jordan Rierson

Mentor: Dr. Kelly Anderson, Cato College of Education

Despite the continued needs of students identified with and at-risk for Emotional Behavioral Disorders, the available quality and effective interventions are limited for most educators, especially for early intervention purposes. The purpose of this systematic review study was to evaluate the available literature on elementary interventions for students with and at-risk for Emotional Behavioral Disorders, taking into consideration intervention implementation procedures and effectiveness with EBD behaviors on students in the elementary grades. This study utilized a three-phase systematic review design in order to search for and examine available sources, which was outlined using the PRISMA method via the Covidence software program. Following title and abstract and full text screening procedures, 21 articles showcasing EBD intervention studies were ultimately considered for synthesis. Upon screening of the literature, it was apparent that most of the interventions used were highly effective with various EBD behavior categories. It was also apparent that there was little variability in the type of intervention. There were conclusive findings of effective EBD interventions for use in elementary classrooms, but further research is necessary to consider sources outside of the set criteria for this study, as well as to identify interventions with more deviation from those that are most commonly used.

Keywords: Emotional Behavior Disorders, EBD, interventions, effective, elementary

Special code(s): Honors Research

Abstract: 304

A Vision-Based Ping-Pong Ball Anemometer
Cedric Davis

Mentor: Dr. Artur Wolek, William States Lee College of Engineering

Uncrewed aerial vehicles (UAVs) are influenced by wind conditions that can hamper their operations. Drones operating in unpredictable wind may perform erratically and endanger the environment. Further, headwinds necessitate more power and reduce the drone's flight endurance. However, UAV's can be equipped with wind sensors that measure the wind and leverage this information to improve flight control. Often, these wind sensors are mounted to minimize the impact of induced air velocity from propellers, yet this induced air velocity is still a major source of measurement error. This work investigates the design of a novel wind sensing system that allows measurements to be obtained far away from a UAV. The method is based on the drag sphere concept, which is employed in meteorology by assessing the drag force acting on a sphere rigidly mounted to a sting and force load cell. Inspired by this approach, we investigate a method that involves a drone hovering with a suspended ping-pong ball to measure wind velocity. The drag-measuring ping-pong ball hangs far below the drone to minimize the impact of propeller downwash. A camera on the underside of the drone uses video processing to extract the positions of the object over time. Using a drag model based on the ball, we infer wind velocity while compensating for its natural dynamics. This project investigates the viability of this concept in a prototype table-top setting by comparing estimated wind-velocities to hotwire and ultrasonic anemometer for comparative analysis during a light outdoor breeze.

Abstract: 305

The Effects of Obesity and Notch on Skeletal Muscle
Paige Sigmon

Mentor: Dr. Susan Arthur, College of Health & Human Services

Obesity is a worldwide concern due to increased risk of diseases, weakened skeletal muscle repair, and decreased quality of life. This limits the ability to improve symptoms through physical activity (PA). Notch is a cell signaling pathway involved in regeneration of muscle tissue following injury. The current literature describes Notch as dysfunctional in obesity by changes in lipid metabolism. However, relationships between skeletal muscle regeneration following exercise-induced injury, obesity, and Notch are unclear. The aim of the present study is to identify whether obesity and Notch effect muscle repair following PA. For this study, mice were arbitrarily divided into control and treatment groups. Treated mice received injections of a Notch signaling inhibitor, were fed a high-fat-diet (HFD) and ran downhill to induce muscle injury. These treated musculoskeletal samples represent muscle of obese individuals with Notch signaling turned off, following exercise-induced injury. Western blotting determined presence of a Notch marker, and markers for muscle repair. Low Notch expression is to be expected in samples treated with the Notch inhibitor. High expression of muscle repair markers is expected in obese samples without Notch, relevant to obese samples with Notch. This information will contribute to literature regarding musculoskeletal health in obese populations. PA is imperative to lowering the severity or amelioration of obesity and associated symptoms. This improves performance of activities of daily living (ADL) and quality of life. Understanding the skeletal muscle repair process with obesity will aid in further investigations of potential therapeutic targets such as the Notch cell signaling pathway.

Special code(s): Honors Research

Abstract: 306

Inflammasome Inhibition and Breast Tumor Apoptosis

Jenna Venditti and Heven Siyum

Mentor: Dr. Didier Dréau, College of Science

Cell stress is sensed by multiple pathways including inflammasomes. Breast tumors encompass multiple cells including immune cells especially macrophages that actively participate in the development of a pro-inflammatory environment that favor tumor progression. In particular, NLRP3 inflammasome are activated in macrophages and breast tumor cells and lead to increased pro-inflammatory secretions. Furthermore, sustained inflammasome activation can trigger cell death. Our previous results demonstrated that the NLRP3 inflammasome inhibitor MCC950 prevented NLRP3 inflammasome activation in macrophages. Whether preventing NLRP3 activation leads to alterations in macrophage survival and especially in tumor cell apoptosis is unclear. To test the hypothesis that NLRP3 inflammasome promote macrophage and tumor cell death, we assessed in vitro the effects of increasing doses of MCC950 on inflammasome activated cells. Data suggests a role of NLRP3 inflammasome activation in cell death in both macrophages and tumor cells and provide support toward the development of therapy targeting inflammasome to prevent breast cancer progression.

Abstract: 307

Resisting Plantation Presbyterianism: Black Agency in the Antebellum United States
Lauren McMillan

Mentor: Dr. Jill Massino, University College

For the Undergraduate Research Committee, I will devise a poster that highlights the focus of my honors thesis, which explores how black Presbyterians agency under Plantation Presbyterianism in the United States from 1815 to 1861. “Plantation Presbyterianism” was a belief system created by Presbyterians through the combination of politics, religion, and economics to justify slavery from the onset of the Atlantic Slave Trade to the Civil War. Despite “Plantation Presbyterianism,” black Presbyterians were instrumental in the Abolition movement, and their Presbyterian theology played a crucial role in the resistance against slavery. A religious and intellectual analysis of Plantation Presbyterianism, my research draws on slave narratives, letters, newspapers, publications, session minutes, and missionary reports. This thesis is divided into four chapters, detailing how black Presbyterians achieved agency amidst Plantation Presbyterianism, including “A Brief History of Plantation Presbyterianism in the United States,” “Black Presbyterian Abolitionists,” “Societies,” and “Personal Narratives.” While historians have researched how Presbyterianism played a role in slavery, they have seldom explicitly discussed how black Presbyterian abolitionists resisted this oppression, instead focusing primarily on white Presbyterian abolitionists. My thesis provides new insights into the church and slavery as well as a nuanced view of Presbyterianism. More fundamentally, through my work, I seek to give voice and grant agency to both enslaved and free black individuals who bravely fought against oppression yet have been silenced or absent in the historical narrative about slavery and Presbyterianism.

Special code(s): Honors Research

Abstract: 308

Histories of New Media: The Contemporary Discourse of Digital Arts
Sydney Carmer

Mentor: Dr. Jae Emerling, College of Arts + Architecture

Art has always existed in a dialogic relationship with the history of science. Both art and technology share the Greek root *technē* that evinces a mode of production involving skill and knowledge, a kind of hands-on problem-solving. The emerging field of “new media” or “digital arts” has become a pressing topic for artists and art historians alike in recent years, but this discourse—the statements surrounding digital art practice and the artifacts that result—is anything but novel. Techno-scientific events are already represented in language and images that predate them. New media involves the use of digital technologies and tools of mass communication, including virtual and interactive forms of art. The problem that arises when art students remain disconnected from this history is that they use these new tools without fully understanding them and thus make art without understanding the pre-existing discourse that their works enter into. Digital media pedagogy lacks any standard structure among more accessible universities, contributing to the failed synthesis of studio and art history courses. My research addresses this pedagogical gap by analyzing the ways in which new media reframes longstanding art historical discourse regarding authorship. I specifically investigate the topic of appropriation, which is directly involved in generative AI and other contemporary digital tools. This inquiry demands a historical, theoretical, and pedagogical approach that avoids absurdism about the “end of art.” We are witnessing another transformation of the artist/author concept—a transformation that reveals the intimate relationship between art and science rather than a simple rivalry.

Special code(s): Honors Research

Abstract: 309

Funds To Finish™: Enabling Advisors to Guide Students: Ensuring Financial Readiness for Graduation

Meelad Doroodchi

Mentor: Dr. Elise Demeter, Office of Assessment and Accreditation

Financial aid planning is a critical concern for students navigating higher education. While academic advisors play a pivotal role in guiding students through various academic aspects, their ability to provide personalized advice may be hindered by a lack of insight into students' financial constraints. To address this gap, our research focuses on investigating how to create a web application tool with high usability aimed at aligning students' financial aid resources with their degree plans. The investigation would define the elements that the tool needs to empower advisors to deliver tailored guidance and support, facilitating better decision-making regarding financial aid options, course selection, and degree progression. Additionally, we are aiming to conduct interviews with advisors at UNC Charlotte to ensure the dashboard meets their needs, while also building upon existing research to enhance financial aid support in higher education.

Abstract: 310

Foraging Behavior of Semi-Free Ranging *Lemur catta* and *Varecia rubra* at the Lemur Conservation Foundation

Kyla Kelly

Mentor: Dr. Lydia Light, College of Humanities & Earth and Social Sciences

The foraging behavior and diet of semi-free ranging primates is not a widely understood topic in primatology. Much research has been done regarding diet in wild primates, but dietary preferences depend on the availability of the food in the environment (Ratsimbazafy 2006). Given that both *Lemur catta* and *Varecia rubra* housed at the Lemur Conservation Foundation semi-free range in an enclosed forest, this opportunity to observe what they will forage for in a non-traditional environment can contribute meaningful information for the management of semi-free ranging primates. For this study, I will conduct four days of continuous focal-animal sampling in 10-minute intervals on each individual in the group once before observing the same individual again for a total of 6 observations hours a day. For each observation, I will record GPS and vertical location, material being consumed, and meteorological information. All materials that were foraged will be marked via GPS location and flagged for later identification by trained botanists. The end goal of this research is to determine what the lemurs are feeding on when free-ranging in their enclosures. I intend to come up with a comprehensive list of what the lemurs fed upon within the forest, including a breakdown of what material or plant part they consumed. This research will help determine what semi-free ranging lemurs will eat when given the opportunity to forage within their enclosures. Based on previous research at this site, I anticipate seeing that the lemurs of both species will primarily forage on leaves and twigs.

Abstract: 311

Investigating and Comparing Sustainable Development Goal #1 in Germany and the United States

Kendal Moses, Ciara Dix, and Ben Cassanos

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #1: No Poverty. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #1: No Poverty? What are the differences? To what degree are the countries on track to make progress on SDG #1 by the 2030 goal year? To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #1 by the 2030 goal year.

Special code(s): Global Research

Abstract: 312

Dynamic Behavior of a Kinematic, Gravity-closed, XYθ-Compliant Baseplate Mount
Sania Khan

Mentor: Dr. Jimmie Miller, William States Lee College of Engineering

Isolating a system from thermal and vibrational exchange improves the precision and reduces the error of mechanical instruments. In this research vibration analysis is used to model the dynamics of a system that focuses on isolating a baseplate from a surface. This kinematic mount was designed in a prior experiment to minimize the transfer of energy between a table and an aluminum baseplate, using gravity to restore the position of a plate mounted onto it whenever the plate or the surface under it are disturbed. It consists of three support stands, each with a glass lens sandwiched between acrylic pads, placed arbitrarily under the plate's edge. Vibration analysis was done by measuring the linear and angular displacement of the baseplate when the system was tapped lightly on the side of the plate with a rubber mallet. The displacement was measured as a function of time through laser interferometry, and the results were then graphed and modeled. Analysis of the graphs shows an unforeseen second degree of freedom that has affected the damping of the system, causing a complex vibration from impacts. This is likely due to the arbitrary placement of the support stand in relation to the baseplate’s center of mass. From these results, an effective damping coefficient and spring constant for the system was calculated, and the motion of the mounting system modeled mathematically. These results can be used to simulate the mounting system on various scenarios, predicting its dynamic behavior in an array of designs.

Abstract: 313

Racial Disparities in Emergency Department Disposition Among Patients with ASD
Michael Gonzalez

Mentor: Dr. Mara Hollander, College of Health & Human Services

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder characterized by challenges in social interactions and distinct, repetitive behaviors. On average, those with ASD visit the Emergency Department (ED) more frequently than those without ASD. The objective of this study is to investigate the racial disparities among ASD patients within the ED and evaluate how these disparities may impact visit outcome. We used a nationally weighted all-payer database of emergency department visits, the Healthcare Cost and Utilization Project's 2019 Nationwide Emergency Department Sample (NEDS), to evaluate, by race, the likelihood of being admitted to the hospital during an ED visits among patients with ASD versus those without. We found that patients with an ASD diagnosis were 48% more likely than those without to be admitted (OR 1.48, 95% CI: 1.37-1.60). Hispanic (OR .70, 95% CI: .65-.75) patients were approximately 70% as likely to be admitted relative to White patients. However, relative to White patients (25% vs. 19%), Hispanic patients with ASD (26%) were significantly more likely than those without (14%) to be admitted (5.4 percentage points, 95% CI: .02-.09). This finding suggests potential disparities in healthcare access for minority ASD patients. Understanding these disparities is crucial for developing targeted interventions and policies to mitigate healthcare inequities and improve outcomes for all individuals with ASD. By addressing systemic issues contributing to disparate care, such interventions can promote equitable healthcare provision and enhance the well-being of ASD patients across racial backgrounds.

Special code(s): Community-Engaged Research

Abstract: 314

The Desensitization and Secondary Trauma Medical Workers Contend
Alexis McNeilis

Mentor: Dr. Melinda Adnot, Honors College

Secondary trauma has accumulated significant attention in recent years due to its profound impact on the psychological well-being and desensitization of medical workers. Previous research conducted provides an overview of the phenomenon of secondary trauma experienced by medical professionals, investigating its causes, consequences, and existence. Medical workers such as emergency responders, frontline healthcare workers, nurses, and doctors, are frequently exposed to distressing and traumatic events as part of their daily work. While providing care to patients and witnessing suffering, medical professionals often internalize the emotional burden they experience, developing symptoms such as emotional exhaustion, depersonalization, and decreased empathy in their personal lives. Secondary trauma not only affects the job satisfaction and mental stability of medical workers but also compromises the quality of patient care they are providing. I use current literature on the prevalence and risk factors associated with secondary trauma in medical settings, highlighting the need for organizational support and individual coping strategies. Furthermore, I highlight the existence of the negative impact of secondary trauma on medical workers. Our findings emphasize the urgency of addressing secondary trauma in healthcare settings and underlines the importance of implementing motivated measures to promote the well-being of medical workers both within and out of their daily work lives.

Special code(s): Honors Research

Abstract: 315

Ten Works: A Critique of UNC Charlotte's Art Collection and its Practices
Jonah Sanderson

Mentor: Dr. James Frakes, College of Arts + Architecture

This year the Department of Art & Art History turns 60 years old. To celebrate that event, the first online catalog of *60 Works for 60 Years* is under curation to promote significant pieces from the UNC Charlotte Collection. My task this semester was to begin a process of recovery and advocacy by selecting ten significant works. The collection directs a critical spotlight on the role of the university as a collector and aims to increase the institution's ability to acquire and care for all of its artworks. While the university has the capacity to support student artists and artists in the community by acquiring their work, a healthy art collection needs institutional support of a type that has been missing from Charlotte for decades. By responsibly collecting and maintaining contemporary art, UNC Charlotte honors and reflects the diverse narratives of the student body. In addition to supporting its students, artworks in the collection reveal how the university has grown, how its collection changes, and how these important works need more conservation and publication. A university of Charlotte's standing is in need of an art museum with skilled professionals. University museums have many benefits to their community as a laboratory of questions and investigation. An institutional critique will be proposed through an investigation of ten artworks and their stories as well as the artists who created them. A proposed plan of action will then advocate for a university art museum that better serves the collection and community.

Special code(s): Community-Engaged Research, Honors Research, NC Research, and Urban-Charlotte Research

Abstract: 316

VideoLLM for Understanding Activities of Daily Living in Elderly Care
Sindhu Gadiraju

Mentor: Dr. Srijan Das, College of Computing & Informatics

By the year 2050, it is projected that one-sixth of the global population will be 65 or older. This demographic shift signals a significant increase in the demand for healthcare services, particularly for the elderly. In response, the implementation of effective activity monitoring systems becomes crucial. This research project focuses on developing a model tailored specifically to monitor the health of elderly individuals and facilitate the early detection of potential health issues. Our primary aim is to generate detailed reports outlining the daily activities of the elderly population, providing invaluable insights into their well-being. Existing research primarily centers on human activity recognition in videos sourced from the web, where activities typically exhibit noticeable motion and a human-centric viewpoint. However, these models demonstrate minimal accuracy when applied to Activities of Daily Living (ADL), characterized by subtle motion and diverse viewpoints. To bridge this gap, our study proposes the fine-tuning of ADL videos for instructional purposes, leveraging a visual model that is integrated with a Large Language Model - a type of artificial intelligence that understands and generates human-like text. The envisioned outcome of our research is a video conversational model capable of producing comprehensive summaries highlighting the actions performed in the videos. By providing clear and concise insights into the daily activities of the elderly, our research aims to significantly enhance healthcare services tailored to their unique needs.

Abstract: 317

A Literature Review on the Interaction Between Culture and City Zoning Ordinance and Regulation

Duncan Bryson

Mentors: Dr. Melinda Adnot, Dr. Shen-en Chen, & Dr. Katherine Idziorek, University College

Engineers and municipal officials often have to balance design and regulations around efficiency, safety, cost, and serviceability. However with a focus on uniformity and efficiency city ordinances can sometimes unintentionally restrict cultural expression or practices. This issue has already been recognized and most governments allow for variance applications or the creation of planned unit developments. This literature review examines the interplay between the two ideas of self-expression and utilitarian safety and efficiency. In my preliminary research I find that planned unit developments, conditional use zoning requirements, and variance applications are currently used to provide for individual and community expression within a municipal area. These findings show that while steps have been taken to allow people to fashion their buildings in ways that are more expressive of themselves, there are significant barriers in both time and money to do so. This literature review will show how the conversation around zoning and ordinances changes with time and location based on the needs of the community. While some discussion is ongoing, more research may be needed in order to better understand the relationship between city ordinances and community expression, especially concerning low-income communities who may not have the resources to make their voices heard. This literature review will also demonstrate how cultural or sociological movements can outpace the rate of government adaptation leading to further barriers interrupting the linkage between zoning and cultural expression.

Special code(s): Honors Research

Abstract: 318

Investigating Technological Play Theory: Learning in the "Flipped Classroom"
Lori Glavan

Mentor: Dr. Erik Byker, Cato College of Education

Technology is a valuable classroom tool which helps teachers free-up class time for active learning practices. This is best observed through the flipped classroom model, teaching higher content topics outside of class while hands-on activities are implemented in class after students have gained background knowledge. Students hold the power to take initiative of their own learning experience, attain easy access to engaging virtual content, and benefit from reduced barriers to learning. Byker's Technological Play Theory provides an insightful theoretical framework for investigating K-12 teacher roles in implementing flipped classrooms for students. Technological Play Theory, defined as *the movement of curiosity to creativity using technological tools*, provides a critical lens to explore insights into the successes and challenges of the flipped classroom.

Special code(s): Honors Research

Abstract: 319

How is a woman's sexual and mental wellbeing affected after being a victim of sexual assault?

Khai Reaves

Mentor: Dr. Melinda Adnot, Honors College

From a psychological perspective, sexual assault survivors often deal with a range of emotional responses, including post-traumatic stress, anxiety, and depression. The traumatic experience can have a significant impact on their sense of safety and trust. Public health interventions are essential in addressing the bigger implications this has on a population as a whole. It is important to emphasize prevention, support, and education to reduce the prevalence of sexual assault. The criminal justice system also plays a role in seeking justice for victims and holding perpetrators accountable. However, the legal process itself can contribute to additional stress for survivors. In sum, the intersection of psychology, public health, and criminal justice plays a crucial role in understanding the extreme impact that sexual assault has on the sexual well-being and mental health of female victims. Coordination between these domains is vital to ensuring comprehensive recovery for victims, promoting mental health, and developing a society that actively works to prevent and respond effectively to sexual assault. This literature review will take a deeper dive into these intersections to further analyze the data and research on the effects sexual assault has on victims. Further discussions from various psychological, criminal, and public health publications of datasets, books, and journal reviews will provide more knowledge on this topic so that changes can be made in order to further support victims overall wellbeing and provide education to victims as well as the public.

Abstract: 320

Elucidation Reassortment in Hantavirus

Courtney-Grace Neizer

Mentors: Dr. Rick White & Dr. Alex Dornburg, College of Computing & Informatics

Hantaviruses have become an emergent threat to public health globally. Transmitted through respiratory droplets from rodents with case fatality rates exceeding 33%, there is an urgent need to forecast where and when hantavirus outbreaks will occur. However, challenging such forecasts is a lack of understanding surrounding the molecular basis of hantavirus virulence and transmission. In particular, virtually nothing is known about levels of viral reassortment between viruses or how changes in rodent communities' impact reassortment. Here we will provide the first assessments of new world hantavirus reassortment levels and investigate how the diversity of mammalian hosts impacts reassortment.

Methods: We will use a range of maximum likelihood and Bayesian phylogenetic approaches to estimate the evolutionary history of Hantavirus strains. Focusing on the RdRP, Nucap, and Glyco segments, we will conduct a series of Bayesian analyses to estimate reassortment networks of various strains

Results & Conclusion: Our work will fill a critical knowledge gap in our understanding of Hantavirus reassortment dynamics and their potential impact on public health. By predicting reassortment events, we can better anticipate the conditions more likely to give rise to the emergence of novel Hantavirus strains, thereby providing vital policy relevant information. Overall, this study sheds light on the importance of monitoring Hantavirus reassortment and its implications for public health. Understanding the genetic diversity and evolutionary relationships of Hantavirus strains can aid in developing strategies for disease prevention and control.

Abstract: 321

How Accessible are Resources to Undergraduate Students at the University of North Carolina at Charlotte?

Arianna Lomonico

Mentor: Dr. Aimee Smith, College of Humanities & Earth and Social Sciences

As of Fall 2023, the University of North Carolina at Charlotte has approximately 24,000 undergraduate students enrolled. The university provides a wide range of resources for all students. This research aims to shed light on the transition experiences of students with chronic illnesses entering college and how they use the services available on campus. This study will examine the accessibility and availability of tools that help UNCC undergraduate students with chronic illnesses. For our study, chronic illness is defined as an illness that requires at least 4 visits with a specialty provider per year to manage their condition. Data will be collected from UNCC students with chronic illnesses via online surveys (using Qualtrics). Data collection is currently underway. We plan to report the percentage of individuals accessing resources for their chronic illness, what the current resources are, and what resources they would like to have on campus. We will also use UNCC's public information via online and/ or faculty to learn more about programs they offer to students. Potential findings might range from limited to abundant access to services, resulting in a more comprehensive knowledge of the difficulties and possibilities that this group faces within the UNC Charlotte community.

Special code(s): North Carolina Research, Urban-Charlotte Research

Abstract: 322

Investigating and Comparing Sustainable Development Goal #3 in Germany and the United States

Hayes Brogdon, Jack Brezac, and Nick Hamilton

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #3, which includes good health and well-being. This goal includes promoting good physical and mental health for everyone, as well as improving public health systems. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #3? What are the differences? To what degree are the countries on track to make progress on SDG #3 by the 2030 goal year? Both countries have good health care systems. In Germany, everyone has access to health care with two types of health insurance. In the United States, the disparities are much bigger because the quality of care depends on private and public insurance options. To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #3 by the 2030 goal year.

Special code(s): Global Research

Abstract: 323

Human-Oriented Performance Optimization for Virtual Walkways
Batman Whiteside

Mentor: Dr. Lim Churlzu, William States Lee College of Engineering

Background: The traditional approach to designing facility layout optimization either comes from architectural perspectives focused on ergonomics or from engineering perspectives concentrated on distances and traffic volumes. These approaches do not adequately account for the haphazard element of human factors. This study seeks to fill the gap by testing that human element within the traditional architectural and engineering design.

Objective: The purpose of this study is to discover numerical indicators that statistically reflect human reactions to changes in certain environmental factors, i.e., ceiling height and quantity of human objects.

Methods: The design factors of this study include both architecture and human objects. Participants were equipped with the HTC Vive virtual reality headset as well as with the Virtuix Omni treadmill for simulating gait. Iterated over four varying scenarios, participants were instructed to press a button at the end of the 30-meter-long hallway. During their walk, two equal waves of 1 or 7 dummies began walking in the opposite direction of the participant. Ceiling height was set at 9ft or 12ft. Eye gaze coordinates were recorded in tandem with horizontal positional data.

Results: The saccade amplitude, acceleration, and duration tended to decrease after the dummies came into the participant's sight. Additionally, the gaze fixation duration and quantity increased as the dummies appeared. Gaze velocity also increased. Scenarios of 1 dummy vs. 7 dummies significantly changed in the following variables: gaze velocity, fixation quantity, and fixation duration. Scenarios of 1 dummy vs. 7 dummies did not have significant change in the following scenarios: saccade peak acceleration, saccade amplitude, and gaze jerk.

Conclusion: At this stage of research, we may expect the disparity in quantity of human objects to have a significant effect toward human factors. These results may indicate the breach of environmental clarity and composure in high-occupancy walkways, providing numerical insights into architectural and engineering designs. Further analysis of data may uncover additional correlations that contribute to the design of walkways for improved human performance.

Special code(s): Honors Research

Abstract 324

Examining Spiritual, Eating, and Pain-related Affect Regulation Factors in Predicting Irritable Bowel Syndrome Symptom Severity among US College Students

Ava Grace Lee

Mentor: Dr. Jennifer Webb, College of Science

Irritable Bowel Syndrome (IBS) is a chronic disorder that affects the digestive and excretory system. Though it is the most common gastrointestinal disorder, scientists have yet to find a cure. Symptoms include abdominal pain, constipation and diarrhea which can lead to other symptoms such as anxiety, catastrophizing and fear of food. IBS has also been found to be especially prevalent in college students and the emerging adulthood population (18 to 25 years). Due to IBS being a disorder of the gut-brain interaction, practicing forms of complementary and alternative medicine (CAM) have been proven useful. In individuals experiencing chronic illness, CAM is often used to help people relate better to their emotions, thoughts, and physical sensations (e.g., pain or discomfort). For example, these approaches can be used to positively alter thinking patterns, lower stress levels, reduce symptom severity and increase overall quality of life. Two common forms of CAM are prayer (requesting outcomes related to health and wellbeing from a specific greater being, or in general) and gratitude (cultivating intentional awareness and appreciation for positive aspects of one's life experiences). The present study examines how these particular CAM approaches relate to IBS symptom severity in a sample of US college students. Participants completed a set of online questionnaires assessing demographics, visceral anxiety, catastrophizing, fear of food, prayer and gratitude practices. It is mainly hypothesized that engaging in prayer and gratitude will hopefully be associated with reduced symptom severity and other negative attributes of IBS.

Special code(s): Honors Research

Abstract: 325

Loneliness: Impact on College Students' Academic Performance, Unique Challenges Faced by Low-Income Students, and What Colleges Can Do
Carter Fleming

Mentor: Dr. Melinda Adnot, Honors College

This literature review serves to shed light on the general significance of loneliness and how loneliness affects college students' academic performance, with a specific focus on low-income students. Another goal of this review is to discuss how college administrations can proactively combat loneliness on campus. Loneliness has a profound impact on quality of life because it can lead to depression and anxiety, among other adverse psychological outcomes. Loneliness is also linked to chronic physical health complications and a shortened life expectancy. Research shows that Generation Z faces distinctive challenges related to loneliness, stemming partly from their excessive usage of social media. Given that most college students are members of Generation Z, it is necessary to explore how the high prevalence of loneliness among this cohort impacts their academic performance. Moreover, the effects of loneliness on academic performance may be amplified in low-income students because it is more difficult for them to afford to spend time and money on opportunities for socialization due to work obligations and the added expense of social activities. Additionally, it is likely less feasible for low-income students to take time to meet with professors outside of class or hire tutors to possibly offset some of the effects loneliness has on their academic performance. Many colleges have begun to address loneliness among their student populations, with some strategies appearing to be more effective than others. More data is needed to draw conclusions, but social support groups are a promising kind of loneliness intervention.

Special code(s): Honors Research

Abstract: 326

Social Media Impact: Analyzing Public Perception Shifts of NICU Nurse in News Coverage

Allie Theisen

Mentor: Dr. Margaret M. Quinlan, College of Humanities & Earth and Social Sciences

Approximately about 5.04 billion people, over half of the world, use some form of social media. As social platforms continue to progress in popularity, it has become increasingly evident that the utilization of the press plays a distinct role in shaping individuals' personal and professional lives. Due to the increased indiscriminate mingling of personal and patient information from the employment of social platforms as an outlet to share health information, issues related to patient privacy have become considerably common. The matter at hand is that while some cases of terminating employees may initially be perceived as clear-cut, other disciplinary matters are less simple due to the innate vagueness and inconsistent nature of social media guidelines and regulations enforced by medical institutions. This study examines the media's unique role in shaping the public view of professional purity and how such attitudes impact the institutional and public responses of Neonatal Intensive Care (NICU) nurses. Through a qualitative thematic analysis of news coverage, we will analyze the coverage of Sierra Samuels, a NICU nurse, who was fired after sparking controversy after being accused of mocking a newborn with gastroschisis on Instagram. This posting provoked a debate on the potential impacts of the use and misuse of social media in the healthcare industry. As the utilization of social media continues to arise in medicine, the necessity for guiding principles and rules to regulate and protect patients' privacy becomes ever more evident. Overall, this study discusses the role of social media in NICU nurse communication, which further questions the presence or lack thereof of media policies currently in place by the healthcare community.

Special code(s): Community-Engaged Research

Abstract: 327

Untangled: Addressing the Impact of Hair Discrimination in Performance in Schools and the Workplace

Savannah Powell

Mentor: Dr. Mindy Adnot, Honors College

Would a person's choice of wearing ethnic natural hair for school or work impact their performance? The ideal response would be that "no" a person's natural hair would not impact that person's performance. All hair types and textures are beautiful and deserve to be treated and worn however a person may feel. Yet, it seems that society treats African hair as the exception. African hair discrimination is a form of social injustice in which natural, textured or protective African hair is viewed in a negative light and is portrayed as a distraction and/or unprofessional. This literature review dives deep into the history of African natural hair, the treatment of African natural hair in society, and recent action to prevent hair discrimination. Preliminary research reveals that hair discrimination victims are often prevented from school activities or denied jobs because of what institutions deem as "unprofessionalism." Other research shows that people of African ancestry feel more included and comfortable when they wear their natural hair to school and work. However, the conflict between societal expectations and the individual's desire to be accepted as their authentic self might prevent Black people from being perceived as performing their best in schools and jobs. These findings suggest that the choice of hair impacts a Black student's or employee's subjective performance. This literature review sheds light on a topic that is overlooked, yet highly important, in hopes to bring more attention and to encourage future generations to be more open to natural African hair.

Special code(s): Honors Research

Abstract: 328

Improving Computer Science Retention with BRIDGES
Christian Klepper

Mentor: Dr. Kalpathi Subramanian, College of Computing & Informatics

Computer Science is notorious for its poor student retention rates due to social misconceptions, varied developmental backgrounds, and feelings of unbelonging. For these reasons, retention is a hard problem to solve holistically. Furthermore, students often feel lost and directionless because computational studies are intrinsically open-ended. Engaging students in early core courses is key to addressing retention issues by demonstrating the potential of computing. In this project, we use data visualization and datasets relevant to today's students in an effort to engage and connect with students and demonstrate the role of computing in today's varied applications. As part of the BRIDGES project, we have implemented mapping applications using a variety of real-world datasets, targeted at freshmen-level CS courses. These newly developed modules will be integrated into our assignment repository and published for use by computer science educators worldwide. Insights will be gathered through project surveys and analyzed for their impact on student learning. Demonstrations of the developed modules will be presented at the Undergraduate Research Conference at the University of North Carolina at Charlotte.

Abstract: 329

Bird-Window Collision Risk Assessment

Ty Sokolowski

Mentor: Dr. Sara Gagne, College of Humanities & Earth and Social Sciences

Bird-window collisions are considered one of the largest man-made contributors to the death of avian species, with upwards of 1 billion birds dying every year. This statistic continues to increase exponentially as more buildings, specifically ones with large window coverage and a high percentage of vegetation in the surrounding landscape, are created. Most of the research that has been done on the topic of bird-window collisions has been on the number of carcasses. What is needed now are studies that assess the potential risk of window surfaces to birds. My research objectives were to 1) estimate the collision risk of window surfaces on the UNC Charlotte campus and 2) compare risk estimates to carcass survey results from 2022-2024 at the same sites. In January and February 2024, I systematically ranked building sides where carcass surveys occurred. I used a rubric that included multiple factors such as the percentage of window surface that reflected vegetation, the percentage of building sides that were windows, the degree of reflectivity, and the minimum distance between windows and other trees or buildings. The Sycamore building had the highest risk factor due to it's close proximity to the Botanical Gardens and it's high percentage of window coverage. Throughout my research, I discovered that typically the buildings around the outside edge of campus are at a higher risk of bird-window collisions. I will compare these results to collision hotspots identified by carcass surveys. In December 2023, there was a mass mortality event of cedar waxwings (*Bombycilla cedrorum*) at the Sycamore building, indicating the robustness of my risk estimates and the high priority of the site for mitigation. These risk estimates can be used in further research to determine the best sites for bird-friendly window markers.

Special code(s): Community-Engaged Research, Sustainability Research

Abstract: 330

The Expression, Purification, and Characterization of Select CXCL4 Mutants
Patrick van Ravesteyn

Mentor: Dr. Irina Nesmelova, College of Science

CXCL4 mutants K50E, N47E, and E28K are being studied to determine the effects of oligomeric state on the binding affinity of CXCL4 to the atypical chemokine receptor 1 (ACKR1). Wild type CXCL4 naturally exists as monomers, dimers, and tetramers, with tetramers formed as a pair of dimers. It has been experimentally and computationally observed that the K50E mutation prevents the formation of tetramers and exists predominantly as a dimer, whereas the N47E mutant forms tetramers. The E28K mutant exists as a monomer, and in this project, we will start with the E28K mutant. We will express and purify it from E. coli cells and characterize it through biophysical methods such as Circular Dichroism and Nuclear Magnetic Resonance spectroscopy to confirm that E28K is properly folded and is monomeric. The binding affinity between E28K and ACKR1 will be determined using Microscale Thermophoresis and compared to the binding affinity between wild type CXCL4 and ACKR1. This process will be repeated for N47E and K50E. While the oligomeric state of N47E and K50E are known, it is still unclear how it influences the binding affinity.

Special code(s): Honors Research

Abstract: 331

A Literary Analysis of Urban Homesteading for Sustainable Living
Josie Sheeler

Mentor: Dr. Melinda Adnot, Honors College

The United Nations recognizes climate change as the single biggest health threat facing humanity. While global industries continue to produce carbon emissions, the power to take immediate action lies in the hands of individuals and communities to reduce energy consumption and implement conservation measures. Urban homesteading, a growing practice surrounding sustainable living and local food production, offers an innovative solution to urgent environmental challenges. This literature review examines the environmental benefits of transforming individual yard spaces into productive gardens, including small-scale livestock pens, through urban homesteading. In preliminary research, it is evident that practices such as gardening, composting, foraging, raising chickens, beekeeping, and food preservation reduce individual carbon footprints, foster a deeper connection with nature, and enhance local environments. Urban homesteading combats the wasteful consumption of water and electricity in lawn care, which often serves purely aesthetic purposes. Instead, this practice promotes biodiversity, reduces food waste, lowers food miles, and mitigates environmental degradation caused by industrial agriculture. Additionally, urban homesteading reduces people's reliance on the mainstream food industry, which is a system that is highly polluting and vulnerable to unpredictable challenges. The contribution of this literature review highlights the potential for urban homesteading to encourage environmentally conscious lifestyles, decrease reliance on harmful industries, and promote a connection with nature. By encouraging individuals to transform their yards into productive green spaces, urban homesteading has the potential to create more sustainable communities and positively impact the Earth, one backyard at a time.

Special code(s): Honors Research, Sustainability Research

Abstract: 332

Archeology and Stable Isotopes in Western Mediterranean in Prehistory: Data From Iberia

Valeria Mulero Gonzalez

Mentor: Dr. Luca Lai, College of Humanities & Earth and Social Sciences

Looking at historical diets and lifestyles in the Western Mediterranean Basin before recorded history allows an understanding of how people's way of life changed over time, particularly in terms of Pastoral practices vs, agricultural needs. To conduct this comparison, stable isotopes can be used to explain variations and trends in diets, mobility, and environmental changes. Some stable isotopes that are being considered in the data collection are Carbon(C), Nitrogen(N), Hydrogen(H), Sulfur(S), and Strontium(Sr). This information is found within existing research papers that have studied remains of humans and animals to assess the variations and trends. This data will be used to uncover insights on dietary practices, mobility patterns, and environmental changes in the Western Mediterranean Basin Prehistory. Giving a better understanding of the prehistoric world to further develop how the past was made up of. Overall, this research can be used for future comparative isotopic data to further the knowledge of Isotopic data development.

Special code(s): Global Research

Abstract: 333

Large-Scale Entity Matching for theAdvisor
Davis Spradling

Mentor: Dr. Erik Saule, College of Computing & Informatics

“Large-Scale Entity Matching for theAdvisor” addresses the critical challenge of enhancing scholarly research by making a dynamic tool that allows scholars to easily look up computer science papers that helps bridge papers to their citations through an abstract network. While there exist many resources for looking up papers and attributes of those papers such as year published, author, etc., none exists that link those papers their citations. The main challenge behind this is the complex data sets, diverse entities within the data, and expensive computing needed to drive this program. A naive linear matching approach would take approximately fifteen years to match appropriate entities with one another. However, through the use of k-mer hashing techniques, dynamic programming using Levenshtein distance, and parallel computing through the University of North Carolina at Charlotte’s own Orion Cluster, this number has been reduced to merely three weeks. Within this further research was done to identify distinct characteristics of k-mer hashing to improve computation time and accuracy which included adding threshold values for the computation of Levenshtein distance and the removal of frequent k-mers to keep unique k-mers that identify very easily with entities they come from. Overall, these advancements not only were able to improve the accuracy of large-scale entity matching for theAdvisor but also enhance the computation time by making it a mere 99.9967% faster. Thus, making it possible to create a network linking large-scale entities by citation data.

Abstract: 334

Period Parity: A Literature Review

Olivia Gortva, Jianaa Ghosh, and Anyah Wallace

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

In this literature review, we explore the relationship between low income and menstrual health in America to shed light on the realities of menstruating while having a low socio-economic status. To provide an informed response, we analyzed relevant literature to illuminate the nuances of menstruating. Previous discussions surrounding the topic have explained how menstrual inequities need to be taken more seriously because of the substantial population of menstruators residing in the United States. Struggles include an inability to afford or have limited access to period products. The financially vulnerable who struggle to access period products may resort to using alternatives, which increases the chance of infection, resulting in poorer mental and physical health. Another problem is that men's products are generally less expensive despite having a similar function. Menstrual health is, historically, viewed as a taboo topic. Because of this, women often feel ashamed and suffer in silence. Other research finds that minimal health education, lack of financial aid for period products, and medication for menstrual disorders all correlate with poor menstrual health. This "period poverty" –lack of accessibility and knowledge of how to use period products– indicates that we must make changes to negate these issues. Continued ignorance and stigma concerning menstrual health in America allow for those who menstruate to fall through the cracks and for income to be among the determining factors that dictate one's menstrual health. To combat this, we need to implement positive discussion surrounding the issue.

Abstract: 335

Investigating and Comparing Sustainable Development Goal #13 in Germany and the United States

Alec Peay, Sammi Gentry, and Neel Panajkar

Mentor: Dr. Erik Jon Byker, Cato College of Education

Our research investigates and compares aspects of the Sustainable Development Goal (SDG) #13: Climate Action. The main research questions for our international comparative study are: What are the similarities among Germany and the United States related to target goals for Sustainable Development Goal #13. The purpose of this goal is to take urgent action to combat climate change and its impacts around the world. Our planet is on the brink of disaster with rising temperatures, high numbers of greenhouse gasses in the environment, and rising sea-levels to name a few issues taking place. Currently, in the United States, major challenges still remain and the score is moderately improving. The United States SDG index score is currently 75.9 and with a spillover score of 67.8. In Germany only some challenges remain and the score is also moderately improving. Germany's SDG index score is 83.4 and the spillover score is 65.2. SDG #13 remains a major challenge in the US and Germany. In the US, the score is stagnating or increasing at less than 50% of the required rate. In Germany, the score is moderately improving, but at an insufficient rate to attain the goal. To conduct this research, we each wrote a Research Memo paper based on a literature review methodology. The Research Memo included international reports and peer-reviewed journal articles. The Research Memo was framed by Bereday's (1964) Comparative Model. To sharpen our critical thinking skills, we also engaged with an Artificial Intelligence (AI) Debate Bot to further strengthen our findings. This collaborative study was part of a semester-long Global Networked Learning (GNL) research collaboration among students at UNC Charlotte and students at the PH Ludwigsburg in Germany. A GNL project is a collaborative approach to learning that enables students and instructors from different locations around the world to participate in learning and creation of knowledge together. In our research, we report the comparative findings of our GNL project. The research includes an examination and discussion of the challenges and possibilities in meeting SDG #13 which urges countries' to take action to combat climate change and reduce its impacts by the 2030 goal year.

Special code(s): Global Research

Abstract: 336

Combined Offshore Wind and Wave Energy Resource Assessment
Anthony Grancagnolo and Patrick Hultberg

Mentor: Dr. Saffeer Khan, William States Lee College of Engineering

The United States has set a bold goal of deploying 30 gigawatts of offshore wind (OSW) energy by 2030, enough to power 10 million homes, support 77,000 jobs, and spur economic and workforce development. North Carolina is ranked first in overall OSW energy potential along the Atlantic seaboard. Three areas along the NC coast (Kitty Hawk, and Wilmington East & West) have been leased for OSW development. Offshore energy can also be harnessed from ocean waves as a complementary resource to OSW. There is a need for a detailed combined wind and wave energy resource characterization in the lease areas to enable colocation and multiuse of sea space. The purpose of this project is to assess and characterize the combined wind and wave energy resource potential in NC OSW lease areas. Our team has collected data from existing met-ocean data sources and models to analyze the wind and wave power density and characterize the potential OSW and wave energy resource. The team found annual OSW and wave energy potentials of 3.1 and 9.05 GW in Kitty Hawk; 3.0 and 4.07 GW in Wilmington West; and 3.1 and 4.09 GW in Wilmington East. If a fraction of the combined OSW and wave energy resource (~17 GW) along NC coast is harnessed, it is sufficient to power all homes in NC (~ 4 million homes). The team will present project findings at the IEEE Green Technologies Conference in Springdale, Arkansas, and Annual Coastal Studies Institute Symposium in Wanchese, NC during April 2024.

Abstract: 337

Unprecedented Job Loss and Recovery During the Early Pandemic
Thomas Hartman and Kaleb Gomez

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

The COVID-19 pandemic created a unique, unprecedented economic crisis that caused the loss of millions of jobs and a large shift in global supply chains. While there have been recessions that have caused similar issues, the nature and duration of the COVID-19 recession demonstrated that certain sectors of the economy are more susceptible to job losses, affecting some demographics more than others. Studying this phenomenon is crucial to understanding unemployment and shifting markets during this period. Jobs deemed as nonessential saw sharp losses, especially within high contact service work. This explains further inequalities since the sectors experiencing losses have a higher rate of women and people of color working in them. Despite this, the job recovery happened quickly, with unemployment rates falling from 14.7% back to 8.4% by August of 2020. Our paper shows that effective government policy can help alleviate the issues of job loss and inequity while keeping recessions shorter. Specific measures of poverty have actually lowered since the start of the pandemic because of assistance programs, with 10 million Americans moving above the poverty line and childhood poverty hitting an all-time low in 2021. With this research, we look to find who became unemployed, how they recovered, and how the various government assistance programs helped mitigate further losses. This research is relevant to developing effective strategies to combat future recessions. Using this research, we propose that the US government should keep certain relief policies in place, and how they can be used for further growth.

Abstract: 338

Biosynthetic Production of *Campylobacter jejuni* Sugars in *Escherichia coli* for Library Generation

Claire Moneghan

Mentor: Dr. Jerry Troutman, College of Science

Overuse of antibiotics for bacterial infections can cause bacteria to no longer be killed by those antibiotics. This is dangerous because humans rely on antibiotics to treat deadly infections. One bacteria type that causes sickness in humans is *Campylobacter jejuni*. This bacterium is covered in a sugar structure that helps it infect and make people sick. To better understand the function of *C. jejuni*'s sugar structure and to develop medicines that can block it from helping the bacteria, we need a large amount of that sugar structure to run experiments. It's difficult to produce these sugar structures in a test tube, but bacteria make them all the time and very quickly. Growing *C. jejuni* can be difficult and dangerous, so a different bacteria type should be used to grow the sugar structures. The goal of this project is to use a version of *Escherichia coli* that doesn't make people sick as a factory for sugar structures from *C. jejuni*. This can be done by taking DNA from *C. jejuni* and giving it to *E. coli*. The *E. coli* that have this DNA will be able to make a steady supply of the *C. jejuni* sugar structures that we need to study new antibiotic treatments that prevent *C. jejuni* from infection. There will be several different forms of *E. coli* that will have increasingly more of the *C. jejuni* DNA and the products they make will be individual sugar building blocks that make up the complete sugar structure, or the complete sugar structure itself.

Abstract: 339

A Literature Review of the Effects of Religion on the Well-being of American Adolescents

Dalton Yandle

Mentor: Dr. Melinda Adnot, Honors College

In a day and age where popular influencing factors among youth, like social media, have been found to have negative effects on the well-being of adolescents, religion has the potential to be a positive influence, promoting favorable life outcomes. The focus of this study is how religion affects the well-being of American adolescents. This literature review will investigate previous studies in order to determine how different aspects of religion, like community, the parents' religiosity, and the adolescent's own religiosity, can affect their well-being. The most consistent finding was that external factors, like the community provided by religion or the religiosity of the adolescent's parents, positively influenced adolescents' health. However, some research found that other factors, such as the presence of a traditional two-parent family or friends, had more of a significant impact on the adolescent's well-being than religiosity. Focusing on the adolescent's own religiosity, religion has been found to protect against negative life outcomes such as poor mental health, suicidal thoughts and actual suicide, substance abuse, and other rebellious behaviors in teenagers. At the same time, religion promotes multiple positive aspects of well-being, such as physical and mental health as well as closer familial ties. On the other hand, some studies argue that greater investment in religion may lead to inverse effects on well-being. This literature review's contribution is to illustrate the real effects, both positive and negative, of religion on youth in American society.

Special code(s): Honors Research

Abstract: 340

The Impacts of Pharmaceutical Companies in the U.S.

Maddy Davis and Taylor Blackwood

Mentor: Dr. Stephanie Bradley, College of Humanities & Earth and Social Sciences

Pharmaceutical companies are important to our health and well-being, however the pharmaceutical market is a for-profit industry. Being so, the industry does not always prioritize maintaining affordable medications and treatments for the public. The goals of this study include monitoring the extent to which the pharmaceutical industry prioritizes profits over accessible and affordable prescription medications, analyzing the relationship between pharmaceutical and insurance companies, and looking at the ways in which the government has helped the industry to become more profitable. Literature shows that pharmaceutical companies receive major tax breaks and benefits from the government, have major impacts on the affordability of medication, including life-saving prescriptions, and use patents and monopolies in order to drive up the cost of various treatments. Competition between pharmaceutical companies also drives up production costs as each company seeks to advance their research and production more quickly than others. The conflict of interest between pharmaceutical companies seeking to increase revenue, and patients seeking affordable prescriptions, show that there is a strong need for the regulation of pharmaceutical companies and drug prices. Specific, well-defined, and monitored regulations are needed so that Americans have affordable and accessible medicine. The tax dollars of American citizens are the exact dollars used by the government to fund pharmaceutical companies, and yet it is the same citizens who are becoming increasingly unable to afford necessary treatments and medication.

Abstract: 341

The impact of role asymmetry on linguistic alignment in collaborative tasks
Venus Kajangu, Samihan Nimbalkar, and Ava Grace Lee

Mentor: Dr. Alexia Galati, College of Humanities & Earth and Social Sciences

Interpersonal alignment is pervasive in daily life. Whether it is two children playing with building blocks or doctors collaborating on a medical case, humans coordinate their language and behavior across a range of activities. In this study, we analyzed the degree of linguistic alignment in a collaborative route-planning task manipulating role symmetry. This expands upon previous research that showed how alignment can be detrimental to performance in motor tasks when partners have symmetric roles. Forty dyads completed 5 route planning trials with symmetric roles, where both partners had equal information, and 5 trials with asymmetric roles, where one partner had more information about route blockages and the other lacked visual access to a portion of the map. To assess the level of alignment, we subjected time series of word sequences to Cross-Recurrence Quantification Analysis (CRQA) from 52 trials of dialogues. We predicted that in situations with asymmetric roles, which have fewer degrees of freedom for organizing behavior, dyads will display more alignment. Indeed, dyads in the asymmetric condition produced longer word sequences that were repeated across partners (maxL) than the symmetric condition. Additionally, dyads completed easier maps by using a greater proportion of words forming repeated sequences, suggesting a greater degree of coordination. These findings contribute to a deeper understanding of how task constraints, such as unequal access to information, influence the emergence of alignment in collaborative tasks.

Abstract: 342

Impact of Beaver Dam Analogs on Suspended Solids and Sediment Size Distribution in a North Carolina Foothill Stream

Carlos Escobar

Mentor: Dr. Sandra Clinton, College of Humanities & Earth and Social Sciences

Beavers are considered “ecosystem engineers” because they dramatically alter their surroundings by constructing dams, canals, and lodges, which create new wetland habitats and modify stream hydrology. Beaver dams are also areas of enhanced groundwater - surface water interactions (GWSWIs) which provide crucial ecosystem services, including water filtration, nutrient cycling, and habitat creation. For these reasons, beaver dam analogs (BDAs) have been used as a low tech process based restoration technique to mitigate human impacts on streams. We are interested in quantifying how beavers modify ecosystems and water resources, highlighting their role in sediment deposition and hydrological processes and evaluating the effectiveness of human-made structures (BDAs) compared to natural, beaver-made dams. Our overall goal is to understand how the deposition of clay-sized particles in streambeds reveal complex clogging patterns and influence hyporheic exchange dynamics. We have been monitoring surface water and groundwater at a BDA restoration site on Foothills Conservancy Property near Morganton, NC for ~ 1 year in collaboration with the Catawba Riverkeeper. In this study we are quantifying the change in total suspended solids (TSS) and sediment size (SS) over time following the installation of a series of BDAs. We sampled surface water and sediment above and below 8 BDAs to determine changes in sediment dynamics, underscoring the importance of hyporheic zones as sensitive interfaces for pollutant transformation and habitat support.

Special code(s): North Carolina Research

Abstract: 343

Investigating Early-Childhood Education

Yahaira Corza

Mentor: Dr. Erik Jon Byker, Cato College of Education

The purpose of this poster is to describe and report on early-childhood education and a better understanding of the impact it can have on students when they go to school at an early age. The poster situate this topic in the context of public schooling and education in the United States. The poster research is topical and important because it gives us a better understanding of a child's development on communication and learning skills. . The following research questions are investigated in this presentation: **(**1) What is early-childhood education? (2) What are the features of early-childhood education? (3) What is the impact of early-childhood education on a students' success in school? (4) What are examples of policies and programs related to early-childhood education? (5) What are the research findings related to the impact of these programs? The presentation examines these research questions using a literature review research design methodology. In relation to the research questions, the presentation reports on findings, which include: the meaning and impacts of ECE, the short and long-term effects for students who participated in early-childhood education, and lastly some policies and programs related to early-childhood education.

Abstract: 344

Examining the Educational Benefits of Outdoor Education
Mariana Gracia Garza

Mentor: Dr. Erik Jon Byker, Cato College of Education

The purpose of this presentation is to examine the educational benefits of outdoor education in schools. This presentation is topical and important because outdoor education provides opportunities for experiential learning, fosters a deeper connection with the environment, and promotes physical and mental well-being. It helps develop skills like problem-solving, teamwork, and resilience, while also cultivating a sense of stewardship for the natural world. The following research questions are investigated in this paper. (1) What is outdoor education? (2) What are the features of outdoor education? (3) What are the research findings related to the impact of these programs and practices? (4) What are the affordances and constraints of implementing outdoor education into schools? The presentation examines these research questions using a literature review research design methodology. In relation to the research question, the presentation reports on findings, which include: In the University of Nord-Trondelag, Department of Teaching Education, the children had different temperaments regarding outdoor education, some had a mixed reaction but others had an increased behavioral activeness from the outdoor environment. In the University of Minnesota, a study shows the benefits of young children connecting with nature, to develop and emphasize their cognitive development. Through quality analysis they made known the core principles of outdoor curriculum which positively impacts their experiences with learning, nature, and authenticity. The presentation concludes with a discussion and personal reflection about the value of inquiry and conducting literature reviews type research.

Abstract: 345

Microbial Dynamics in Agricultural Land Restoration and Soil Fertility
Areena Moshawi and Sida Mohamed

Mentor: Dr. Sharon Bullock, College of Science

Redlair, situated on South Fork River in Gaston County, boasts fertile land that serves as an essential habitat for rare plants such as the Big-leaf Magnolia tree. However, in recent decades, agricultural activities have altered the distribution of microorganisms that play an important role in soil nutrition. Therefore, this shift poses a threat to the survival of these trees. Our research aim was to explore microbial organisms' utilization to restore the soil's natural richness and mitigate the extinction risk these trees face. Our primary focus was to characterize gram-positive and gram-negative bacteria distribution across the land. Specifically, we examined the abundance and distribution of gram-negative bacteria (specifically *Azospirillum brasilense*), given their pivotal role in nitrogen fixation within the soil. Nitrogen plays an important nutritional role in the growth and development of plants. Our research involved the collection of samples from various locations within the Redlair area. We conducted culture-based testing and molecular-based assays to identify the microbial composition within these samples. We found that the physical and chemical characteristics of all soil samples were optimal for bacterial growth. Additionally, culture-based tests revealed that the presence of gram-positive and gram-negative bacteria varied with animal activity. Soil samples were analyzed using PCR to identify the presence of *A. brasilense*. *A. brasilense* was only detected in soil samples from areas without animal activity. Future studies will investigate the use of a laboratory-produced biofertilizer to increase the presence of *A. brasilense*.

Special code(s): Community-Engaged Research, Sustainability Research

Abstract: 346

The Impact of Ageism Among Healthcare Workers and Investigation of Successful Interventions: A Literary Review

Larkyn Derrick

Mentor: Dr. Melinda Adnot, Honors College

As the population is aging at a rapid rate all over the world, with 22 percent of the U.S. population being 65 years of age or older by 2040 (US Department of Health and Human Services), care for older adults is much more prevalent in all kinds of healthcare practices. There is a growing body of research on how ageism, prejudice and discrimination on the basis of age, is affecting the health outcomes of older adults. Moreover, researchers and practitioners are exploring solutions for combating ageism among healthcare professionals and what interventions are most effective. The goal of this literature review is to analyze the effects of ageism among healthcare professionals on the health outcomes of patients, and subsequently determine the methods of intervention that are most effective in reducing ageism among healthcare professionals. In preliminary research, I find that ageism by healthcare professionals is associated with many negative physical and mental health outcomes, particularly for older women and other minoritized groups. I also have found that educational and intergenerational contact interventions are successful in reducing ageist attitudes of healthcare professionals. These findings suggest that ageism has a broad negative impact on older adults when carried out by healthcare workers, but more importantly that this is an issue that can be mediated by effective, sustainable, inexpensive interventions.

Special code(s): Honors Research

Abstract: 347

Writing Mechanics vs "Good" Writing

ScottLynn Graves

Mentor: Kristina Duemmler, College of Humanities & Earth and Social Sciences

The question this research sought to answer is “in early education, why are the mechanical aspects of writing being prioritized over audience-tailored writing?” This question arose when I started my first-year composition class and I began to view my writing differently. Previous research suggests that it is hard for students to simultaneously focus on writing mechanics and writing effective texts. Williams suggests that students should be allowed to write “badly” first by freewriting a rough draft and then revising their writing, looking for errors such as spelling, grammar, and punctuation. While Daffern’s study concludes that spelling, grammar, and punctuation jointly influence written composition. To add to this conversation, I decided to digitally interview four people. Two were high school English teachers, one was a first-year writing instructor, and lastly, I interviewed a college student studying English Education. At the end of my study, I found that I had similar responses from all four participants when asked about the mechanical aspects of writing. They said that writing mechanics are important depending on the context and who the audience is but shouldn’t necessarily come first in the writing. They also agreed on definitions of good and bad writing, saying that good writing gets the point across, reaches a target audience, flows, and has character while bad writing does the opposite. My research is important to the conversation because it explains why writing mechanics is crucial to good writing, therefore, justifying to early education teachers that all aspects of writing deserve attention.

Abstract: 348

Educational Development with Technology: A Literature Review
Mya Allen

Mentor: Dr. Melinda Adnot, Honors College

This literature review examines the transformative potential that arises from the integration of computing technologies and artificial intelligence (AI) in the classroom, with a focus on how these technologies affect students who have learning disabilities. Given the speed at which technology is developing, it is important that we consider the ways in which AI might contribute to educational experiences. The review aims at identifying innovative approaches that increase accessibility and inclusivity in schools and educational institutions. Current research provides a framework for designing learning environments that are accessible to everyone. Furthermore, divergent perspectives from recent research provide up-to-date information about how AI impacts the learning environment for students with learning differences. This changing environment points to an increasing use of AI in the classroom, which calls for careful ethical reflection. This literature review's contribution is the integration of multiple perspectives in an effort at developing a more equitable environment for students with disabilities. This review contributes to the continuing conversation on the relationship between AI, computing technologies, and inclusive education by exploring the body of existing knowledge, filling in gaps, offering critical evaluations, and laying the foundation for future research. The ultimate objective is to develop technologies that have a positive impact on the educational atmosphere for students with learning difficulties.

Special code(s): Honors Research

Abstract: 349

Analyzing the Mood Affects of College Students due to Music

Sophia Alizadeh

Mentors: Dr. Anne-Kathrin Kronberg and Dr. Megan Smith, College of Humanities & Earth and Social Sciences

Research shows that music affects our mood and mental well-being. Upbeat music tends to make individuals have a more positive outlook on life while sad music does the opposite. Based on research, the type of music one listens to can affect the increased or decreased likelihood of depression, mood-wings, sleep, and attention span. Employing a quasi-experiment, I will be exploring how specifically, college students' mood gets affected by the music they listen to. After conducting my research, I expect to find that a college student's mood does become affected by music they listen to. They will live their day to day life based on the music they listen to and with time, I expect to find that it can cause a more permanent mood change. Exploring how music can infiltrate our lives is a topic that has always caught my attention and even though there has been research done, I want to dive deeper. I want to see how the genres of music we lean towards shape us into who we are. Yes, there are many different things that go into what makes a person unique but I want to discover, how can music have an altering change within a person?

Abstract: 350

Phage Hunters: The Discovery of Phage AWGoat Using *Arthrobacter globiformis* as a Host Bacterium

Wyatt Workman

Mentors: Dr. Sharon Bullock and Dr. Michelle Pass, College of Science

Bacteriophages, also known simply as “phages”, are viruses that infect and replicate within host bacterium cells. Bacteriophages are the most abundant organisms in the biosphere with an estimate of approximately 10^{31} particles present in the world today. *Arthrobacter globiformis* is a gram-positive organism mostly found in organic matter and was the host bacterial cell used to incubate the environmental samples for this course. *Arthrobacter globiformis* is a strong host cell to use due to its flexible temperature rates for growth (22-37℃), fast growth and reproduction rates, as well as having lush bacterial lawns that grow in abundance across the nutrient-rich PYCa media. The purpose of this research is to discover bacteriophages and submit phage samples to Howard Hughes Medical Institution (HHMI) to contribute to their database. This can lead to future research and discoveries on the uses of bacteriophage for treating antibiotic-resistant bacteria and other bacterial infections. This was done by collecting samples of organic matter from the environment and isolating potential phage from these samples to culture and confirm if there is phage via plaque assay techniques. If a phage is successfully located within a sample and meets HHMI’s requirements, it can be sent off to be DNA sequenced and put into its expanding database. Performing this experiment and having success in isolating phage, helps to further build the culmination of research into how phage can be utilized for combating antibiotic-resistant bacterial infections and other phage therapies.

Abstract: 351

Securing ARM Binaries with Model-Checking

Kausika Manivannan

Mentor: Dr. Meera Sridhar and Dr. Harini Ramaprasad, College of Computing & Informatics

LLVM is a compiler infrastructure that can translate high-level programming languages into executable machine code. ARM binary is a type of machine executable that provides instructions to ARM processors, which are commonly found in smartphones. These processors are susceptible to various security risks, such as hardware flaws and cyber-attacks. This project aims to detect these security flaws in ARM binary code and write methods and tools to ensure their safety from vulnerabilities. These methods can be used to check the reliability of software and hardware systems. To develop these tools, I investigated two techniques that detect programming flaws: Abstract Analysis and Model Checking. These techniques can detect shallow bugs and check for safety properties. Additionally, I created a Prolog interpreter for IMP language to understand how programs behave and analyze their semantics. The expected outcome of this project is to deploy these security methods to developers and improve security in these problem areas.

Abstract: 352

Optimizing Campus Transportation: A Physarum Polycheplem Solution
Shreyas Vimaldev

Mentor: Dr. Belinda Parker, William States Lee College of Engineering

Cellular intelligence has been utilized in many countries to optimize their transportation system. The smart slime mold, Physarum Polycephalum, is capable of developing vascular networks of protoplasm to efficiently connect node-like food sources to optimize transportation routes. This is of particular interest as a model to streamline transportation systems across and between cities. The scope for the current research will utilize this cellular intelligence in an attempt to optimize the bus transportation system across university campuses which will aid students getting to classes on time, leading to increased academic success. A review of relevant published literature, interviewing personnel in the current UNCC transport system forms the initial steps in this research and will be followed by modeling the infrastructure of UNCC campus with the smart slime mold and integrating this with computer modeling. A successful pilot research initiative undertaken at UNCC ill lead the way for the model to be utilized at other universities across the country.

Abstract: 353

Roanie Revelation: Uncovering a Hidden Gem in Phage Isolation
Caitlyn Bolling and Caelan Walsh

Mentor: Dr. Sharon Bullock, College of Science

Bacteriophages make up a large portion of the biological material on planet Earth. They are important to soil communities as they are viruses that only infect bacterial cells. These viruses play a crucial role in nutrient cycling, growth control, managing plant diseases, and even diseases in us. There has been research in using bacteriophages as treatments for antibiotic-resistant bacterial cells making them invaluable to solving a potential epidemic. It is estimated that there are 1031 phage particles, and we have only discovered fewer than approximately 3,000. With that being said, there is extreme genetic diversity hiding in these populations, and that is why it's important to continue the discoveries of phages. The ability to characterize phages can bring the discovery of genomes with the key to solving many global issues and new vectors in biotechnology. The goal of our study was to find phage from the soil in order to isolate and identify it through the HHMI protocols we were provided. We took a soil sample and enriched it with media and bacteria to allow for bacteriophage growth. The bacteria that was used as a host for our phage was sp. ATCC 21022. Through a series of plaque assays, serial dilutions, and concentration of the particles we were able to identify our novel lytic myoviridae phage, "Roanie" and an unnamed phage that we were initially unaware of. Further experimentation of enzyme digests, TEM, and gel electrophoresis Roanie was characterized and validated as novel.

Abstract: 800

Serpent
Ruby Clemmons

Mentor: John Hairston, College of Arts + Architecture

This piece was for an illustration project about designing an invention and depicting two different scenes of the device in use. I created a sci-fi inspired arm cannon, in which the user utilizes it as a prosthetic arm as well as a weapon. The piece depicts a character using it to illuminate a dilapidated, abandoned area, prior to encountering a large snake in battle. I engaged cross-hatching techniques using ballpoint pen on Bristol paper for this project. I wanted the environment to be full of small details that demonstrate how worn down, old, and possibly dangerous the area is. I was heavily inspired by the Metroid and Fallout series, both games have great emphasis on atmosphere and environment, especially that of a forgotten or abandoned yet futuristic world. I learned a lot about ballpoint and cross-hatching with this project, I feel like I have found a particular method of shading and line work that I feel very comfortable and free with. This project has shown me how important every single little line can be in creating atmosphere and breathing life into an illustration.

Abstract: 801

George Michael
Sarah Vojnovich

Mentor: Aspen Hochhalter, College of Arts + Architecture

The purpose of this project was to photograph our daily lives while studying abroad in Ireland from May to June of 2023. As a photography major, I took this photo with my camera and did minimal editing to the photograph. I quite enjoy taking candid photographs along with further experimentation in black and white photography, and I used Ansel Adams as my inspiration for this project as he specialized in black and white photography. The strongest skills I learned as a result of this project were snapping the moments that people wouldn't think important and reflecting on techniques learned in film photography where you wait for the right moment and be purposeful in your intent and choice of subject matter.

Special code(s): Global Research

Abstract: 802

Disturbing the Fenghuangs
Hypnos Chhabra

Mentor: Jessica "JB" Burke, College of Arts + Architecture

The purpose of my project was to explore animal anatomy and creature design by creating a character design based on a provided list of mythical creatures. From the list, I chose the Fenghuang, a Chinese mythical bird. My medium was a digital illustration done in Tool Paint SAI 2. Some of my inspirations involved with my Fenghuang's designs were various creatures native to China and ancestors of domesticated animals. Some animals involved are the head and crest of a red junglefowl, the plumage of a mandarin duck, the shell of an impressed tortoise, the horns and hooves of a Père David's stag, the tail, scales, and color patterning of a koi fish, and the frame of the Archaeopteryx lithographica. The environment that the Fenghuangs inhabit is based on secondary forests near mountains, such as Qinghai and Tibet, but also the natural habitat for the red junglefowl and the impressed tortoise. Some new skills I learned while creating *Disturbing the Fenghuangs* were to utilize textures to create a believable environment and creature design. This includes leafy patterns to indicate the sparse vegetation of a secondary forest, using a flat brush for plumage, and using bumps and wrinkles to indicate scales and skin.

Abstract: 803

Universe Inside of Me
Jazmine Chance

Mentor: Anna Kenar, College of Arts + Architecture

For this piece, the project itself was to explore the idea of abstraction as forms that describe our emotional and visual universe. The piece titled the *Universe Inside of Me* is an abstract representation of what defines the components of how I view the fine art world. The image consists of a vinyl on a music player which I saw as how a vinyl itself can be plain but the music that comes from it takes the listener into a theatrical journey. I always saw the world through a different lens where movement in sound and graphics can showcase movement under emotion. In this 12 1/4 in. x 16 1/4 in. piece with intaglio and relief ink, there exists an organic print with a ghost print underneath that personifies the contradiction of outer appearance versus the truth underneath of what the world can express. The acquired skills from this project involved the process of the use of a laser cutter onto a 4 1/2 in. x 4 1/2 in. acrylic square and the printing process of layering intaglio and relief ink.

Abstract: 804

Sam
Lisa Mirisola

Mentor: Andrew Leventis, College of Arts + Architecture

This oil painting on linen is inspired by taking the subject of a painting and distorting the view by zooming into the subject from an uncommon viewpoint. As a painter, art is not often shown in this way. We are taught that there are compositional rules, especially when the composition has a human subject. Art is meant to tell a story but this work hides everything from you, even their face. This work is possibly the first in a series that I'd like to continue working on that uses unconventional approaches to how I compose a subject in a painting. The painting originated from another project of mine about photo albums of strangers meant to make the viewer consider familiarity within the photos and create a sense of nostalgia even though the subjects or places were new to them. As an Artist, I'd like to continue striving for this style and these concepts. I like to treat the composition as a study of the subject, the mind, and the concept of what makes art good. I always enjoyed the analytical approach to art history and how we divulge and pick apart why art is the way it is, not always what it's about. I think this is why I treat my process the same way. It is not about the story but how I can push the rules of composition in turn leaving the viewer with their own uninfluenced story about it.

Abstract: 805

(in)Visible
Zoe Turner

Mentor: Aspen Hochhalter, College of Arts + Architecture

Mental health can be a difficult subject to approach, especially in visual media where it is easy to further harmful stereotypes and to do nothing productive. However, I believe that utilizing the gothic with its rich literary and visual history allows for a different perspective on how we can explore a person's mental health. Specifically, looking at gothic horror in its written and visual entertainment formats provides us with a means of exploring the internal and external factors of a person's mental wellbeing. The demonstration of both mental and physical manifestations of normal and paranormal episodes suggests that the presence of one does not negate the existence of the other. To explore this concept, I have used a mixture of analog and digital photographic processes, as well as an array of technical skills including motion blur, view camera movements, and a variety of facial and body work.

Special code(s): Honors Research

Abstract: 806

The Fragility of Memory
Kelli Crockett

Mentors: Andrew Leventis and Aspen Hochhalter, College of Arts + Architecture

What could you observe about someone's life, just from the objects they hold dear? It is a very human thing, to instill our sense of remembrance, grief, and love into something that can be damaged, or even lost. It seems foolish to do so, and yet we cannot help ourselves from materializing our emotions into something we can hold and cherish. It's a risky act of creation, of self-soothing, of love. I adore this so-very-*human* act, foolish as we are. The vastness and gentility of these emotions helps me to seek a greater understanding of my own sentimentality. To encompass and further investigate this concept, I've painted a series of objects that I keep close to myself, telling the story of my family through generations of sentimental heirlooms. I've titled this series of oil paintings *The Fragility of Memory*.

The Fragility of Memory: A Bunny for Me was originally displayed as the centerpiece of a 22-painting collection in UNC Charlotte's Fall 2023 BFA exhibition, *Collected Fragments.* It was shown in UNCC's *56th Annual Juried Student Exhibition* and will be on display for 1 year in the UNCC Career Center Art Gallery beginning in May 2024. *The Fragility of Memory* collection has also been featured in the 2024 Goodyear Arts gallery exhibition, *The Shelf Life of Grief,* and will be included in the Nova Literary Arts Magazine *Volume 55* publication and accompanying exhibition this spring.

Abstract: 807

Angel Hands
Caroline Walls

Mentor: Jessica “JB” Burke, College of Arts + Architecture

This painting was a response to a scientific medical illustration project in Figure and Anatomy class. The project was a test to my ability to accurately represent the muscles in the human hands. I was inspired to create a biblically accurate angel form out of the inverted reference of the medical illustration. This project tested my knowledge of human anatomy and creative problem solving in the process of turning the hands into a complex form.

Abstract: 808

***Faux Bug* (2023)**
Maya Hutagalung

Mentor: Jessica “JB” Burke, College of Arts + Architecture

The goal of this piece was to take something that existed in the world and present it as an abstraction by removing context that would identify that image. One way to achieve this is by drawing a microscopic image. The piece depicts a beetle’s thorax. To viewers, the piece may evoke other familiar images such as tentacles or eyeballs. People search for identity in the unrecognizable. The medium used is Pen and Ink on Bristol Paper, 18” x 24” (including a white border). My inspiration came from a photograph submitted to the Nikon Small World competition. I use this reference for an educational setting (a class project) and my piece is not for commercial use.

This project challenged me to push mark-making techniques to a fully rendered piece. Creating texture was important to represent a tough thorax. I chose pens so that I could depict roughness. I used different pens and markings, such as hatching and stippling. I also learned to make a satisfying piece using aspects such as composition without relying on object recognition to draw the audience's attention. I cropped the reference image to focus on a flow of dark values in the center and pushed these values darker. This heavy “line” creates movement, drawing the eye along it.

Inspiration Credit:

Krebs, Charles. Thorax, head and eye section of Chrysochroa fulminans, Charles Krebs Photography, Issaquah, Nikon Small World Nikon, Thorax, head and eye section of Chrysochroa fulminans (a metallic beetle) | 2004 Photomicrography Competition | Nikon’s Small World (nikonsmallworld.com)

Abstract: 809

Wanderings: Italy
Suzanne Voigt

Mentor: Aspen Hochhalter, College of Arts + Architecture

Based in positive psychology and chaos theory, the concept of “wisely wandering” is an established approach in career counseling that guides participants through a variety of non-linear activities, assisting them with self-discovery and a creative approach to career exploration. For this project, my aim was to showcase my own wise wanderings and self-discovery practices, which occur most often when I travel outside of the United States. Over the years, I have had the pleasure to visit many countries, primarily in Europe, and this cultural exploration has greatly shaped the way I see the world and how I desire to serve people, helping them to better understand how they too can wander wisely. For many people, wandering can seem like a daunting or frightening prospect, however, with positivity and a strategic structure in place, wise wanderings go from concepts of treacherousness to an extraordinary mosaic of adventures. In this 3D digitally composited image, layered within resin on cedar canvas, my goal was to showcase my lived experiences of wise wanderings through the mosaic lens of digital photography and the use of colors that correspond to my own experiences, feelings, and emotions in these various places where I have wandered. This image of my wanderings in Italy have aspects of “paths” along with symbolic elements that hint at the place/country I captured.

Special code(s): Global Research

Abstract: 900

Interpreting Penthesilea of the Achilles-Penthesilea Sarcophagus
Hollie Rode

Mentor: Dr. Jim Frakes, College of Arts + Architecture

The Achilles-Penthesilea sarcophagus from the 3rd century C.E. places a primary visual focus on mythological relief. As is common with Roman sarcophagi of the time, the story between the pair and the battle that surrounds them provide a narrative for the patron, Aelius Myron, and his wife, Aurelia Agrippina, to live on in memory. The story of Achilles has been studied frequently, but in my talk, I will shift focus to Penthesilea, who lies dead in his arms at his own hands, and answer the question of why Aelius Myron chose this imagery to represent his wife. First, I will give a brief overview of the myth of Penthesilea's death at Achilles's hands to provide the context available to the Roman audience's awareness. Then, I will examine the feminine ideals of the Romans in the Severan period and establish why the use of this imagery might come into question. The conventions of Roman Sarcophagi then establish why those ideals do not apply to this mythic imagery. Next, I assess depictions of Amazons to provide more detail about Penthesilea herself and what she represented at that time. Ultimately, these factors lead to the conclusion that the message of this sarcophagus, while intended as a nod to the patron's memory, also serves as a potential love letter to the memory of his wife.

Abstract: 901

From "I Cain't Say No" to "Astonishing": An Analysis of Golden Age to Contemporary Musical Theatre

Abigail Williams

Mentor: Dr. Jay Grymes, College of Arts + Architecture

The purpose of this project is to discuss how the roles of women have changed throughout the last 100 or so years of musical theatre works. The Golden Age Period of Musical Theatre is generally referred to as beginning in the 1920s with shows such as *Oklahoma!*, *Carousel*, and *Anything Goes*. It is widely agreed that the Golden Age Period ended with the premiere of the musical *Hair* in the late 1960s. “I Cain’t Say No” from *Oklahoma!* (1943) is sung by Ado Annie, and is a piece largely about her inability to say no, as indicated by the title, to men in less than pure contexts. “Till There Was You” is sung in *The Music Man* by Marian (the Librarian), about how her life was incomplete until she met Harold Hill, the protagonist (and in some ways antagonist) of the musical. Between the Golden Age and Contemporary musical theatre periods, there was a transition in the way women were perceived and written in these theatrical works, for example, the premiere of the musical *Chicago* in 1975. Through research and a further analysis of repertoire and contemporary musical theatre selections, such as “Astonishing” from *Little Women* (2005) and “Me and the Sky” from *Come From Away* (2017), I anticipate to find that women, especially in the 21st century, have come into their own roles in theatrical works, that are indicative of a change in the perception of women throughout time, and a change in how women feel about themselves outside of their traditional gender roles.

Abstract: 902

Dua Lipa and “Levitate”, A Trio of Lawsuits
May Smith

Mentor: Dr James A. Grymes, College of Arts + Architecture

Since 1790, U.S. Law has contained various forms of copyright protection. This protection extends into the realm of music, an art primed by inspiration and derivation. However, the results of said inspiration can be too close to the original, and deemed a copyright violation. This paper aims to analyze a trio of lawsuits involving alleged musical stealing. Artist Dua Lipa has been sued by three separate interest groups for her 2020 song “Levitating”. One lawsuit from a colleague who claimed his work was stolen via a contractual violation, another from a South Florida reggae band claiming a stolen chorus, and one from an artist claiming a stolen verse. The first burden of proof a plaintiff must clear is proof of access, as somebody couldn’t have copied a song no matter how similar, if the accused did not have access to the song. However, my analysis looks at the cases regardless of the potential proof of access. The analysis is aided by musical examples, with transcriptions done by myself and forensic musicologists. The analysis is based on the claims made by the plaintiff in their complaint to the court, or in some cases, during the trial. Overall we can look at how cases may affirm each other, or even contradict one another. I also compare how judgements may vary depending on the court district and level, such as appeals to a higher court.

Abstract: 903

In the Shadows: The Place of the Tenor Saxophone in Solo Classical Music
Gavin Foley

Mentor: Dr. Jay Grymes, College of Arts + Architecture

The tenor saxophone is an instrument that provides a rich sound beloved by musicians in many genres, but it is greatly under supported in modern classical concert music as compared to its counterpart the alto. Since the invention of the saxophone in the mid nineteenth century, the soprano, alto, tenor, and baritone have cemented their place as the standard voices for Western classical music. It has been the alto voice that has become the primary saxophone for solo classical performance as the instrument's pedagogy and tradition developed further into the next two centuries. This research seeks to examine the historical factors that have led to the tenor specifically lacking utilization in this setting, with an end goal of putting forth an example of how to challenge this. Through examining the early history of the saxophone's development and proliferation as well as the nature of early study and repertoire, the intended outcome is discovery of what factors have contributed to the alto's comparative success. Also presented will be a more specific examination of the musician James Houlik's career, and how he was able to defy this status quo and lead a successful career in both performance and education playing primarily the tenor saxophone. This historical research combined with the case study will create an outline of how the tenor saxophone can be better represented classically, and it should prove useful to the largely underrepresented community of classical tenor saxophonists, especially in academia.

Abstract: 904

The Value of Impermanence in Japanese Aesthetics
Samantha Fine

Mentor: Dr. Seirin Nagano, College of Humanities & Earth and Social Sciences

This research aims to expand the possibilities of interactive and perishable forms of modern art by comparing them to East-Asian philosophies of aesthetics, focusing on those of Japanese origin, before mass western intervention. The western concept of “art” values the archival object, an unchanging final product which French Art Historian Didi Huberman refers to as “the element of permanence.” However, I argue that this method of determining artistic value based on permanence is a cultural development parochially ingrained in artistic institutions. American-Japanese Historian Donald Keene posits that perishability, or *impermanence,* constitutes artistic value in Japanese history. Japanese artistic ideas intertwine with the concept that life is temporary, and thus more value can be placed in objects which evolve, change, and eventually perish. Japanese author Jun'ichirō Tanizaki also references the “sheen of antiquity,” the beauty in an object that has been used regularly and acquired a shine from the skin’s oils. In the past century, modern art and artistic institutions of the West have slowly begun to recognize the value of interactive relationships between viewer and artwork, spearheaded by art movements that value tactile interactivity. I argue that, based on the value of aesthetic perishability in Japanese visual culture, to categorize these interactive explorations in Modern Art as a “new” form of art, one that is inherently Western, ignores the long-standing existence of this concept in East-Asia. Thus, an understanding of early Japanese aesthetics can expand an otherwise narrow mindset surrounding the perishability of art in modern artistic institutions.

Special code(s): Global Research

Abstract: 905

Exploring Kamen Rider Fan Alters: Religious Expressions of Superhuman Power and Community Values

Jared Spears

Mentor: Dr. Alexandra Kaloyanides, College of Humanities & Earth and Social Sciences

This paper explores Kamen Rider fan alters as religious expressions of superhuman power and community values. We examine how objects are seen as religious through the world of the Japanese anime Kamen Rider and the religious aspects fans ascribe to it. Through the lenses of fan communities and pop culture, we analyze how fans interpret and engage with religious themes in Kamen Rider Zero One. This includes stories from human rights and equality to punishments and religious extremism. To study religion in pop culture is to research the commercial appeal of religious symbols and community. This exploration contributes to a particular understanding of the complex interplay between popular culture and spirituality in the modern era.

Special code(s): Global Research

Abstract: 906

Reforms in Saudi Arabia and their Social, Legal, and Economic Impact on National and non-National Women, 2015-2023

Carrigan Marlowe

Mentor: Dr. Hania Al- Shamat, College of Humanities & Earth and Social Sciences

Since 2015, as part of its economic diversification strategy and opening the country to tourism and foreign investments, Saudi Arabia has adopted a number of social, political, economic, and legal reforms targeted at women. Long held restrictions on women's attire, right to drive and travel, and participation in public activities were lifted. Safeguards against work harassment were instituted. Women's participation in politics and economics was actively promoted. Preliminary data suggests that such policies have had a tangible impact on Saudi national women, especially in the fields of employment and entrepreneurship. While the reforms mainly targeted national women, the question remains how such reforms impact non-Saudi women residing in the kingdom. Such a question gains special importance since migrant women constitute around 11 percent of total women in Saudi Arabia and they have traditionally been the active participants in the job market. This study utilizes existing data and international reports to compare the social, legal, and economic impact of current reforms on both groups of women. It is based on in-depth analysis of existing data from the Saudi government, Human Rights Watch, and Women's Entrepreneurship Report. It takes the complexity of migrants' socio-economic and ethnic backgrounds into consideration. The purpose is to identify the short- and long-term consequences on migrant women across various socio-economic levels.

Special code(s): Global Research

Abstract: 907

Interconnection: Is Believing and Seeing Connections in the World and Between the Self, Others and Nature Linked to Well-Being?

Kryschelle Fakir

Mentor: Dr. Amy Canevello, College of Humanities & Earth and Social Sciences

Do people's beliefs about interconnection, that is, beliefs that the social and physical world functions as a system, influence people's subjective relationships with other people and the natural environment? Are these subjective relationships with others and nature associated with personal well-being? We posit that beliefs about interconnection increase feelings of connection to others and to nature by increasing awareness and understanding of how the self fits into the system. In turn, feeling connected to others and nature should relate to greater purpose in life, personal growth, and environmental mastery. To test these ideas, 157 undergraduates completed an online study and were randomly assigned to read one of three articles designed to either increase beliefs about interconnection (high interconnection), lower beliefs about interconnection (low interconnection) or serve as a neutral control. Participants then reported their feelings of connection to others and to nature, purpose in life, personal growth, and environmental mastery. Results suggest that beliefs about interconnection did not increase feelings of connection to others or to nature. However, these findings support our hypotheses that feeling connected to others and to nature predicts greater purpose in life, personal growth, and environmental mastery. Thus, these findings suggest that seeing the world as a place where everyone and everything is interconnected may not help people feel connected to those systems. However, feeling connected may allow for greater subjective experiences such as purpose in life, personal growth, and environmental mastery.

Special code(s): Honors Research

Abstract: 908

Understanding How Diverse Demographics Influence the Communication Consultant Experience and Desired Areas for More Support

Audrey King, Cayla Avant, and Sonia Pacheco Mejia

Mentor: Dr. Heather Bastian, University College

Research has found that peer mentorship can play a valuable role in a student's personal growth and development. At UNC Charlotte, the Communication across the Curriculum (CxC) program trains communication consultants to serve as peer mentors and provide one-on-one support to students within select classes. This applied research project investigates how communication consultants view the impact of their role on personal and student development. Specifically, this study asks: How do consultants perceive the impact of their role on students/peers, and how do consultants perceive the impact of their role on their own development?

To answer these questions, consultants in Fall 2022 (n=44) and Fall 2023 (n=45) completed an online survey that asked them to evaluate and reflect on their roles as consultants. This project uses multiple-choice demographic information questions, a seven-point Likert scale of agreement, and open coding of free-response questions to categorize and determine perceived impact. The study finds that, through participation in the CxC program, consultants' understanding of their own development as well as their peers' is generally positive. However, consultants in certain demographics, including the type of course consulting for and the amount of time as a consultant, report different impacts on their own development and feel varying levels of support from the CxC program. These findings highlight areas where consultants already feel supported and suggest areas where consultants require more support from the CxC program moving forward.

Abstract: 909

Exploring the Impact of Communication Consultants: An Analysis of Student and Consultant Perspectives

Meenu Murugan and Ysabelle Blaine

Mentor: Dr. Heather Bastian, University College

Research has found that peer mentorship can play a valuable role in a student's personal growth and development. At UNC Charlotte, the Communication across the Curriculum (CxC) program trains communication consultants to serve as peer mentors and provide one-on-one support to students within select classes. This applied research project investigates how communication consultants view the impact of their role on personal and student development. Specifically, this study asks: How do consultants perceive the impact of their role on students/peers, and how do consultants perceive the impact of their role on their own development. To answer these questions, consultants in Fall 2022 (n=44) and Fall 2023 (n=45) completed an online survey asking them to evaluate and reflect on their consultant role. This project uses multiple-choice demographic information questions and seven-point Likert scale of agreement questions from the surveys. Particularly, this study focuses on the two questions that examine consultants' beliefs about the impacts of working with a consultant on others and the impacts of working as a consultant on themselves. This methodology captures variations in consultants' perceptions regarding their beliefs about the impact of their work through analysis of different demographics. This study finds that consultants' beliefs about their impact on their peers and themselves are generally consistent with limited variation across some demographics and key areas of their work. These findings help evaluate how well CxC conveys its philosophy and objectives through training and communication. These findings also highlight areas for development and success in the communication consultant program.

Special code(s): Community Engaged Research

Abstract: 910

Evaluating the United States Role in the 1981 Cancún Summit
Ashley Alcivar Conteron

Mentor: Dr. Jurgen Buchenau, College of Humanities & Earth and Social Sciences

Latin American economic development in the 1980s was overshadowed by high levels of foreign debt. Concurrently, the latter half of the Cold War era saw neoliberal ideals dominate the international diplomacy of the Global North. Neoliberalism emphasized free market principles which primarily focused on privatization and reducing government involvement. As international conferences met to discuss ever-growing global economic disparities the Reagan administration used neoliberalist strategies to create advantageous outcomes for the United States. The Cancún Summit notably stands out as Global South nations attempted to negotiate a new economic order. However, this movement led by Mexico was faced with opposition, particularly from the United States, which sought to combat barriers to free trade and protectionist legislation. The release of archival documents from the Reagan administration opens insight into the strategy of the United States government. By emphasizing trade and economic relations, the U.S. sought to deflect attention from its military intervention in Central America. Analyzing the archival documents to understand the motives behind the United States' actions reveals a focus on immigration, anti-drug efforts, and free trade. This study seeks to contribute to a deeper understanding of United States-Latin American relations by uncovering how economic interests were impacted by underlying priorities. Moreover, this research seeks to explore the Cancún Summit’s significance as the Global South attempted to gain economic autonomy; a movement that was hindered by the power dynamics that impacted international diplomacy during the 1980s.

Special code(s): Global Research

Abstract: 911

The Political Economy of Policing

Sofia Fuentes

Mentor: Dr. Martin Shuster, College of Humanities & Earth and Social Sciences

What are the political and economic factors underlying police misconduct settlements, police militarization, and police administration, and how do these factors influence contemporary policing practices? Settlements are utilized to remedy any state or federal lawsuits and allegations of police misconduct by officers and their departments. In late 2020, many began to question the effectiveness of these settlements, after a string of police brutality cases, sparking a public interest in police protocol. The Philosophy and Critical Theory Lab at UNC-Charlotte is currently deeply engrossed in the active pursuit of compiling extensive aggregate data about police misconduct settlements. With this data, scholars will be able to answer that fundamental inquiry. This meticulously undertaken endeavor is slated for comprehensive analysis. In the initial phases of this data collection process, lab associates painstakingly curated an exhaustive list encompassing all fifty states, meticulously identifying the top five most populous cities within each state. As a subsequent step, the research initiatives are poised to meticulously examine this copious information, thereby contributing substantively to the cultivation of a nuanced and multifaceted understanding of police misconduct settlements across diverse geographical and demographic contexts. In adherence to a meticulous methodology, the approach involves the compilation of a comprehensive list detailing these cities. One constraint of the research is the varying time municipalities take to compile and provide the requested data. Moving forward, the PaCT lab aims to collect all data to enter the second phase of the project, compiling financial data for publication and sharing with the public.

Abstract: 912

Isolation and Resilience: Understanding Loneliness in Aging LGBTQ+ Communities
Angel Medina

Mentor: Dr. Megan Smith, College of Humanities & Earth and Social Sciences

This research project aims to investigate the prevalence and factors contributing to loneliness among senior LGBTQ+ individuals. Rooted in the hypothesis that senior LGBTQ+ individuals experience heightened levels of loneliness due to stressors such as discrimination, lack of familial support, and limited access to LGBTQ+ affirming social networks, this study adopts a mixed-methods approach. Participants aged 65 and above, identifying as LGBTQ+, will be recruited from sources including LGBTQ+ community centers, senior centers, and retirement communities. Using the UCLA Loneliness Scale and surveys assessing mental and physical health, social support networks, and access to LGBTQ+- resources, the study seeks to illuminate impact of loneliness within this demographic. This research builds upon an extensive literature review, including works by Cattan et al. (2005), Fredriksen-Goldsen et al. (2011), and Hughes (2015) on loneliness, social isolation, and LGBTQ+ aging. Through previous research, we aim to provide a comprehensive understanding of the challenges faced by senior LGBTQ+ individuals. Expected findings include identifying higher levels of loneliness among senior LGBTQ+ individuals, as well as demographic factors correlating with increased loneliness. The study anticipates correlations between mental and physical health outcomes and loneliness levels, alongside access to LGBTQ+-affirming resources and support networks. These findings are crucial for informing interventions and strategies aimed at alleviating loneliness and promoting social connectedness among senior LGBTQ+ individuals. Through this research, we aim to contribute to existing research by providing insights into the experiences of loneliness within this demographic, advance the field and improve targeted interventions and public health policies.

Abstract: 913

Guns or Butter: Unveiling US Culpability During the Angolan Famine 1975-2002
Riley Griffin

Mentor: Dr. Jill Massino, College of Humanities & Earth and Social Sciences

This presentation will showcase parts of my thesis which examine the role of the United States Government in the development and continuation of the Angolan Famine and the Angolan Civil War. During the Cold War, the United States covertly provided aid and counsel to UNITA (The National Union for the Total Independence of Angola) as a means to counter Soviet and Cuban influence in Southern Africa and Angola. Following UNITA's defeat in the first Angolan Civil War (1974-1976), the organization began utilizing guerilla warfare to destabilize the civilian infrastructure of the MPLA-led government. These tactics included the use of landmines throughout the rural and agricultural areas of Angola as well as frequent ambushes and monitoring along established roads and highways. Extensive landmine dispersal, in conjunction with the brutal ideologies and tactics utilized by UNITA, contributed to famine-like conditions by restricting access to arable land and aid from international organizations. Following the 1985 repeal of the Clark Congressional Amendment (1975), which banned US assistance to any Angolan groups, the Reagan and Bush Administrations supplied UNITA with direct financial and military assistance. As a result, US aid to Angola soared from $10 million per year in 1985 to an estimated $80 million in 1989. US contributions to UNITA throughout the late 1980s and failures to seriously contribute to peace negotiations throughout the 1990s decisively contributed to the continuation of famine conditions up to and beyond the end of the Civil War in 2002.

Special code(s): Honors Research

Abstract: 914

Long-Term Side Effect to a Short-Term Solution: Disciplinary Action's Negative Impacts on Future Political Participation

Sasha Sembur

Mentor: Dr. Martha Kropf, College of Humanities & Earth and Social Sciences

The literature on school discipline, academic achievement, and political participation underscores the intricate connections shaping the educational and civic landscape. Numerous students have delved into the consequences of school-imposed punishments on the long-term aspects of student lives. Disparities in disciplinary actions persist, particularly impacting students of color, despite the emphasis placed on social and emotional learning in schools. Despite the State of North Carolina's aspirations to establish a positive school climate, data suggests a misalignment with these goals, which requires a closer examination of its consequences. This research design employs two different stages of analysis. On the statewide level, North Carolina's data on discipline, demographics, and political participation is utilized to find connections between the two variables. The inclusion of short-term suspensions, long-term suspensions, and expulsions, all distinguished by student race and gender, helps perceive different patterns that might influence future civic engagement. On the national level, data from the National Longitudinal Study of Adolescent to Adult Health (ADD) survey reveals correlating factors between disciplinary actions and broader demographic variables. This multi-wave approach, spanning surveys and interviews over the course of two decades, captures critical life transitions and their impact on political participation. This study aims to bring attention to correlations within the potential repercussions of school disciplinary practices on future political behaviors. This research takes both state and national perspectives into consideration to bridge the gap between local and broader trends, shedding a light into the implications of school disciplinary actions on civic engagement.

Special code(s): Honors Research, North Carolina Research

Abstract: 915

Examining How to Live Sustainably in the Peruvian Amazon
Alicia Ramirez

Mentor: Dr. Erik Jon Byker, Cato College of Education

The purpose of my oral presentation is to describe and report on ways to live sustainably in the Peruvian Amazon. The research is based on ethnography and participant observation methodology (Geertz, 1973). The presentation is based on a study abroad program called: Sustainability Field Study in the Peruvian Amazon. I participate in this experiential learning course to examine the economic, equity, and environmental issues associated with sustainable development in the Peruvian Amazon rainforest. The experience allowed me to interact with local communities on the Amazon to further investigate the context of how locally innovative sustainability practices are measured and evaluated. After this experience, I have been able to highlight the interconnections between the United Nations' Sustainable Development Goals (SDG) and make comparisons about how the goals are achieved in this context. Specifically, my research aligns with the SDG #4: Quality Education and SDG #15: Life on Land. My research questions were the following: (1) What is the education system like in the Peruvian Amazon and how does it compare to other places in the world? (2) What does collective identity look like in the context of the Peruvian Amazon? (3) To what extent does the culture in the Peruvian Amazon influence how the people achieve sustainability? The presentation will share findings related to firsthand, participant observation of interactions among the indigenous peoples in the Peruvian Amazon.

Special code(s): Community Engaged Research, Global Research, Sustainability Research

Abstract: 916

Influence of Controlling Images on Black Adolescent Sexuality and Institutional Interactions: A Critical Analysis

Kennedy Brooks

Mentor: Dr. Shanice Jones Cameron, College of Humanities & Earth and Social Sciences

Leslie Harris's film *Just Another Girl on the IRT (1992)* serves to give a face and a name to the mystified image of the Black teenage mother. The first half of the film is spent establishing the movie's heroine, Chantal Mitchell, as a bright but incorrigible student who mediates her time spent acting as a caretaker for her younger brothers on her parents' limited income by working towards going to college to become a doctor and escape the cycle of poverty that she was born into. Chantal realizes that she is pregnant at the end of the first act, leaving her to spend the rest of the film grappling with the implications of her unintended pregnancy on the rest of her life.

By using *Just Another Girl on the IRT* (1992) as a narrative focal point to understand the circumstances that underlie the high-risk sexual behaviors that lead to unintended pregnancy for female Black adolescents, communicative intervention methods can be determined to mediate the societal impacts that limit Black women. Black American women and girls should be able to interact with institutions without having to mediate the impact of controlling images and their commodification. Identifying this information is the first step to developing a constructive approach towards addressing the prevalence of high risk sexual behaviors amongst Black adolescent girls in a way that is culturally informed, equitable, and grounded in restorative justice.

Special code(s): Honors Research

Abstract: 917

An intervention for peer-led sexually transmitted infection education among older adults

Sarah Tesar

Mentor: Dr. Megan Smith, College of Humanities & Earth and Social Sciences

Older adults have sex, at rates varying from 73% (57-64) - 26% (75-85), and it is important to acknowledge this demographic when thinking about sexually transmitted infection (STI) education. The CDC reported that 15% of new cases of AIDS were in individuals fifty years and older. A study in the UK found that adults fifty years and older are one of the fastest-growing cohorts of those living with a diagnosis of HIV+. Sexual ageism leads providers and older adults themselves to not acknowledge the need for frank discussion on STIs. These statistics reveal the need for those in gerontological professions to create novel educational interventions. To understand the root of the problem, the authors have reviewed the literature seeking to learn why STI rates in older adults are rising so rapidly. The literature indicates that most adults currently living in retirement communities or nursing homes do not have access to sex education that is tailored to their age and stage. Despite the lack of STI educational programs for older adults, we found comparable peer-led programs designed for young adults. We recognized that with some modifications, these could serve as a foundational model. While we do not have data on the efficacy of the peer-led programs for older adults, we are ready to conduct a pilot study to support a STI education and awareness peer-led program for older adults.

Special code(s): Community Engaged Research

Abstract: 918

The Influence of Body Weight on HbA1c when Predicting Diabetes in Active Older Adults

Samantha Webb

Mentor: Dr. Trudy Moore-Harrison, College of Health & Human Services

BACKGROUND: Elevated blood glucose leads to diabetes and is the eighth leading cause of mortality in the United States (USA) and has a greater prevalence in African Americans than other USA populations. Glycosylated glucose (HbA1c) is an assessment of the stability of glucose over a time with a value less than 5.7 m/mol% normal and a value greater than 6.5m/mol% considered diabetic. Diabetes and elevated blood glucose can be controlled with lifestyle choices such as weight control, exercise, and diet. METHODS: Thirty-seven volunteers (25 exercises and 12 non-exercisers) 55 years of age and older from the same neighbor signed institutional consent forms and attended an assessment coordinated with a senior health risk program. They were evaluated with a lifestyle questionnaire and for blood variables including HbA1c at the beginning and conclusion of the program. HbA1c values were evaluated for differences between the groups with an independent t-tests. RESULTS: The non-exercisers were heavier (90.6 ± 26.6 kg: p 0.05) even though the non-exercisers were 10.8% heavier that exercisers. The exercisers were prediabetic as their HbA1c mean was 5.7 m/mol%. The age of the participants also was not different (p> 0.05). These results suggest that weight was not a factor that influenced HbA1c in these active older populations. Although further research is warranted on this topic, these data indicate that HbA1c would not be an effective indicator of diabetes in this older active group of urban adults.

Special code(s): Community Engaged Research, Honors Research, Urban -Charlotte Research

Abstract: 919

Addressing Mental Health in Older Adult Minorities
Maya Dove

Mentor: Dr. Meredith Troutman-Jordan, College of Health & Human Services

Background: Rates of mental health diagnoses are rising in the United States, with older adult minorities being overlooked due to the stigma within their racial communities about this topic. Many older adult minorities are hesitant to reach out for mental health treatment, which needs to be addressed. Within this demographic, feelings of loneliness and despair due to several factors including but not limited to bereavement are found. Mental health is an important topic and this author has seen and felt this stigma within communities such as these first-hand.

Aim: To evaluate the understanding of mental health within the older adult minority population through an educational presentation in order to reduce generalized stigma.

Methods: This mixed methods project was conducted at a living community of The Park Community Development, a local non-profit organization. Participants were surveyed on their prior knowledge and feelings related to mental health, received an educational presentation on mental health, and a similar survey was completed. Qualitative and quantitative data collection were completed, additionally using a Quasi-experimental approach.

Findings: 68% of participants indicated that they would feel comfortable reaching out for mental health treatment or assistance as needed following the informational session. 100% of participants indicated they learned more resources from the session. Through open ended questions 58% of participants identify their ideas of mental health as a topic as “very important” before the session. Lastly, 100% of participants indicated they are aware of more resources after the session.

Special code(s): Community Engaged Research, Urban-Charlotte Research

Abstract: 920

The Impact of Doula Care on Black Maternal Mortality: A Review of the Literature
AnnaMarie Rohrs

Mentor: Dr. Melinda Adnot, Honors College

This literature review will discuss the impact of doula care on Black maternal health disparities, focusing on the work that is being done or needs to be done to improve health outcomes for Black women, specifically in Charlotte. Black mothers are four times more likely to experience serious complications or death during pregnancy and childbirth and their babies are twice as likely to die, when compared to their white counterparts. Existing literature describes how a variety of factors, such as socioeconomic status, health literacy, and implicit bias in healthcare may play a role. This review will mainly focus on Black birthing women and infants but will also include statistics involving other communities for the purpose of comparison. As Black women are impacted the most by maternal health disparities, this research will focus on identifying key determinants and offering solutions for how to improve these disparities. Preliminary research suggests that doula care can be an effective support model for families in low-income areas and minority communities. Doulas provide emotional and physical support, impacting the care that the mother receives while also lowering rates of cesarean sections and unnecessary birth interventions. Doulas provide holistic care, focusing on the whole person, which fills the gap commonly found in the professional clinical setting. This review may offer an insight into possible solutions, involving doulas, that may be implemented to improve maternal mortality in every community.

Special code(s): Honors Research

Abstract: 921

Disability and Literacy Awareness in Patient Education: A Literature Review
Alyssa Cain

Mentor: Dr. Melinda Adnot, Honors College

Poor patient education is a contributing factor to healthcare disparities for individuals with disabilities and lower literacy levels. Patient education is the process of providing knowledge to people seeking healthcare services about their plan of care and the necessary skills to improve their health. Past literature concludes that while appropriate patient education benefits patient recovery, it is becoming increasingly difficult to achieve due to constraints in the current healthcare system and professional education. Further investigation into the educational needs of at-risk populations will contribute to the discussion of patient education as the current research focuses more on the precipitating factors to this issue and less on the patient experience. As documented in peer-reviewed journals and expert opinion, this literature review will describe gaps in quality patient education delivery and complement this research through patient testimonials gathered from the public domain. A review of the current literature shows that lasting effects on a patient's health and well-being occur when their healthcare team fails to provide adequate teaching about their care. Considering these effects can often extend beyond the time spent in a clinical setting and are thus underreported. To address the issue, it is necessary to integrate further education on effective communication strategies for at-risk groups into professional training and implement systemic solutions within the healthcare system. Frequent hospital readmissions and overall patient dissatisfaction, fear, and confusion may occur when the healthcare team fails to confirm patient understanding of health maintenance guidelines before discharge.

Special code(s): Honors Research

Abstract: 922

America's Public Health Crisis: A Transgenerational Analysis of Black Maternal and Infant Mortality

Jordan McDaniel

Mentor: Dr. Melinda Adnot, Honors College

It is no secret that the United States is a country built on the backs of oppressed people. This literature review will explore the relationship between the legacy of slavery and Black maternal and infant death rates in the United States by surveying scholarly sources. Literature on the legacy of enslavement and maternal and infant mortality currently discusses how the disparities seen between Black and white women are due to numerous factors such as discrimination from healthcare workers, lack of access to care and ineffective patient education. The main goals of this literature review will be to explore the severe racial gap between infant and maternal mortality rates for Black and white women and infants in the United States, the legacy of abusing black bodies in science and medical practice, and how these ideologies manifest in the United States healthcare system, all while focusing the dialogue around anti-Black racism. Reliable, peer-reviewed sources will be used to provide a cohesive understanding of why Black women and their babies are dying at alarming rates in the United States and a discussion on what has been and can be done to ameliorate the systemic racism that this country and its healthcare system was built on.

Special code(s): Honors Research

Abstract: 923

Gender Disparities within Nursing
Zaneta Yanzu

Mentor: Dr. Melinda Adnot, Honors College

Gender disparities is a topic that is frequently discussed in university/college programs-specifically in STEM majors. STEM includes any major that falls underneath the category of Science, Technology, Engineering, and Mathematics. Examples of this include Computer Science, Engineering, Chemistry, and Health Sciences such as Nursing. In reference to nursing, data illustrates that more female students remain in comparison to males. This research will address the gaps in nursing and its impact on society's perception of male students within a female dominated major. Nursing will be the focus due to claims of being female dominated and will provide a general overview of whether these claims are factual. This will address STEM fields that may have similar claims. To address this, a review of existing literature and collections of oral accounts from three male nursing students at UNC Charlotte will be used. Resources used to investigate this include documents from the University of North Carolina at Charlotte's Special Archives Collection, oral accounts from different undergraduate students in the United States, as well as oral histories from three male nursing students at University of North Carolina at Charlotte. Regarding the documents from the special archives collection, data on the enrollment of nursing majors from the University of North Carolina at Charlotte will be used to assess any positive or negative correlation with the following claim. The implications of this work may include interventions or recommendations that will apply to the University of North Carolina at Charlotte or other universities to resolve it.

Special code(s): Honors Research

Abstract: 924

Image Dilution and Filtering Using Classical Geometric Kernels and Canny
Anubhav Nimesh Bhadoria

Mentor: Dr. Xingjie Li, College of Science

Finding and interpreting key features of an image has a wide range of applications, from medical imaging to pattern recognition. While human vision is generally able to interpret complex images with relative ease, it is a major challenge for computer vision. In this project, we studied specific kinds of illusions that occur due to the characteristics of an image, such as resolution or noise levels, instead of human psychology and applied classical matrix convolution and canny to dispel the illusions. We first reviewed the mathematics of matrix convolution, which is a technique to apply a filter called a kernel to an image by updating each pixel value based on the neighboring pixels. Then, we implemented this technique in code to study the effects of different kernels and compare them against standard filtering tools present in Python libraries. We also explored various methods to control the strength of each kernel using a classical threshold and studied the effects of using multiple kernels, such as blur and edge detection. Motivated by the results, we studied the deviation of Canny edge detection, a popular multi-stage edge detection algorithm, and combined it with classical convolution to develop algorithms that better remove the illusion compared to only utilizing classical kernels. Moving forward, we would compare the effectiveness of the algorithms over a range of thresholds using large language model artificial intelligence tools that are trained on large sums of data and can interpret images. The techniques that we study and develop in this project would enable us to subsequently study the application of image dilution with convolutional neural networks (CNN) in a medical context, such as predicting the chances of disease from a retinal scan.

Special code(s): Honors Research

Abstract: 925

Degradation of Polyfluorinated Substances with nano Zero Valent Aluminum
Emily Hayden

Mentor: Dr. Jordan Poler, College of Science

Per- and polyfluorinated alkyl substances (PFAS) have been widely used throughout the world for various industry purposes due to their hydrophilic and hydrophobic properties. The carbon-fluorine bond makes them very strong and stable, which allows them to exist for thousands of years without degrading them, causing them to be an emerging contaminant. PFAS bioaccumulates in the body, mainly in the blood and liver. There have been studies that have shown that perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) have been linked to adverse health effects. Due to PFAS not easily not breaking down in the environment and the various health effects, the degradation of PFAS has gained interest recently. The current methods for degrading PFAS are costly and require large amounts of energy. A new degradation method, nano zero valent aluminum (nZVAl) has shown promising results at completely degrading PFOS. PFAS degradation is monitored by LC/MS and a fluoride selective ion electrode. Solid phase extraction and LC/MS method is used to determine the amount of PFAS in a sample at low concentrations. A 100 ppb sample of PFOS was completely degraded to below the detection limit of the LC/MS. This method could lead to improvements of removing PFAS from the environment and can be used at water treatment centers.

Special code(s): Global Research, Honors Research, NC Research, Sustainability Research

Abstract: 926

Characterization of poly(vbTMAC) through Extinction Coefficient & Size at Various Lengths & Solutions

Dhairya Desai

Mentor: Dr. Jordan Poler, College of Science

Of the current water purification techniques, ion exchange resins are of interest as they purify the water by removing contaminant ions and exchanging them with safe ions. Our group focuses on synthesizing anion-exchange polymers used to functionalize our nanomaterials. However, analytical characteristics are needed to evaluate the synthesis and performance of these nano resins. The study focuses on UV-Vis analysis to characterize the absorptivity of our polymer in various conditions. The polymer matrix gives the resin stability and ion exchange capabilities; quantifying the polymer concentration is crucial to understanding our materials' performance. Through the Beer-Lambert Law, the extinction coefficient directly correlates polymer concentration to light absorption, allowing rapid characterization of our resin synthesis. Recent studies have determined the extinction coefficient on other common ion-exchange polymers but not ploy(vbTMAC). Polymers with a length of 225 and 30 had an extinction coefficient of 2.149 ± 0.006 mL mg^{-1} cm^{-1} and 2.3 mL mg^{-1} cm^{-1}, respectively, in ddH2O, indicating that extinction coefficients are negatively correlated with polymer lengths. Our polymers must also be tested in different solution conditions as certain resin synthesis reactions are carried out at varying pH levels. Accurately determining polymer concentration by extinction coefficient is crucial for optimizing resin synthesis and the durability of materials. Current work is being done to determine the size of the polymer as a function of time through DLS. Future work should expand on the scope of the polymer studied and test the extinction coefficient in practical applications.

Special code(s): Honors Research, NC Research, PKP Member, Sustainability Research

Abstract: 927

Unveiling the Thermal Stability of Sodium ion Batteries using Accelerating Rate Calorimetry

Ean Bass, Reece McCloskey, Michael Chak

Mentor: Dr. Lin Ma, William States Lee College of Engineering

To combat climate change, the global energy complex must shift away from fossil fuels and towards less toxic, more sustainable solutions. In this regard, lithium-ion batteries (LIBs) have emerged as powerful tools to provide dependable energy storage solutions for both electric vehicles (EVs) and grid-scale applications. However, the lack of natural lithium has led researchers to investigate sodium-ion batteries (SIBs) as an alternative. SIBs offer a promising solution due to cost-effective electrode materials like carbon and metals as well as sodium's relative abundance compared to lithium. Their application is particularly advantageous in scenarios where high energy densities and low weights are not key pillars to the success of the project, such as with grid scale energy storage systems. Despite these advantages, ensuring the safety of this emerging battery technology is paramount before widespread deployment of SIBs can be enabled. While extensive research has been conducted to understand the safety performance of LIBs, a significant knowledge gap regarding SIBs still remains. Therefore, our research focuses on analyzing the thermal stability of Na0.97Ca0.03[Mn0.39Fe0.31Ni0.22Zn0.08]O2 (NCMFNZO)/hard carbon (HC) SIBs over a wide range of temperatures (50°C to 400°C) using accelerating rate calorimetry (ARC). We examine key parameters such as onset temperature, self-heating rate, and temperature rise, revealing the impact of state-of-charge and electrolyte formulation on SIBs' thermal stability. We anticipate that our research outcomes will provide crucial guidance for the design of upcoming electrode and electrolyte materials, with a specific focus on enhancing cell safety in sodium-ion battery applications.

Special code(s): Sustainability Research

Abstract: 928

Synthesis of Novel Voltage-Sensitive Dyes for the future of action potential Imaging
Katie Hale

Mentor: Dr. Michael Walter, College of Science

Thiazolo-[5,4-d]-Thiazoles (TTz) fluorescent dyes are small organic molecules comprised of a rigid aromatic core and variable side chains. The unique properties of these molecules allow for many innovative applications. Previous research has shown that asymmetric TTz's display quantum yields as high as .95 in nonpolar solvents, impressive fluorescent lifetimes, and low cytotoxicity, making them comparable to fluorescent dyes currently on the market. An intrinsic property of asymmetric TTz molecules comprised of a donor and acceptor side group is voltage sensitivity due to the intermolecular charge transfer induced by voltage input. This opens the door to their usage in biosensing for neurodegenerative disease diagnostics. My research focuses on alterations to the synthesis of asymmetric TTz to produce a second generation with enhanced yield and tailored side chains to improve voltage-sensing efficiency. I hypothesize that the production of asymmetric TTzs with an intermediate hydrocarbon chain length (6 carbons) as well as extended conjugation and increased transition dipole through the addition of positively charged nitrogen will allow for increased product yield, high quantum yield, and fluorescent lifetimes. Characterization of these derivatives will include spectroscopic analysis as well as UV-vis and spectrofluorometer readings. This innovative approach to small molecule fluorescent dye synthesis holds promise for advancements in neurobiology, photochemistry, and disease diagnostics.

Special code(s): Honors Research

Abstract: 929

Quantum Trajectories of an Electron in Confined Volume
Steven Murphy

Mentor: Dr. Donald Jacobs, College of Science

Bohmian mechanics (BM) provides an alternative interpretation to quantum mechanics compared to the Copenhagen interpretation. This theory allows for simultaneous knowledge of particle momentum and position while exhibiting interference effects and without the need for introducing an observer or assuming there is a quantum-classical boundary. A nonconservative quantum force is present, which is governed by how the system wavefunction evolves. The highly non-local quantum force accounts for entanglement and interference effects that are experimentally observed, and the average properties of the model predict the same average properties obtained from the Copenhagen interpretation of quantum mechanics. BM provides a mechanism for randomness and a framework for the transition of quantum to the classical realm. Even though the equations used in BM are few to govern a quantum system, they are computationally intense, due to the vastness of the quantum state space (or Hilbert space).

In earlier projects, a MATLAB code was developed with the equation prescribed in BM to calculate particle trajectories in the classic one- and two-dimensional square well problems. This work was extended to address open quantum systems. In this project, we consider a three-dimensional box and include spin to fully describe the dynamics of an electron. We will investigate the trajectories in the three-dimensional case with spin and see how the system evolves with time. Other projects will stem from this one by studying multi-electron systems to simulate various atoms and molecules placed in a box.

Special code(s): Honors Research

Abstract: 930

Investigating Neurophysiological Responses to Emotional Videos: A Multi-Biomarker Study Using the Database of Emotional Videos from Ottawa (DEVO)

Michael Gonzalez and Amber Mossembekker

Mentor: Dr. Vishnu Girishan Prabhu, William States Lee College of Engineering

Emotions play a crucial role in human experiences, influencing behaviors and well-being. Understanding the neurophysiological foundation of various emotional responses is critical for comprehending human behavior, cognition, and mental health. This study aims to investigate the neurophysiological changes in participants while interacting with different emotion-inducing (happy, fearful, sad, etc.) virtual reality (VR) scenarios. This research aims to develop (i) a multimodal neurophysiological database while interacting in VR and (ii) an affordable and accessible VR treatment that provides personalized, targeted interventions for mental health conditions such as depressive and anxiety disorders. Previous research has demonstrated that VR environments that respond to patients' cardiac and other biofeedback data can reduce anxiety and stress levels. Using a mixed-methods study design, we collected subjective and objective data from 25 participants experiencing videos from the Database of Emotional Videos from Ottawa in the VR. On analyzing the cardiac activity data and functional Near-Infrared Spectroscopy (fNIRS) collected using biosensors and the subjective data collected using the Self Assessment Manikin Questionnaire, we observed promising findings. Since the integration of fNIRS with VR is still evolving, this project contributes to exploring fNIRS and biofeedback for VR mental health treatments. By advancing the utilization of VR systems, known for their initial capital investments coupled with low ongoing operational costs, as a tool for mental health treatment, this research has the potential to revolutionize treatment affordability and positively impact mental healthcare.

Special code(s): Community Engaged Research, Global Research

Abstract: 931

Improving Thermal Imaging as a Tool to Study Waste Heat in *C. elegans*
Kegan Heaney

Mentor: Dr. Susan Trammell, College of Science

The nematode worm *Caenorhabditis elegans* or *C. elegans* is often used by biologists for genomic and biological research. This organism serves as a basic model of other organisms, including human beings, and can be manipulated genetically to study specific diseases including those that impact metabolic activities and functions, such as diabetes. All organisms carry out metabolic processes to produce chemical energy which are not perfectly efficient, resulting in energy being lost via waste heat. A new technique using mid-infrared (thermal) imaging to investigate waste heat production in *C. elegans* was previously developed by this lab. In this work, we present new imaging and analysis that demonstrate a statistically significant difference in the temperatures of living and dead *C. elegans*. These results suggest that the living worms are approximately 0.5-1 °C warmer than dead worms. The larger temperature is likely the result of waste heat produced via metabolic processes in the living worms. In addition, we report on the measured rate of cooling for living versus dead worms and find a significantly significant difference in the cooling characteristics of these two groups. These results further bolster our finding that living worms are warmer than dead worms. This is the first reported detection of waste heat production in *C. elegans* via infrared imaging. Being able to measure the waste heat output in these ectotherms provides a novel investigative technique to study metabolism that can be applied to various sub-populations of *C. elegans*.

Abstract: 932

Design of a Hybrid Offshore Wind Farm on Lake Michigan
Melissa Zeleznik and Cody Williams

Mentor: Dr. Arun Vishnu Suresh Babu, William States Lee College of Engineering

Globally, there are ambitious goals to reduce carbon emissions through clean energy projects. In the United States, these projects are incentivized by the Inflation Reduction Act, resulting in a large movement towards offshore wind farms. However, most research and development is going toward oceanic offshore farms. Nevertheless, the National Renewable Energy Laboratory, research article, *Great Lakes Wind Energy Challenges and Opportunities Assessment,* identifies the potential for offshore wind on the Great Lakes. This project furthers this research by designing and proposing a theoretical offshore wind farm located on Lake Michigan, becoming the first of its kind on a body of freshwater in the United States. The proposed wind farm will be located on the southeastern part of Lake Michigan near Bridgman, Michigan. The site was designed with 22 Vestas V236 15 MW turbines optimized to be spaced by 8 rotor diameters. These turbines will be placed on floating tetra foundations. These turbines will be coupled with a 10 MW proton exchange membrane electrolyzer, to produce hydrogen to be used in the nearby steel manufacturing industry. This wind farm has a nameplate capacity of 330 MW, contributing 10 MW towards the production of hydrogen. The annual energy produced is estimated to be 1.09 TWh after hydrogen production. This hybrid wind farm will provide benefits for the local community and nationwide wind energy industry by creating jobs and apprenticeship opportunities to meet the requirements of energy tax credits and furthering development and research of future offshore wind farms.

Special code(s): Honors College, Sustainability Research

Abstract: 933

A Mathematical Study of Iterative Methods for Solving Linear Equations
Dominic Kealoha and Fabiola Rojas

Mentor: Dr. Xingjie Li, College of Science

Iterative methods such as Jacobi, Gauss-Seidel, and Successive Over-Relaxation (SOR) are fundamental tools in solving large systems of linear equations across various scientific fields. Their use of matrix multiplication instead of matrix inverse makes them ideal for solving large systems quickly. Our research explores the factors of each method that define their respective strengths, limitations, and convergence behaviors to understand how these methods address drawbacks encountered when performing matrix operations by hand, as well as how they can be used in real world applications. After implementing each method by hand to understand how the algorithms work, we developed a Python program that assesses a user-given matrix based on each method's specific convergence criteria. The program compares the spectral radii of all three methods and chooses to execute whichever will yield the fastest convergence rate. Our research revealed the importance of mathematical modeling and understanding specific properties of the coefficient matrix. We observed that Gauss-Seidel is usually the most efficient method because it is faster than Jacobi and doesn't have as strict requirements as SOR. We applied the knowledge we gained to a traffic flow model of I-485. After creating a program that generates the matrix for this model, we were able to iteratively approximate the flow of cars through neighboring exits using data from the N.C. Department of Transportation. This information shows which areas are the most congested and can be used to inform future infrastructure development.

Special code(s): Urban-Charlotte Research

Abstract: 934

Quantification of Aquatic Viruses in Marine Hydrothermal Vent Ecosystems
Ruthie Freedman

Mentor: Dr. Elaine Luo, College of Science

Viruses are the most abundant biological entities on earth and play a key role in the ecology and biogeochemical cycling within aquatic ecosystems. However, the ecological role viruses play within deep-sea hydrothermal systems is poorly constrained. The quantification and taxonomic identification of viruses within these systems can aid in the understanding of the extent of their ecological impacts. Flow virometry (FVM), the application of flow cytometry for the analysis of viruses, is a common technique used for the quantification and detection of aquatic single-stranded DNA and double- stranded DNA and RNA viruses in sizes as small as 80 nm. Marine samples collected from three hydrothermal vents (Anemone, Ashes, International District) at Axial Seamount, an active deep-sea volcano along the Juan de Fuca ridge located off the coast of Cannon Beach, Oregon, will be run through a CytoFlex flow cytometer at a rate of 30 microliters per minute. We hypothesized that viruses will be detected, and their viral abundances and subpopulations will vary across the three sites due to varying site characteristics. Viral counts and subpopulations were recorded and analyzed using CytExpert software and a nonparametric Kruskal-Wallis ANOVA test. On average, Anemone site had 2.11 x 106 VLPs/mL and three distinct subpopulations, Ashes had 2.30 x 106 VLPs/mL and one distinct subpopulation, and International District 4.30 x 105 VLPs/mL and two distinct subpopulations. Counts between sites were significant between Anemone and International District, and Ashes and International District.

Special Code(s): Honors Research

Abstract: 935

Understanding Salt Adaptation with Metabolomics in Sand Beans
Mark Mistretta

Mentor: Dr. Bao-Hua Song, College of Science

Amidst the ongoing challenges of climate change, which exacerbates issues such as food insecurity and soil degradation, salt accumulation in soils further compounds these adversities. Legumes, renowned for their nutritional richness and nitrogen-fixing abilities, offer a promising solution. *Strophostyles helvola* (sand bean), a halophyte thriving in saline land, emerges as a model legume species to understand plant adaptation to diverse environments. We used two ecotypes of *S. helvola*, one thriving in mountainous environments and the other along beach shores, readily exposed to a saline environment. This study aims to investigate the metabolomic responses of mountainous and beach ecotypes of *S. helvola* to salt stress employing untargeted metabolomic comparisons (LC-MS). Both ecotypes underwent increasing NaCl concentrations, mimicking salt stress conditions. Root samples were collected at three-time points to investigate metabolite accumulation at different stages under salt treatments. A total of 614 metabolites were identified, revealing dynamic shifts in concentrations in response to salt treatment. Preliminary analysis indicates differences in metabolite accumulation between the two ecotypes, particularly under salt stress, with certain metabolites showing significant variations. Notably, the beach ecotype exhibited distinct metabolic signatures that may be linked to its enhanced salt tolerance. This research illuminates the metabolic intricacies underlying salt tolerance in *S. helvola* ecotypes, offering insights for developing salt-tolerant legume varieties. The findings may shed light on strategies for mitigating food insecurity and soil degradation in salt-affected regions, underscoring the importance of understanding plant adaptation strategies in addressing global agricultural challenges. Understanding these mechanisms is crucial for advancing agricultural practices, enhancing sustainability, and developing resilient crop varieties to ensure global food security in the face of environmental changes.

Special code(s): Honors Research, Sustainability Research

Abstract: 936

Quercetin as a potential topoisomerase II inhibitor to induce double-stranded DNA breaks in female mice ovaries

Lidia Say

Mentor: Dr. Christine Richardson, College of Science

In eukaryotic cells, extensive DNA damage may lead to mutations, genetic instability, and possibly cancer. Homologous recombination (HR) is a DNA repair pathway where a homologous template is used to direct repair synthesis. Quercetin is a subgroup of bioflavonoids commonly found in dietary supplements and is thought to have health benefits. Structurally, Quercetin is similar to etoposide, which is a known topoisomerase II (Top2) inhibitor in secondary cancers. Top2 alleviates tension formed in DNA double helix strands during replication. If Quercetin inhibits Top2 from repairing DNA double-stranded breaks (DSBs) after it temporarily ligates the DNA strands, this could be detrimental to DNA integrity. The research is conducted using a transgenic mouse model that will show DSB-induced HR as green fluorescent protein (GFP) positive cells. Quercetin will be administered via oral gavage with a dosage of 250 mg/kg. The genotype of female mice will be determined, and their ovaries will be extracted. Ovaries will be embedded using optimal cutting temperature (OCT) and cryosectioned. Finally, DAPI and GFP staining will be used to analyze GFP+ events in ovary cells. The expected result is to see GFP+ events in the ovary cells of the treatment group, which suggests that HR repair has occurred. The benefit of this study is to be more knowledgeable on the effects of taking excessive supplemental quercetin, to see if it really is beneficial or if it may have side effects such as DNA DSBs if ingested in excess.

Special code(s): Honors Research

Abstract: 937

Screen of Natural Compounds to Identify Those that Produce Chromosomal Translocations in Mouse Embryonic Stem Cells

Elizabeth Toufekoulas

Mentor: Dr. Christine Richardson, College of Science

DNA encodes the cellular components essential to life. However, DNA can be damaged in ways that compromise the integrity of the genome. DNA damage can occur through endogenous mechanisms such as replication or by environmental exposures to ionizing radiation, ultraviolet light, or chemicals, including etoposide. Illegitimate repair of DNA double-stranded breaks (DSBs) can lead to diseases such as cancer. The Richardson lab created a genetically engineered mouse embryonic stem cell line that contains a green fluorescent protein (GFP) translocation reporter. If this reporter line undergoes illegitimate repair following DNA DSBs, it generates chromosomal translocations that mimic those observed in leukemia, and functional GFP protein will be produced. Previous research demonstrated that naturally occurring compounds called bioflavonoids induced DSBs in this reporter line and the illegitimate repair of DSBs can cause DNA translocations. Using this reporter cell line, natural compounds from the NIH library could produce similar translocations. The reporter cell line was treated with a 50μM concentration of natural compounds previously identified to cause 20% or more of the DNA damage that etoposide induces. These treated cells were then scanned with a fluorescent microscope after multiple days to score for GFP fluorescent (GFP+) cells. With this approach we are to identify compounds that caused translocation events like those seen in infant leukemia. We hypothesize that natural compounds similar in structure to etoposide will undergo the most frequent illegitimate DNA repair causing translocation events. Our research will help to identify novel natural compounds that may be risk factors for infant leukemia.

Special code(s): Honors Research

Abstract: 938

Investigating The Role of Mincle in Staphylococcal Osteomyelitis
Aiza Noyal

Mentor: Dr. Ian Marriott, College of Science

Staphylococcal osteomyelitis is a serious infection of bone tissue that results in progressive inflammatory bone loss. Understanding the molecular mechanisms underlying damage associated with *Staphylococcus aureus* infection is crucial for developing novel points of therapeutic intervention. Macrophage-inducible C-type lectin receptor (Mincle) serves as a receptor for pathogen and damage-associated molecular motifs and is known to be expressed by sentinel immune cells such as macrophages. Surprisingly, preliminary data from our team has shown that the expression of mRNA encoding Mincle is upregulated in bone-forming osteoblasts, a non-leukocytic cell type, following infection with *S. aureus.* Here, we have utilized immunoblot analysis to demonstrate that Mincle protein is present in primary murine osteoblasts and show that its level of expression is increased following *S. aureus* infection. To determine whether Mincle is functional in osteoblasts, we challenged cells with two specific ligands for this receptor, trehalose-6,6-dibehenate (TDB) and -glucosylceramide (β-GlcCer). We have found that both TDB and β-GlcCer increases the level of phosphorylated spleen tyrosine kinase (Syk), a downstream signaling component for Mincle, in osteoblasts and increases the release of the proinflammatory cytokine interleukin-6 by these cells, as determined by immunoblot analysis and specific capture enzyme-linked immunosorbent assays, respectively. Such responses were found to occur in both a time and dose-dependent manner. Together, these data support the notion that Mincle is functionally expressed by osteoblasts. Ongoing studies are being performed to determine the relative contribution made by Mincle to the beneficial or detrimental responses of osteoblasts to *S. aureus* challenge.

Special code(s): Honors Research

Abstract: 939

Nematostella vectensis Response to Cell Free Supernatant

Rachel Showers

Mentor: Dr. Adam Reitzel, College of Science

Organisms present in estuarian environments experience daily variation in abiotic and biotic factors. *Nematostella vectensis*, the starlet sea anemone, is a species commonly found in estuaries and is used as a model organism due to its adaptability to abiotic and biotic factors as well as having a high-quality genome. Previous research has been focused on *N. vectensis* tolerance to changes in abiotic factors such as temperature and salinity, however, research focused on changes in biotic factors is understudied. Our work is focused on understanding microbial metabolite interactions with marine invertebrates, using a liquid containing secreted metabolites from bacterial growth known as cell-free supernatant (CFS). A North Carolina population of *N. vectensis* was placed into a .5% concentration of CFS for a week and then extracted. RNA-Seq was used to determine how gene expression in *N. vectensis* was affected by the presence of CFS including variations between sexes and control groups. Additionally, we examined CFS's impact on egg-to-adult development in *N. vectensis* by exposing different life stages to CFS and measuring the survival and development of individuals after exposure. Overall, our work will provide insights into the role of CFS within estuarian environments and its potential harmful or beneficial effects on marine invertebrate survival.

Special code(s): Honors Research

Abstract: 940

An Analysis of the Flexural Strength of *Parasteatoda tepidariorum* gumfoot line silk
Ella Kellner

Mentor: Dr. Sarah Stellwagen, College of Science

Spider webs are made from several types of silk, one of the strongest biomaterials known. These silks withstand forces in many directions in order to capture prey. *Parasteatoda tepidariorum*, a cobweb weaver, uses gumfoot lines as a spring-loaded trap to capture crawling prey. The tensile strength, or the parallel forces generated when a silk strand is pulled from both ends, has been tested and well-characterized for these silks. However, the flexural strength, or the force that results when a silk is pushed or deformed perpendicularly, has not. We tested the flexural strength of gumfoot silk lines at two different speeds and found at higher speeds, the gumfoot line is able to withstand more force. As silks in nature are warped and distorted in many different ways depending on use, it is important to understand the contrasting functional characteristics when alternately stressed.

Abstract: 941

Creating the Model Cell Line for Studying Seckel Syndrome
Sarah Nipper

Mentor: Dr. Junya Tomida, College of Science

Seckel Syndrome is a rare autosomal recessive disorder characterized by severe microcephaly, a receding forehead, large eyes, a beak-like protrusion of the nose, narrow face, receding lower jaw, micrognathia, and mental retardation. To date, ten separate subtypes of Seckel Syndrome have been reported due to differing genetic causes, and at least eleven genes have been identified to be responsible for the various subtypes. Given the impact Seckel Syndrome has on patients, the genetic causes for this disorder are being investigated. The ATR-ATRIP complex is central to the DNA Damage Response Pathways which are responsible for responding to and repairing DNA Damage and Replication Stresses. Patients with Seckel Syndrome have a mutation within the ATR or ATRIP genes which causes a deficiency of the ATR-ATRIP complex. ATR-ATRIP complex deficiency leads to the loss of DNA damage checkpoint responses and to, cell death. In this study, we focused on creating model cell lines to study Seckel Syndrome using biochemical and molecular biology techniques including cell culture, mutagenesis, and immunoblotting. These model cell lines will be used for future studies of Seckel Syndrome. In addition to improving our understanding of the disorder itself, these studies may improve our understanding of the DDR and the role it plays in repairing DNA damage.

Special code(s): Honors Research

Abstract: 942

The effect of CXCL12-based chemokine heterodimerization on CXCL12-CXCR4 driven breast cancer cell migration

Samuel Schmid

Mentors: Dr. Irina Nesmelova, Dr. Didier Dréau, and Zander Fiebig, College of Science

Breast cancer, despite decades of research improving our understanding of its progression, remains the second most common malignancy in women in the United States. Chemokines and chemokine receptors play an important role in both tumor cell migration and immune cell trafficking in breast cancer. Chemokines can participate in hydrophilic interactions forming chemokine heterodimers. Breast cancer cells respond differently to specific chemokine heterodimers. It has been established that CXCL12-CXCL4 chemokine heterodimer inhibits CXCL12-CXCR4 driven breast cancer cell migration. Whether chemokine heterodimers including CXCL7, CXCL9, CXCL10, CXCL11 with CXCL12, can inhibit cancer cell migration is unknown. AlphaFold and PyMOL applications were used to predict the formation of CXCL12 heterodimers with these chemokines and design the chemokine-derived peptides mimicking the heterodimers' *in silico*. Migration assays were used to experimentally test if CXCL7, CXCL9, CXCL10, CXCL11 prevent CXCL12-induced migration of triple-negative MDA-MB-231 breast cancer cells. These applications offer insight into the biological activities and mechanisms of chemokine heterodimers in biological settings and suggesting chemokine heterodimerization as a prospective approach to design therapies to prevent cancer progression. Samuel Schmid, 2024.

Special code(s): Honors Research

Abstract: 943

Biodiversity and Community Composition of Macroinvertebrates in Southern Louisiana Saltmarshes: Effects of a Freshwater Diversion

Winnie Yao

Mentor: Dr. Paola López-Duarte, College of Science

Coastal infrastructure, dredging, and rising sea levels contribute to accelerated saltmarsh erosion and degradation, which can negatively impact plant and animal diversity. Restoration efforts intended to mitigate marsh loss include the West Point a la Hache Siphon, built in southern Louisiana to draw water from the Mississippi River to nearby marshes that were no longer receiving sediments, nutrients, and freshwater. The goal of this study is to evaluate the effects of freshwater diversion on macroinvertebrate communities nearby. The objectives are (1) to compare biodiversity between experimental (close to the siphon) and control (away from the siphon) sites during years when the siphon was off and on, and (2) to evaluate community composition across sites and years. We used a literature review that classified macroinvertebrate groups in this area as stenohaline (low tolerance to salinity changes) or euryhaline (high tolerance to salinity changes) to predict changes in the community. We hypothesize that the freshwater diversion to adjacent saltmarsh will change the macroinvertebrate community and increase biodiversity (Shannon Diversity H'). We deployed litter bags (meshed bags with dried vegetation) on the marsh surface for two months at our experimental and control sites during times when the siphon was off and on to capture macroinvertebrates in the area. The contents of these bags are being sorted, identified, and quantified in the lab under a microscope. Preliminary results suggest that there are more similarities between control and impacted sites when the siphon is off than when the siphon is on.

Special code: Honors Research

Abstract: 944

RIG-I promotes protective type I interferon production by human glial cells during bacterial meningitis.

Krishna Majithia

Mentor: Dr. Brittany Johnson, College of Science

Globally, bacterial meningitis causes 1.2 million cases of meningitis, contributing to 250,000 deaths annually. Meningitis is infection of the meninges which provide protection to the brain and spinal cord, however, infection can progress to encephalitis, infection of the brain itself. During meningitis, potent inflammatory responses lead to life-threatening injuries and permanent neurological damage in 20% of survivors. Two main causative agents of bacterial meningitis include Neisseria meningitidis and Streptococcus pneumoniae. Previous data indicates that in response to infection, resident glial cells in the CNS recognize bacterial ligands via host pattern recognition receptors, leading to the release of immune mediators and contributing to potent neuroinflammation. Recent data in peripheral cell types suggests a novel role for the nucleic acid sensor, retinoic acid-inducible gene I (RIG-I) in the identification of bacteria and stimulation of type I interferons (IFNs). While the antiviral effects of IFNs are well characterized, it is becoming increasingly evident that IFNs may function more broadly during bacterial infection. Currently, the role of RIG-I in initiating production of IFNs during bacterial infection of the CNS has not been explored. In this study, we demonstrate upregulation of RIG-I expression and subsequent type I IFN production by glial cells following infection. Additionally, we show a reduction in viable bacteria with increasing type I IFN production, promoting increased host cell survival. Collectively, these findings indicate a protective role for type I IFNs during bacterial meningitis and future studies will explore the role of RIG-I dependent responses in a murine model of meningitis.

Special code(s): Honors Research

Abstract: 945

Cytosolic Nucleic Acid Receptor-Mediated Detection of Staphylococcus aureus Contributes to Protective Interferon Responses in Primary Murine Osteoblasts

Mary-Kate Key

Mentor: Dr. Brittany Johnson, College of Science

Osteomyelitis is an inflammation of the bone due to infection. Approximately 80% of cases are caused by the bacterial pathogen *Staphylococcus aureus*. It is known that osteoblasts, resident bone cells, express pattern recognition receptors (PRRs), that are responsible for pathogen recognition and initiation of immune responses. We have recently reported that *S. aureus* infected osteoblasts produce type I interferons that limit intracellular bacterial burden. However, the mechanism underlying initiation of interferon responses by osteoblast is uncharacterized. Here, we address the hypothesis that PRR detection of *S. aureus* by osteoblasts stimulates protective interferon responses. First, we examined expression of the cytosolic nucleic acid sensors, retinoic acid inducible gene-1 (RIG-I) and cyclic GMP-AMP synthase (cGAS) in primary murine osteoblasts. Our results indicate that osteoblasts have low constitutive expression of these sensors that is further elevated following exposure to *S. aureus* membrane vesicles possessing bacterial ligands and whole viable *S. aureus*. Additionally, exposure to *S. aureus* membrane vesicles and whole *S. aureus* stimulated interferon production by osteoblasts. Importantly, siRNA mediated knockdown of RIG-I and cGAS significantly reduced IFN production by *S. aureus* infected osteoblasts indicating a role for these sensors in stimulating protective bone cells responses. Collectively, these data indicate RIG-I & cGAS recognition of *S. aureus* promotes production of IFNs by osteoblasts. Therefore, RIG-I and cGAS could be novel targets to enhance beneficial responses during Staphylococcal osteomyelitis.

Abstract: 946

Understanding the Hsp70 Client Code
Ashley Choi

Mentor: Dr. Andrew Truman, College of Science

Hsp70 is an essential molecular chaperone required for the folding of newly synthesized and misfolded proteins (known as “clients”). Although Hsp70 has been extensively studied, the molecular determinants that direct Hsp70 to its clients remains poorly understood. We performed cross-linking mass spectrometry on purified Hsp70 complexes from yeast. We identified 124 direct interactors of Hsp70 that are part of diverse cellular processes that include the DNA damage response, cell cycle progression, metabolism and protein translation. Importantly, a subset of the proteins (xxx%) identified contained a post-translational modification at the site of interaction with Hsp70. Analysis of the structural features of Hsp70 interacting proteins revealed an enrichment for intrinsically disordered protein (IDPs). We are currently using a variety of computational and analytical methods to understand the importance of these PTMs (the “Client Code”) in mediating client function and interaction with chaperones. Our working model is that these modifications on clients act as a beacon for Hsp70 to bind and help mediate condensation and folding of proteins with intrinsically-disordered domains.

Special code(s): Honors Research

Abstract: 947

Understanding the Role of Hsp70 Phosphorylation on Cell Integrity Signaling in Yeast
Elizabeth Abedi

Mentor: Dr. Andrew Truman, College of Science

Cells must be able to respond rapidly to environmental challenges such as high temperatures and chemical exposure. This can be accomplished by inducing the expression of the Hsp70 chaperone protein which helps refold damaged proteins. The cell wall integrity MAP kinase pathway (CWI) is required for the response to cell wall damage and induces expression of cell-wall reinforcing genes through the activation of major transcription factor Rlm1. Recent studies have identified numerous phosphorylation sites on Hsp70 that are triggered by a range of cell stresses, such as DNA damage, heat, and nutrient availability. Nevertheless, it is currently unclear how Hsp70 phosphorylation regulates the CWI. To understand how Hsp70 phosphorylation may fine-tune the CWI, a collection of 146 yeast-expressing mutations in Ssa1 phosphorylation sites (73 phospho-mutants, 73 phospho-mimics) referred to as the “chaperone code collection” was exposed to a variety of cell wall stresses to identify mutants that have sensitivity to cell-wall stress. We have now identified several sites sensitive to cell-wall damage and have mapped these to the Hsp70 structure further characterizing the physiological relevance for chaperone code control of CWI. Going forward, we will screen stress-sensitive yeast for CWI activation using a series of western blotting techniques. Taken together our working model is that Hsp70 phosphorylation can play a role in regulating components of the CWI pathway.

Special code(s): Honors Research

Abstract: 948

Exploring the Role of Farnesylation on the Yeast Co-chaperone Ydj1
Ainella Rysbayeva

Mentor: Dr. Andrew Truman, College of Science

Organisms are continuously exposed to environmental stresses that cause protein unfolding and misfolding. To deal with these stresses, cells make proteins known as chaperones that act as custodians of the cell, repairing the damaged proteins. The activity and specificity of chaperones are regulated by helper co-chaperone proteins. Several of these co-chaperones are modified by a farnesyl lipid group to specific cysteine residues near their C-termini. While this type of modification is thought to help localize proteins to membranes, its role in co-chaperone function is poorly understood. In this study, we set out to examine the role of farnesylation on the major yeast co-chaperone, Ydj1. We created a mutant form of Ydj1 that is unable to be farnesylated (C406S) and are currently studying how yeast expressing this mutant are impacted for growth on media containing a variety of stress agents. Since dysregulation of farnesylation is associated with various diseases, including cancer and neurodegenerative disorders, studying PTMs on Ydj1 has the potential to contribute to the development of novel therapeutic strategies against diseases caused by improper protein folding in both yeast and human cells.

Special code(s): Community Engaged Research, Honors Research, PKP Member

Abstract: 949

Targeting Triple-Negative Breast Cancer: IL8-CXCR2 Inhibition and ROS Suppression
Isabele Dimino

Mentor: Dr. Didier Dréau, College of Science

Breast cancer has been steadily increasing by about 0.5% per year since the mid-2000s, and triple-negative breast cancer (TNBC) accounts for over 15-20% of breast cancer cases. TNBC is highly invasive and often unresponsive to standard therapies, highlighting the urgent need for more targeted treatments. Chemokine interleukin-8 (i.e., CXCL8) and its main receptor CXCR2 play a crucial role in regulating immune responses. Moreover, IL-8 binding to CXCR2 induces cancer cells towards higher IL-8 concentrations promoting both cancer cell migration and invasion into surrounding tissues and blood vessels. In addition, IL-8 activation of CXCR2 triggers an inflammatory microenvironment within the tumor and supports cancer cell survival and progression. However, the precise role of the IL-8-CXCR2 signaling pathway in TNBC progression remains to be fully elucidated. Here, we utilize in vitro models to assess whether CXCL8 signaling through CXCR2 promotes tumor cell proliferation and growth, and whether reactive oxygen species (ROS) modulate the CXCL8-driven tumor progression. Results suggest significant effects of CXCL8-CXCR2 signaling in tumor cell stress and growth and may usher new therapeutic interventions to prevent breast cancer progression.

Special code(s): Honors Research

Abstract: 950

Reactive Oxygen Species and NLRP3 Inflammasome Activation in Macrophages
Kyra Raphael

Mentor: Dr. Didier Dréau, College of Science

This year, approximately two million people in the United States will be diagnosed with cancer. As the rates of cancer diagnoses increase, so does the need for effective treatment and diagnostic tools. Inflammation has been shown to critically favor the development and progression of cancer. Indeed, chronic inflammation damage cells, promote abnormal cell growth and proliferation, and adversely modulate the immune system. Inflammatory cells, including macrophages release cytokines that promote the growth and survival of cancer cells. Among the multiple mechanisms in macrophages triggering the release of pro-inflammatory cytokines, activation of NLRP3 inflammasome, a cytoplasmic multimeric sensor complex has gained attention in cancers. Beside pro-inflammatory cytokine secretions, NLRP3 inflammasome activations is also associated with macrophage reactive oxygen species (ROS) production. ROS over-expression causes cell damages to cell lipids, proteins, and DNA and can trigger cell death. Here we assessed the interplay between NLRP3 inflammasome activation and ROS expression in macrophages as mechanisms promoting the inflammation and cancer progression. Results support the role of NLRP3 inflammasome activation and of ROS in inflammation and their potential of targeting in preventing breast cancer progression.

Special code(s): Honors Research

Abstract: 951

Investigating Copy Number Variations of Immune System Genes using Droplet Digital PCR

Nishi Patel

Mentor: Dr. Danillo Augusto, College of Science

Natural killer (NK) cells are lymphocytes representing approximately 5 to 15% of the circulating blood cells and are critical effectors of the innate immune system, eliminating cancer and infected cells. NK cell control receptors are encoded by two major genomic regions: leukocyte receptor complex (LRC) and natural killer complex (NKC), which are known for their unusually complex polymorphism and extensive gene copy number variation (CNV). The LRC encodes leukocyte Ig-like receptor (LILR) and killer-cell immunoglobulin-like receptor (KIR) families, which recognize human leukocyte antigen (HLA) class I molecules as putative ligands. We aimed to use droplet digital PCR (ddPCR) to assess the CNV of the genes within the LRC and NKC. ddPCR is the most precise method created to quantify DNA to date, and it precisely provides quantification even in samples with low concentrations. First, DNA is fragmented using restriction enzymes, followed by amplification with a fluorescent hydrolysis probe specific to our targets. We simultaneously amplify a copy-stable gene as a reference. We have preliminary determined the *HLA-H* copy numbers in 69 individuals and identified 17 hemizygous individuals and 2 lacking the gene. We will next focus on LILR genes, which are known to display extensive CNV and are implicated in cancer risk. We compare our ddPCR results to those from our bioinformatics pipeline, which we applied to analyze short-read data from 1,200 breast cancer patients and 600 controls. We aim to validate the pipeline and discover novel associations with breast cancer risk.

Special code(s): Honors Research

Abstract: 952

Role of METTL3 in Permissiveness of Pancreatic Cancer Cells to Oncolytic Vesicular Stomatitis Virus

Jacob Hawkins

Mentor: Dr. Valery Grdzelishvili, College of Science

Pancreatic Ductal Adenocarcinoma (PDAC) is a severe disease with very poor treatment options presently. Often diagnosed late and not meaningfully responsive to chemotherapy, PDAC is in need of alternative treatments. One approach to this is the use of oncolytic virotherapy (OV), the practice of using a virus capable of preferential infection and subsequent killing of cancer cells. Vesicular stomatitis virus (VSV) is a promising OV. Although VSV has shown great efficacy in most PDAC cell lines, there are still highly resistant groups of PDAC cell lines. Understanding how this group of more resistant PDAC cells, which represent potential patients, are able to fend off VSV is critical to overcoming this resiliency. Recent studies have drawn connections between VSV replication success and an RNA modification N^6-methyladenine (m6A). The addition of a methyl group to both cellular and viral RNA is catalyzed by the METTL-3 protein. For this study, the relationship between METTL-3 abundance and viral replication is explored in moderately resistant (Suit-2) and highly permissive (MiaPaCa-2) PDAC cell lines. We hypothesize METTL-3 assists in VSV replication indirectly by antiviral immune evasion. We have suppressed METTL-3 function and measured VSV replication alongside immune response stimulation, seeing reduced VSV replication accompanied by an increased antiviral state. Presently, we are working towards overexpressing METTL-3 which we hypothesize will increase VSV replication in more resistant PDAC cells. If this holds true, the addition of METTL-3 to the VSV genome, for the utility of OV, would enhance treatment of PDAC cells.

Special code(s): Honors Research

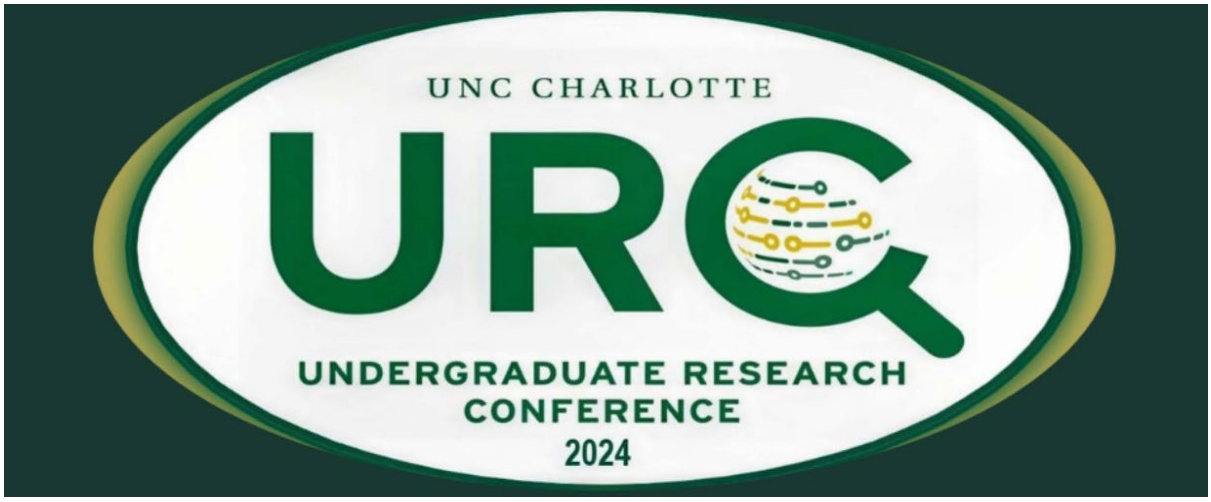
Abstract: 953

Investigating the Roles of Telomerase RNA (TR) Structural Domains on TR Structure and Telomerase Activity in the Parasitic Protozoan, Trypanosoma brucei
Prashant Jha

Mentor: Dr. Kausik Chakrabarti, College of Science

Each time eukaryotic cells divide a small amount of DNA is lost from the chromosomal ends. This occurs because DNA polymerase is unable to perfectly replicate the chromosome ends, a phenomenon known as the end replication problem. As telomeres shorten, genes are damaged, compromising genomic integrity in a process called chromosomal degradation. To prevent this, cells evolved caps of non-coding, repetitive DNA called telomeres at the chromosome ends to serve as a buffer. Telomeres are produced and lengthened by the ribonucleoprotein (RNP) complex, telomerase. Telomerase consists of telomerase RNA (TR) and the telomerase reverse transcriptase (TERT) enzyme, which maintain telomere length and genome stability. The TR provides a template for the addition of telomeric repeats to the chromosome ends while the TERT catalyzes the addition of repeats, thereby renewing the proliferative capacity of cells. When either component is missing or mutated, telomerase function is compromised. Rapidly dividing cells rely on telomerase to support indefinite proliferation through maintaining telomere length. Dysfunction of the telomerase complex has been linked to diseases including cancer, age-related disorders, and genetic syndromes. Comprehending the role of telomerase RNA in telomere extension is crucial for understanding the mechanisms of telomerase activity in these conditions. Our work seeks to better understand how discrete of discrete TR structural domains contribute to the overall TR structure and their impacts on telomerase activity in the parasite *Trypanosoma brucei*. This work will elucidate which TR domains are necessary for telomerase function and inform us of potential future therapeutic targets.

Special code(s): Honors Research



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