RESEARCH SYMPOSIUM

2024 Research Symposium Poster Overviews:

Mostafa Ahmed

Leveraging Biotechnology for the Development of a Nano-vaccine Against Foodborne Pathogens in Chickens

According to the Centers for Disease Prevention and Control, Campylobacter is regarded as the number one cause of bacterial diarrheal illness in the US, accounting for approximately 1.3 million cases of human campylobacteriosis annually. Considering chickens as the primary source of Campylobacter infection in humans, ensuring their effective immunization could significantly curb the transmission of this pathogen to humans. The challenges in the development of effective vaccination strategies against Campylobacter lie in the unsuccessful identification of novel, immunogenic proteins capable of inducing cross-protective immunity against different strains of Campylobacter jejuni, combined with the lack of targeted delivery methods for these antigens to mucosal immune inductive sites. Recent advances and developments in cutting-edge nanotechnology have revolutionized vaccine platforms. The use of nanoparticle (NP)-based technologies has been found to be a promising replacement for older vaccine delivery methods. Here, we utilize colloidal particles made from chitosan, a generally recognized as safe (GRAS) material, for the encapsulation and delivery of vaccine formulations. Our recent findings revealed that vaccinating chickens with a non-encapsulated vaccine, comprising the outer membrane proteins (OMPs) of C. jejuni and synthetic single-stranded DNA molecules containing CpG motifs (CpG ODN), resulted in elevated C. jejuni-specific antibody titers and a reduction in Campylobacter counts by approximately 1.2 log10. Studies are currently being conducted to explore whether encapsulating the vaccine formulations with chitosan NPs and simultaneously administering probiotics would improve vaccine efficacy, ultimately leading to enhanced control of Campylobacter in chickens.

Sarah Allen

Male Children had Less Enamel Caries Compared to Female Children

Various factors can contribute to oral health, including age, diet, and lifestyle. Oral health can be assessed by the presence of dental caries and enamel lesions. Dental caries are areas of tooth decay that create holes in teeth and can lead to significant infection and tooth loss. Dental caries is common in children, seen in over 50% of children ages 6 to 8. Enamel lesions are the initial phase of dental caries, caused by demineralization of subsurface enamel which eventually becomes dentin caries. Our study focuses on the impact sex differences have on the supragingival plaque microbiome. We implemented data analysis techniques to examine the differences between males and females with healthy teeth and teeth with different stages of caries. Our study examined the impact of a child's sex on their supragingival plaque microbiome using 295 samples of Nigerian children, which was split between 134 females and 161 males. Using next-generation sequencing technology, we sequenced a fragment of the bacterial rpoC gene. We found that male children had a significantly higher percentage of healthy teeth in a mouth free from caries (H-CF). In comparison, the girls in our sample had a higher percentage of healthy teeth in a mouth with enamel lesions (H-CE) and teeth with enamel lesions (E-CE). Using a metataxonomic approach and machine learning, we determined significant differences in community in the supragingival plaque microbiome of males and females. Understanding the differences in the oral microbiome of the sexes will potentially lead to better preventive measures for caries.

Christian Blackburn

Analysis of Image-Processing Software Choice for Game-Camera Research

Motion-activated game cameras are an effective mechanism for conservation biologists to remotely monitor wildlife populations for extended periods of time. Numerous image-processing software platforms are available to systematize and speed up photo analysis. The rise in artificial intelligence (AI) image recognition has allowed this process to become quicker by recognizing a species type, filtering out empty or wind-triggered photos, and even identifying individuals within a wildlife population based on body patterns. My main research objective was to evaluate correlations between the choice of image-processing software and the study's taxon of focus, study year, study continent, and the extent of sampling effort. I performed a meta-analysis of wildlife-related studies that utilized game cameras as their primary mechanism of data collection. There was a total of 98 research studies that listed an image-processing software platform used. The most commonly observed software was CameraBase, with a total of 17 studies. The least observed software platforms, with only one study, included Agouti, DeskTeam, FastStone Image Viewer, Matlab, and Zooniverse. The highest observed level of correlation between software choice and a category of interest was for study continent and image set size. Future work could investigate what aspects of these various platforms make them possibly more effective than others and highly desired by wildlife researchers. These aspects could then be combined with emerging technologies like AI to develop one streamlined platform for various applications, such as different taxon of focus or a large range of sampling efforts.

Long Cheng

A Learning Platform for Enhancing AI-Centered Social Cybersecurity Education

Artificial Intelligence (AI) technologies have become increasingly pervasive in our daily lives. However, the advent of these technologies has also brought forth new challenges in the critical area of social cybersecurity. Although the interplay between AI and social cybersecurity has gained much attention from the research community, very few educational materials have been designed to engage students by integrating AI and socially relevant cybersecurity through an interdisciplinary approach. In this poster, we present our designed open learning platform, which can be used to meet the ever-increasing demand for advanced training in the intersection of AI and social cybersecurity. The designed platform, which consists of hands- on labs and education materials, incorporates the latest research results in AI-based social cybersecurity. Through a user study of 201 students from two universities, we demonstrate that students have a better understanding of AI-based social cybersecurity issues and mitigation after doing the labs.

RESEARCH SYMPOSIUM

Long Cheng

An Integrated Platform for Online Abuse Research

Artificial intelligence (AI) and machine learning (ML) have emerged as powerful tools for the automatic analysis of online abuse, a growing concern in our digital era. Researchers from diverse fields, including the Social Sciences and Information Science and Engineering, are increasingly turning to Machine Learning Software Infrastructure to address this critical issue. However, researchers are facing fundamental challenges in accessing essential resources, such as datasets, ML models, and network analysis tools. In this poster, we demonstrate our recent progress on building a user-friendly platform which advances research capability for researchers in both social science and computer science communities to leverage advanced machine learning methods for online abuse research.

Andy Duan

Monocular Panoramic Image Based 3D Scene Modeling

Panorama images are widely used for scene depth estimation as they provide comprehensive scene representation. Existing deep-learning monocular panorama depth estimation networks produce inconsistent, discontinuous, and poor-quality depth maps. To overcome this, we propose a novel multi-scale monocular panorama depth estimation framework. We use a coarse-to-fine depth estimation approach, where multi-scale tangent perspective images, projected from 360 images, are given to coarse and fine encoder-decoder networks to produce multi-scale perspective depth maps, that are merged to get low and high-resolution 360 depth maps. The coarse branch extracts holistic features that guide fine branch extracted features using a Multi-Scale Feature Fusion (MSFF) module at the network bottleneck. The performed experiments on the benchmark dataset show that our model outperforms the existing methods, producing consistent, smooth, structure-detailed, and accurate depth maps.

Alex Feltus

Case Studies Leveraging Generative AI for Computational Biology Education and Research.

Generative AI is amazing when used properly. In the Feltus computational biology research lab, generative AI is used to simulate tissue state gene expression transitions. The AI learns the normal 20,000+ dimensional state from normal and abnormal tissue and then uses these patterns to perturb gene expression numbers to look like the alternate state. Then we find what genes changed and voila we have pieces of the system for further investigation. Scientific rigor ensures that the AI is functioning properly. In Feltus experiential classrooms, students are co-instructed by a generative AI mentor that is available 24/7 to answer prompts using trusted sources to provide true answers. All students can ask the AI co-instructor anything (i.e., there are no stupid questions) and receive an excellent response at 8am or 3am. In this poster, a computational oncology experiment and Bioinformatics (GEN4400/6400) class case will be presented to show that the future of education and research is now.

Sydney Ahern, Wynn Bartee, Charlotte Bodwell, Sayan Gupta, Alex Horton, Pravin Nath, Trey Ridgill and Annette Tower

A Study of the Effectiveness of Super Bowl Advertising

The Super Bowl is the most watched television broadcast event in the US. Advertising during the event, therefore, continues to be a draw for brands looking to reach US consumers. However, the cost of advertising on the Superbowl is high, with a thirty-second spot costing upwards of $7 million in 2024, in addition to the cost of the commercial itself, which often involves the use of celebrities. Thus, understanding the effectiveness of Superbowl advertising is important for companies and marketing departments looking to justify this expense. To that end, this study draws on multiple proprietary databases to analyze historical and secondary brand-level data on (a) advertising spending during and around the Super Bowl and (b) metrics such as reputation and purchase consideration. The project is part of the Advanced Empirical Marketing Research Creative Inquiry (CI No. S2401-MKT-3980-004-21756) conducted by the faculty members and students on this proposal. Thus, the study aims to achieve the following objectives: (1) identify trends in Superbowl advertising and its relationship with brand-level outcomes; (2) interpret findings to provide insights that can inform the expenditure associated with Superbowl advertising; and (3) provide CI students an experiential learning opportunity in the research areas of marketing analytics and strategy. In doing so, the project will consider online marketing spending since brands are increasingly using cross-channel advertising, including during events such as the Super Bowl. The proposed poster, therefore, ties in with the theme of this year's symposium, "Engaged Scholarship, Education, and Practice in the Digital Age".

Josie Nasekos, Alba J. Collart, Elizabeth Canales and Anastasia Thayer

U.S. Consumer Preferences for Using Blockchain Technology to Track Climate-Smart and Organic Production Practices.

The United States Department of Agriculture (USDA) has invested over $3 billion into 141 projects intending to grow the market for agricultural commodities produced using practices that reduce greenhouse gas emissions or promote carbon sequestration, known as climate-smart commodities. Although a USDA-certified label for such commodities is unavailable, third-party verified carbon-reducing labels can signal a product's reduction efforts. The more established USDA-certified organic label differentiates organically produced goods, driving consumer demand since the 1990s. However, fraudulent labeling of these attributes remains a concern, undermining consumer trust. Blockchain technology is considered a potential tool to combat labeling fraud and boost consumer trust by creating a verifiable record of production practices along the supply chain.

We study U.S. consumer preferences for using blockchain-based or standard (non-blockchain) QR codes to provide information about beef and dairy products carrying the USDA-certified organic label and a new carbon-reducing label verified by the Carbon Trust. We conduct a survey and a Discrete Choice Experiment to collect data on preferences for these attributes and estimate willingness to pay. Our findings will have implications for beef and dairy producers as they consider implementing sustainable agriculture practices and adopting emerging technologies such as blockchain into their supply chains.

Anuja Sarda and Alexis Sales

Painting the Path: Leveraging Mural for Stakeholder-Driven Comprehensive Program Evaluation

Stakeholder engagement and visual representation are crucial in fostering comprehension, collaboration, and actionable insights as part of program evaluation methodologies in current times. Using the case studies of two ongoing Medicaid waiver program assessments (HIV/AIDS waiver and Community Choices waiver) in South Carolina, this poster will delve into the transformative potential of Mural, a digital collaboration platform, in facilitating various phases of the development of logic models, stakeholder mapping and outcome measurement with key stakeholders.

By leveraging the interactive capabilities of Mural, stakeholders were empowered to actively participate in creating and refining logic models and elucidating program inputs, activities, outputs, outcomes, and impacts in a visual format. Through collaborative, virtual workgroup meetings, stakeholders contributed diverse perspectives, fostering a shared understanding of the two programs' objectives and pathways to success. Mural served as a dynamic repository for program evaluation data, enabling stakeholders to visualize the program's complex relationships and linear progression from inputs to desired outcomes, identify key indicators for measuring those outcomes, identify other potential stakeholders to engage within local communities, and track progress over time. From needs assessment to impact evaluation, Mural facilitated iterative analysis and decision-making, driving evidence-based improvements and informed programmatic decisions with the workgroup members.

Our poster will offer practical, innovative strategies for collaboration and visualization. It will also illustrate the integration of Mural into various stages of program evaluation and highlight its role in promoting stakeholder engagement and co-creation throughout the evaluation process.

Shreeya Sharma and Khaled Abdelaziz

Employing 16S rRNA Gene Sequencing for Profiling the Gut Microbiota of Probiotic-Treated Chickens

Probiotics are live organisms known for their beneficial effects on host health, including modulation of gut microbiota. The chicken microbiota includes bacteria, archaea, fungi, protists, and viruses with the cecum containing the highest concentration of microbes. Here, we conducted 16S rRNA gene sequencing following the effects of different probiotic administration methods—namely, in ovo, oral, and a combination of both—on the composition and diversity of chicken cecal microbiota compared to the control group over the period of 5 weeks. Each treatment group received a lactobacilli cocktail comprising Lactobacillus acidophilus, L. reuteri, L. animalis and L. crispatus at a concentration of 10^7 CFUs/mL. Alpha diversity metrics (Shannon and Simpson index) and beta diversity metrics (Bray Curtis dissimilarity and PCoA plot) were employed to assess microbiota composition and diversity using the QIIME2 pipeline with statistical analysis done using PERMANOVA. Understanding these dynamics within the cecal microbiota is crucial for optimizing probiotic interventions in poultry production, with implications for improved bird health and production efficiency.

Katelyn Shumate

Birthing Methods Impact the Oral Microbiome

There are two types of delivery methods, vaginal and cesarean section (C-section), used to deliver babies. Vaginal birth is the most common method of childbirth, which occurs when the baby is delivered through the vagina. By passing through the birth canal during vaginal delivery, the baby is believed to be coated with bacteria found in the mother's vaginal microbiome, which then appears in the gut microbiome of the baby. Conversely, a C-section birth occurs when the baby is delivered through the abdomen via surgical incisions. As the baby passes through the abdomen, it is coated with bacteria found on the mother's skin. These bacteria are found in the baby's various microbiomes, such as the gut microbiome. Previous studies have demonstrated that different delivery methods influence the gut microbiome of the baby. Babies that are born via C-section often have a less diverse gut microbiome than those born vaginally. The supragingival plaque microbiome affects the health of teeth and development of caries. This study characterized the supragingival plaque microbiome of 295 Nigerian children that were born via C-section or vaginally by using a metataxonomic approach targeting a form of the bacterial rpoC gene. We used machine learning to visualize the significant differences in beta diversity between the birthing methods. We also used differential abundance testing in Qiime2 and found that a species of Treponema was differentially abundant. Our results demonstrate the impact of the delivery method on the supragingival plaque microbiome that influences the oral health of the baby.

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JaCoya Thompson

Enhancing Data Visualization Literacy in Middle Grades by Exploring a Web-Based Tool in Informal Learning Environments

In today's data-rich environment, various tools have been developed to assist with processing, aggregating, and visualizing different datasets. While these tools make creating data visualizations easier, there is a growing need for tools that help users develop data visualization literacy, including both creating and interpreting visualizations. This study explores how a web-based tool called DataViz can help individuals build the skills needed to generate and communicate insights from data visualizations. In an informal learning setting, ten participants aged 12-14 took part in activities provided by DataViz. The results indicate that DataViz improved participants' ability to derive insights, identify misleading visual representations, and create data visualizations. This research supports the development of resources designed to promote concepts and practices of data visualization literacy.

Ariel Turner and Elias Tzoc

Leveraging AI to Improve Library Services for Students and Faculty

The impact of Artificial Intelligence (AI) poses significant implications across various sectors including higher education. Leveraging AI technologies ethically and responsibly has the potential to transform and tailor learning and research experiences. For academic and research libraries, there is an emerging interest and expectation to provide campus wide access to resources and tools that will help students and faculty understand/learn the benefits and limitations of these new technologies. This poster presentation will provide an overview of the landscape of AI tools and services integrated in modern academic and research libraries. The presenters will highlight current and upcoming AI-enhanced tools and services available through Clemson Libraries. They will also discuss early lessons learned and plans for future exploration and assessment of AI technologies that will further support teaching and research initiatives at Clemson University.

Hazel Vega

Building Capacity for Early Multilingual Learners in South Carolina through Online Teacher Professional Development

South Carolina's (SC) multilingual learner (MLs) population experienced a 610% growth from 2000-2001 to 2011-2012. Yet, the needs of MLs are largely unmet due to the shortage of teachers in English for Speakers of Other Languages (ESOL) and limited state resources. Thus, the purpose of our grant-funded project, Building Capacity for Early Multilingual Learners: Bridging Literacy, Reading Recovery®, and ESOL, is to increase early instructional capacity for MLs in the state by preparing reading teachers (RTs) to deliver evidence-based instruction and support for ML families. Using designed-based research methods, this project aims to provide teacher professional development and create an online course for ML caregivers across six districts. Selected findings from the first two years of the project will be highlighted. In year 1, our needs assessment, including surveys from RTs, students, and district administrators, and RT logs and interviews showed that RTs are often leaders in districts, with expertise in instruction and literacy; yet they are less confident with MLs. In particular, areas for improvement included writing, in-depth instruction on reading for greater comprehension, and incorporation of students and families' cultural assets. In year 2, analysis of RT, district, and student surveys revealed statistically significant growth in knowledge of language-based supports for writing development. However self-reported ratings in this area are still low in self-efficacy and frequency of implementation in instruction. Based on these results, the research team is providing online professional development on translingual writing in early stages of literacy for MLs.

Amlan Benerjee (M&N Associates, Inc), Mihaela Gazioglu, Emily Howell, Rebecca Kaminski (Clemson University), Kavita Mittapalli, Victoria Pennington and Nicole Ferguson-Sams

Advancing Multilingual Learners' Educational Experience through Digital Tools

Recognizing digital tools' potential to democratize education, our poster presentation explores the intersection of a Department of Education grant-supported professional development (PD) intervention and digital tools, addressing challenges in their integration for teachers working with multilingual learners (MLs). We aim to understand how teachers integrate digital tools to support MLs and the grant's contribution to supporting this integration. Additionally, we extend our focus to examine the grant's role in facilitating digital tool integration for MLs caregivers.

Following the initial needs assessment, teachers' interviews, and per semester survey results, our design-based research approach introduces modifications to PD, such as providing technology resources to promote participatory classroom cultures and a collaborative translingual digital composition strategy to empower MLs in expressing their identities and experiences. Furthermore, we propose the adoption of digital storytelling (DST) in middle school MLs classrooms to bridge technological gaps, fostering culturally responsive teaching while facilitating meaningful peer interactions and empowering MLs to share narratives.

Acknowledging the significance of supporting MLs literacy development at home, our initiative extends to providing digital resources to MLs caregivers. A dedicated course supports the implementation of literacy strategies at home, equipping MLs caregivers with knowledge of suitable digital tools for enhancing their child's learning experience beyond the classroom.

This comprehensive approach aims to create a holistic framework for advancing MLs' learning through PD and digital tools. By addressing the needs of both teachers and caregivers, we aspire to contribute to a more inclusive experience for MLs in the digital age.

Nora D. Hochstetter, Dr. Emily S. Howell and Dr. Rebecca A. Kaminski

Exploring Perceived Competencies of Multilingual Elementary Students and their Teachers in Literacy Teaching and Learning: Implications for Professional Development

This study examined mainstream elementary school teachers' self-assessments of pedagogical content knowledge (PCK) in literacy and language instruction for multilingual learners (MLs) in a high-needs school district. Additionally, MLs' perceptions of challenges to literacy and language development were also investigated. Grounded theory coding was used as the analytic method to categorize responses and compare themes within and across teacher and student groups. The findings demonstrate that mainstream elementary teachers of MLs state a need for more explicit education in integrating language, foundational literacy, and content-area instruction, while MLs indicate a need for more explicit instruction in foundational literacy, language, and communication skills. Implications for professional development design are discussed.

Jones J., Harrison C., Abdelaziz K., Miller B., Griffin S., Rennert L., Wang K., Dean D., Cartmell K., Neault M. and Wu J.

Applying Digital and AI Tools for Inter-Collegiate One Health Research Collaborations at Clemson

One Health research approaches integrate human health, animal health, and environmental health. Adopting these approaches improves our ability to manage shared health threats and promote more comprehensive solutions through interdisciplinary teamwork. Challenges for implementing One Health research approaches include communications, data sharing and data management. Members of this inter-collegiate team are applying digital and AI tools for addressing these challenges in the following areas: open-source image analysis tools for quantifying tissue characteristics in translational research animal models using radiography, CT, MRI, and ultrasound data; AI tools for predicting outbreaks and forecasting infectious disease spread using digital trace (e.g., twitter/X) data; computational approaches "multi-omics tools" for developing microbial ecosystem therapeutics as an antibiotic replacement for the treatment of infectious diseases; electronic platform workbooks for 4H youth education to build vaccine confidence and to explore STEM careers; and surveillance of animal samples and wastewater for detecting emerging infectious diseases in animals and digital tools for sharing data with other health organizations to more efficiently track and contain outbreaks. These measures will further strengthen collaborative efforts and facilitate a more seamless integration of human, animal, and environmental health for comprehensive and effective solutions.