UNIVERSITY OF ILLINOIS SPRINGFIELD

UIS STARS

Student Technology, Arts & Research Symposium

April 10-11, 2025

Harshavardhan Bapat

Photo by: Harshavardhan Bapat

UIS STARS

Student Technology, Arts & Research Symposium

Greetings,
As chancellor for the University of Illinois Springfield, I am honored to offer my enthusiastic support for the 2025 Student Technology, Arts and Research Symposium.

Each year, UIS uses this opportunity to celebrate our students' talents from all academic disciplines by providing a platform to showcase their scholarly and creative works. The STARS Symposium epitomizes our UIS vision to "be a space of possibility where learners become ethical and passionate scholars, leaders and citizens." It's "Leadership Lived" on display!

Our student scholars have been guided by talented faculty members, who help them navigate the challenging yet exciting experience of research. To have the opportunity to develop your own ideas and share them with others is an empowering moment in a student's educational experience. I sincerely thank the many faculty members who have provided the mentorship that lies behind each student's presentation. Each of those UIS faculty members affirms our collective commitment to high standards of scholarly excellence.

Congratulations to all of our STARS Symposium presenters! With your presentation, each of you contributes to the intellectual environment of our campus. I sincerely appreciate the contributions of all faculty, staff and students who have worked so hard to provide this wonderful opportunity.

Have a stellar experience, Prairie Stars!

Janet Gooch
Chancellor
University of Illinois Springfield

It is my pleasure to welcome you to the 2025 Student Technology, Arts, and Research Symposium (STARS) at the University of Illinois Springfield. STARS celebrates the scholarly inquiry and the creative endeavors of our students, many of whom have been working under the skilled mentorship of our outstanding faculty.

STARS 2025 represents an exciting opportunity for students to showcase their work with a broader community, and I am delighted that all of you are with us to share in the intellectual engagement and excitement of their discoveries. Your continual support, presence, and interest in our students' work is essential to the success of the Symposium.

Faculty-student collaboration is at the heart of the educational experience and mission at UIS and, as you will see from the student presentations, it is a powerful partnership for learning and development. The students who are presenting their work have been learning not just by listening and reading, but by doing as well. They've been applying what they learn to new endeavors – grappling with real-world problems, testing new ideas, discovering new knowledge, developing new approaches and insights, and finding new and innovative ways to creatively enrich our experiences of self, other, and the world.

Presentations have been invited from all academic disciplines. Different forms of scholarship will be represented, including oral readings and presentations, art exhibits, and musical performances, as well as research posters and presentations. We are very proud of our student presenters, and we congratulate them on their scholarly achievements and on having been selected to share their scholarship in a professional forum and public venue.

I also extend my sincere appreciation to the UIS faculty members whose dedication to excellence in teaching, scholarship, and service is so apparent in the number and quality of presentations included in the Symposium. I commend them for creating a dynamic atmosphere of scholarly inquiry and exchange that inspires, guides, and nurtures students toward greater levels of achievement. I am also grateful to members of the STARS Planning Committee. Their leadership, ongoing commitment, and hard work have helped to make the Symposium an exciting annual celebration of scholarship.

Best wishes to all for an intellectually engaging and enriching 2025 Student, Technology, Arts, and Research Symposium!

Brandon E. Schwab

Vice Chancellor for Academic Affairs & Provost

At UIS we have two great locations for students to engage in hands on research experiences. The first of these is the Therkildsen Field Station at Emiquon (TFSE; uis.edu/emiquon). The TFSE is located about 60 miles northwest of campus in a former floodplain of the Illinois River. Positioned in The Nature Conservancy's Emiquon Preserve, the TFSE provides UIS students and faculty the opportunity to study and learn from this unique restoration project.

The second location is the UIS Field Station at Lake Springfield (www.uis.edu/lakespringfield/). At the UIS Field Station, students and faculty can engage in recreation, formal and informal learning, and research. Located within walking distance of campus, this facility provides an ideal location for students looking to begin performing research. I am excited about the opportunities this space provides students in all disciplines for research and creative projects related to Springfield and the Lake.

A big part of my own education, whether as an undergraduate or graduate student, were opportunities to conduct research away from campus. In some cases, these experiences took me on extended trips to another state or another country. Other times they were a short drive or even a short walk away from campus—the key for me was that they were not in a traditional classroom setting. I felt I could be more creative and learned more from what I was doing in these semi-formal or informal settings.

In addition to providing sites for research the UIS Field Stations also provide financial support. All of you are invited to apply with a faculty mentor for funding through the TFSE Grants program. These awards are available to support projects related to the Emiquon Preserve or its immediately surrounding areas. These projects need not be limited to the natural sciences and could range from art projects which capture the Preserve in different seasons, to sociology projects which look at how the Preserve has impacted the surrounding communities. I encourage you and your professors to get out and explore the Emiquon Preserve, with a little bit of time you will find inspiration for research.

Congratulations to all the student presenters. Student involvement in research at the Field Stations has grown this past year, with new opportunities in the future, I hope to see you there.

Tom Rothfus, Director

Therkildsen Field Station at Emiquon

UIS Field Station at Lake Springfield

THERKILDSEN FIELD STATION AT EMIQUON

Divya Gunjan

The STARS Committee would like to acknowledge the following for supporting the 2025 symposium.

Faculty Mentors for their hard work and dedication to students' creative work and research:

Md Rasel Al Mamun, Samer AbuBakr, Harshavardhan Bapat, David Bertaina, Brytton Bjorngaard, Kyle Blount, José Burgos, Elham Buxton, Hei-Chi Chan, Hua Chen, Lan Dong, John L Ferry, Vincent Flammini, Shipra Gupta, Yanhui Guo, Shane Harris, Anne-Marie Hanson, Peng Kang, Liang Kong, Allison Lacher, Sunshin Lee, Yu-Sheng Lee, Elise LoBue, Jennifer Martin, Amy McEuen, Mike Miller, Sevilay Onal, Neeraj Rajasekar, Noah Reynolds, Tom Rothfus, Rishikesh Sahay, Peter Shapinsky, Frances Shen, Junu Shrestha, Isabel Skinner, Joshua Smith, Jeramie Strickland, Megan Styles, Jorge Villegas, Jae Yom, Suyang Yu, and Natalya Zinkevich.

Chancellor Janet Gooch and **Provost Brandon Schwab** for their support of the symposium.

Ethan Guinn, winner of the annual STARS photo contest, for the wonderful drone photo of our UIS campus on the cover. The photograph offers us a broader view of campus—one that reminds us of the beauty we can appreciate if we get above the mundane view of the parts of reality closest to us, and move our vision to a wider perspective taking in a more comprehensive and inclusive understanding of how systems interact. The photograph offers views of older buildings on the left—the front cover (the Brookens Library, completed in 1976, and the PAC building at the bottom of the cover, completed in 1980). In the center and right back cover) we see the newer buildings: The Health And Sciences Building (1992), University Hall (2004), and the Student Union (2018). The committee thought this was the best image to capture the spirit of STARS this year.

Harshavardhan Bapat, Katelyn Cavanaugh, Elena Dimaggio, Ethan Guinn, Divya Gunjan, Edith Iroagbalachi, Rithesh Raja, Rushi Patel, and **Alakunta Punya Teja** for their photographic work included in this program, selected as part of the Art & Photo Contest.

Jessie Burrell, **Derek Schnapp**, and **Blake Wood** for assistance with marketing and publicity.

Lisa Whelpley for assistance with alumni outreach.

ITS and Web Services for technology support.

Student Research Steering Committee:

Hua Chen
Matthew Geras
Sally A LaJoie
Lucía Vázquez
Yuan Wen
Livia Arndal Woods
Abhi Soni

Research Board:

John Barker
Brandon Derman
Alan Freedman
Tih-Fen Ting
John Transue
Lucia Vazquez
Zihan Liu
Neeraj Rajasekar
Gary Reinbold

Student Technology, Arts, & Research Symposium Planning Committee:

Brian (Cheng-Chia) Chen
Carissa Craven
Sahar Farshadkah
Jessica Flynn
Eric Hadley-Ives
Anne-Marie Hanson
Noah Reynolds
Abhi Soni
Isabel Skinner
Rick Stokes
Lucía Vázquez
Te-Wei Wang
Yuan Wen

**Asterisks indicate student presenters.*

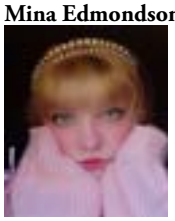
Transformation and Trauma

Teddy Armstrong* with Mike Miller (mentor), Department of Art, Music, and Theatre

My goal is to explore the intersection of poetry and visual arts while experimenting with materials and artforms. This body of work is based on the concept of growth and transformation after trauma. I use different media, such as cross stitch, painting, and interactive art to bring forth the idea of growth from difficult environments. A huge inspiration for me while creating was childlike wonder and how it interacts with trauma. There is a huge focus on consumption and the body throughout these works. Some of these works include a cigarette, a single breast, and an apple that has been bitten. While consumption is often frowned upon, I have turned this usual representation on its head, turning these icons into saints.

Love Without Language

Mina Edmondson* with Allison Lacher (mentor), Department of Art, Music, and Theatre



Love Without Language is a body of work made up of three pieces: The Fallen Star, Bubbly, and The City That Endures. While this series may be small, the message is far from it. Through this work, I use visual imagery to bring forth memories of feats and failures, resilience and trauma, and eventually self-love. Due to my interest in emotional complexity, identity, and the way in which visuals elicit different responses, this body of work explores my own experiences and growing pains to highlight a wondrous, child-like perspective evolving into adulthood.Love Without Language nods to the growth and changes within a person's identity as they navigate through adversity. With the journey of self-love being universally experienced, Love Without Language offers the audience a reminder of their resilience, even when life is uncertain.

More Than a Chair

Cierra Ference* with Mike Miller (mentor), Department of Art, Music, and Theatre

My current work in drawing and painting is an investigation and reconsideration of the boundaries of everyday objects. I have chosen an ordinary chair as a subject due to its connection with everyday life. In our fast-moving and hectic lives, we often take everyday, functional objects for granted until they are needed. Millions of people use this object multiple times a day without any realization of what it symbolizes. I use an airbrush tool and a set of chairs to create designs that expand its original form. These pieces reference David Hammons Body prints. His work involves covering his body in margarine and baby oil and pressing or rolling his body on the floor and sprinkling charcoal and powdered pigment on to it. This design gives his works a ghostly, x-ray look. Rather than using my own body, I imprint chairs to extend its original structure to create multiple possibilities of what this design can become. Some of these works show the full chair but are placed in ways to expand the original image. Others only show parts of the chair in a repeated pattern to create new designs. These works are sprayed onto vinyl that suggest an X-ray image. This method is a way to give these works a life of their own and give the audience a different look at such a common item.

Harshavardhan Bapat

Nuestras Memorias, Shared Memories

Karina Hernandez* with Mike Miller (mentor), Department of Art, Music, and Theatre

The work that I will be displaying are drawings that depict Mexican culture. These drawings consist of Mexican artisanal objects with intricate designs as a frame. I chose to do this series because I want to learn more about my family's culture, and I also want to share the stories and memories that lay behind each drawing. When people think about Mexico, they think about the tourist sites or the stereotypical idea of Mexico, but there is so much more to Mexico. For the first drawing I will display different genres of Mexican music. *Botas picudas* or "pointy boots", represents *musica tribalera*, which is techno. The accordion represents *musica norteña* and the sombrero represents *banda* and *ranchera* music. When I drew this, I thought about my father. His favorite genre is *ranchera* music, and for dances he wears his boots and sombrero. The second drawing consists of a *concha*, a *cantarito*, and a pitcher. Concha is a sweet bread with a seashell-like design on the top. The bread is accompanied by chocolate *abuelita*, which is the Mexican version of hot chocolate, and this is displayed in a big pitcher that is later poured into a *cantarito*, or Mexican ceramic cup. The inspiration behind this drawing is my mother. For family nights she will bring us together with chocolate *abuelita* and a *pan dulce* (a traditional Mexican bread). Not only are these objects dear to me, but they mean so much to Mexico and its people.

The Nature of Posters

Ethan Hughes* with Brytton Bjorngaard (mentor), Department of Art, Music, and Theatre

TMy artwork allows me to express my emotions by drawing from nature and its patterns. The process of developing this work allows me to combine my struggle with severe social anxiety and the soothing effect of nature. This body of work transforms outdoor activities I enjoy into commercial poster designs to convey emotions experienced during the activities suggested by the company in the advertisement. I begin with an activity I enjoy and immerse myself in the emotions it evokes. Through this process I experiment with colors and patterns to find a design that conveys these feelings, while creating an entertaining company in a location that would serve the outdoor activity.

Exploring Humanity's Response to Chaos

Nick Leonard* with Brytton Bjorngaard (mentor), Department of Art, Music, and Theatre

My work examines the emotional and psychological responses of humanity when faced with inevitable catastrophe. These pieces or this piece or this body of work depicts a character, Aiko who indicates quiet acceptance depicted through serene compositions, isolated figures, and soft, muted palettes that emphasize introspection and stillness with chaotic desperation for survival shown through dynamic, erratic brushstrokes, fractured environments, and figures caught mid-motion, embodying panic and resistance at any cost. Aiko reflects the duality of human nature in moments where the world around them falls apart. These moments challenge common depictions of apocalyptic survival, which normally focus on action-driven narratives of heroism, conflict, and struggle against fate. My work focuses instead on the resilience found in surrender and the melancholic beauty within stillness.Thematically, my work explores the fragile balance between action and resignation. By portraying characters who choose reflection over resistance, I aim to create a space for viewers to consider their own responses to crises. These works serve as a meditation on humanity's instinct to survive, even as the end looms, and the quiet strength in acknowledging what cannot be changed.The result is a narrative that examines the universal experience of confronting endings and the ways humans find meaning in the face of the inevitable.

Something's Fishy

Alli Schattschneider* with Mike Miller (mentor), Department of Art, Music, and Theatre

My current work in painting is focused on the unexpected beauty that misplaced objects have when they are put into mundane settings. For example, one painting depicts a fish lodged in a door handle. Why would a fish be lodged in a door handle? Where did it come from? It is captivating to think about a fish out of water- this concept is the guiding principle I use to choose the subjects for my paintings. How can I avoid being normal? Why do we want to figure out why something seems strange or out of place? That "why" and the feelings that come with it are the focus of my art. I want the viewer to become engaged with the painting and create their own story using my seemingly unrelated imagery.I paint these scenes in a specific way that adds elements to the scenes. Using primary colors and expressive brush strokes, I intentionally leave the painted marks unresolved. This makes a scene with some realism but that is also in the process of dissolving. In this way the paintings reveal the slippery nature of knowing, understanding, and defining the world around us.

Life forms from another dimension

Amy Sherwin* with Shane Harris (mentor), Department of Art, Music, and Theatre

In my current work, I focus on two distinct natural patterns: one drawing from leaves and plant formations and the other by sea creatures in my paintings. I often merge two different sea creatures or plant species in a single painting, blending their forms to create new imagined organisms. The consistency in my paintings is there are always two different natural patterns derived from these two themes. By combining these elements, I aim to evoke imagery creatures that I envision the microscopic world would look like. This creates and opens another world of endless possibilities that could live beyond the naked eye. At the beginning of my series I started with smaller forms that looked cellular and worked up to complex creatures. This sequence demonstrates simplified structures of growth to multifaceted life. The texture and color from sea creatures and plants inspires my color palette for my paintings. I chose the tints I find in these forms based on observation and emotions. Turtles originally influenced my earliest artwork, serving as a symbol of my shyness. The unique patterns on the shell drew me in as well. Over the years of embracing my subject matter, I decided to explore a variety of sea creatures outside of sea turtles referencing to becoming socially engaged. This extensive focus mirrors my social engagement and personal growth.

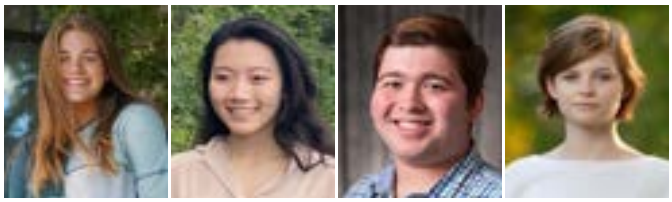
Katelyn Cavanaugh

Chronology Market

Claire Waibel* with Brytton Bjorngaard (mentor), Department of Art, Music, and Theatre

My work is about finding the harmony between minimalism and ornate detail to represent the divide between early and modern graphic design. I am drawn to unite these styles because they are powerful in different ways. I create posters and packaging that abide by modern aesthetics, while also honoring timeless and unique elements of classic design, such as typography and unique shapes. I primarily focus on works from the 18th-19th century, when graphic design first found its identity and purpose. The classic compositions, ornate detail, and typography of early design offer great potential to be used in today's styles and become something better with modern digital programs. I encourage viewers to appreciate the evolution of design and consider how the past can be used as a rich creative resource.

Camerata

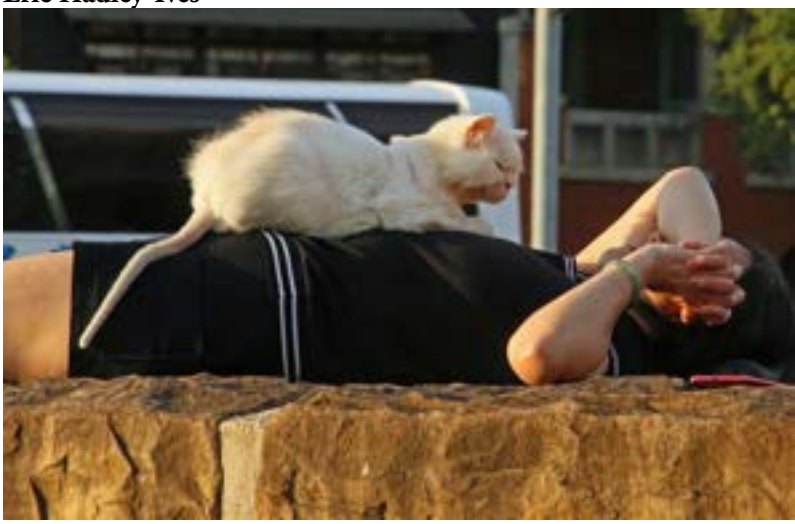


Yunhui Jeong*, Jillian Krieger*, Abigail Su*, Sophia Gambiani*, Jillian Krieger*, Andrew Sims*, Chris Combs*, Alexis Mahr*, Madison Vasich*, Joel Davis*, Matthew Machino*, Corinna Thomas*, & Jacob Heironimus* with Adam Larison (mentor), Music Program

The "Camerata" is an idea that comes from "Florentine Camerata," a group of musicians, humanists, and poets who met in Florence, Italy to discuss trends in the arts, including music. Camerata students at UIS were exclusively chosen through an online or in-person audition. These auditions are designed to evaluate students on skill and musicality, and then on which students would best fit our program. The Camerata program emphasizes self-discipline in the form of solo rehearsal and private lessons. Students learn leadership skills from our diverse group of music professors and from unique experiences within our small ensembles. Private lessons allow our dedicated professors to guide each student to success in a one-on-one setting. Camerata musicians engage in both small groups and large ensembles where students are given the opportunity to interact with musicians from the community; thus promoting professionalism and socialization. Small groups (duets, trios, and more) are the emphasis of this program with the goal of pushing the boundaries of music. Groups will undergo student-only rehearsal and tailored coaching to share and experiment with ideas to prepare the pieces for upcoming events on and off campus. Students are expected to have the self discipline to have practiced their individual parts so by the time of rehearsal, the group can discuss how to fit the individual parts into a whole. The goal of Camerata is to highlight each individual student and ensure that rehearsals are tailored to the student's needs, thus creating an environment in which each student will shine.

Rushi Patel

Eric Hadley-Ives



Panel on Research from Summer 2024 Study Away Program in Japan:
The Obesity Rate Gap Between Japan and the United States and Diet Culture.

Karac Henderson* with Peter Shapinsky (mentor), History

The purpose of this presentation is to combine the current extant data on diet culture and obesity in Japan and the United States with observations I made during my study abroad experience in Japan. I spent two weeks in the Kanto Region of the country, visiting multiple cities and prefectures and interacting with multiple groups of people, primarily college students. There is a significant gap in obesity rates between the United States and Japan. Overweight is defined as a BMI of 25 to 30, while obesity is defined as a BMI of 30 or above. 42.4% ofAmerican adults are obese while only 4% are obese in Japan. The exact causes of this discrepancy are uncertain, but the current literature paints a complex picture. The gap in obesityrates is likely due to a number of factors including differences in urbanization patterns, geography, diet culture, physical activity, social pressures, and socioeconomic disparities. Thispresentation will mainly focus on the impact of diet culture and caloric intake. The observations I made in Japan, while limited, give me a more nuanced understanding of this aspect of the issue. I tried many foods, experienced various types of restaurants, and ate common meals with my hostfamily. Both the literature and my personal experience overwhelmingly indicate that differences in caloric intake contribute significantly to the obesity rate discrepancy.

Panel on Research from Summer 2024 Study Away Program in Japan:
Jazz in Japan.

Adam Skowronski* with Peter Shapinsky (mentor), History

Jazz music has had a tremendous influence on popular Japanese music and has contributed to a large variety of sounds influenced by the musical methodologies of jazz. Jazz came to Japan in the early twentieth century due to increasing globalization, which provided an environment for musicians in Japan to find and make jazz their own. As music evolved later in the twentieth century and traditional jazz fell out of popularity, its influence was still found in many genres which emerged during this time. Using historical academic research alongside theoretical analysis of popular songs sheds light on how jazz influenced the modern Japanese soundscape. Today, the jazz tradition continues to be used as the methods and form of jazz style are emulated in almost every genre popular today. Using my observations in Japan of the music of popular anime as a case study alongside historical academic research, this presentation will shed light on how jazz influence can be found in the modern soundscape. My findings indicate that the music of anime, a style which comes out of Japan, owes much of its substance to the styles found in jazz, which is due to the prominence of jazz in the evolution of music in Japan.

Panel on Research from Summer 2024 Study Away Program in Japan:
Furusato: nostalgic longing and loss of identity.

Maricela Arce* with Peter Shapinsky (mentor), LNT / History

Literally meaning "old village," the concept of Furusato has in the last century taken on new meanings of real loss of identity due to demographic changes in rural areas. This presentation explores the concept of Furusato in two ways. It combines the concept as experienced by the presenter during a two-week long study away program in June 2024—the UIS-Ashikaga Global Experience program—with research. While in Japan, the presenter made considerable observations of abandoned dwellings in landscapes. In conversations, individuals she met revealed their longing for their past and loss of their familial ties. Through the exploration of this concept in fieldwork and scholarship, this presenter will explore the ways in which individuals suffer a loss of identity and sense of belonging as their ties to the land are affected either by uncontrollable circumstances (e.g. environmental catastrophe) or the established societal hierarchical norms.

Panel on Material Culture of Everyday Life in Early Modern and Modern Japan: Artifacts from the Illinois State Museum: *Shrines, Travel, and Connection: Material Culture in Tokugawa Japan, c. 1700-1800*

Tori Kolanowski* with Peter Shapinsky (mentor), History

This presentation combines the study of material culture, Japanese history, and East Asian Religions to explain how a single portable shrine in the collection of the Illinois State Museum can illuminate the importance of spirituality in the everyday lives of individuals in Tokugawa Japan. This shrine holds a statue of the Boddhisatva Jizo, an important figure in Japanese Buddhism. Religious texts, sutras, regard Jizo as a guiding presence for individuals who have recently passed, a source of hope for the struggling, and most importantly, a protector of travelers and children. Jizo first appeared in the sutras before the rise of the Tokugawa clan, a time of political instability, rapidly evolving social structure, and high mortality rates. When the Tokugawa clan began to gain more political control within Japan, ideas of social order and ritual became ingrained within Japanese culture as a means to avoid disorder and the political instability that had plagued the country for decades beforehand. At the same time, with peace came peace dividends of commerce and travel on systems of roads and sailing routes. Devotion to one's religion, or specifically one figure like Jizo, is shown through shrines created in order to bring guidance and cultural ties wherever they may go outside of the household. While the individual may no longer be able to tell us in the present, the extent of their travels, everyday routines tied to their spirituality, and key moments of life can become visible, through objects such as this shrine to Jizo.

Panel on Material Culture of Everyday Life in Early Modern and Modern Japan: Artifacts from the Illinois State Museum: *A Look at Japan's Sartorial History: The Identities of the modern Kimono*

Celia B. Christen* with Peter Shapinsky (mentor), History

A person's clothing is both among the most overt and most malleable aspect of their identity. By exploring material culture such as a formal dress kimono/wedding kimono (*kurotomesode*) housed at the Illinois State Museum, we can reveal an intimate look at how kimono embody the idea of self-fashioning. Serving as the dominant wear of Japan for centuries, kimono, originally known as "small sleeved gowns" (*kosode*), were an integral part of Japanese everyday life. Not tied to a specific gender, class, or lifestyle, the robes changed with those who wore them, becoming an outward-facing and explicit message of identity, thus enabling becoming through clothing. Every aspect— fabric, color, sleeve length, symbols, motifs— was chosen with intent to communicate something about the wearer. Through clothing alone, intimate details could be revealed, status hierarchies enforced, and art could be woven into a person's day-to-day life. This kimono specifically was created following the introduction of Western influence in the Meiji period of Japan (1868-1911), a time period that caused the solidifying of two distinct categories of being through clothing: Japanese clothing (*wafuku*) and Western clothing (*yōfuku*). The kimono, though eventually phased

Elena Dimaggio

out of everyday wear, transitioned into a symbol of Japanese national identity, which them empowered the wearer to signify Japaneseness . This *kurotomesode* in particular personifies a mother of the bride/groom ready to participate in a wedding, a celebration of love and a transition to a new state of life — and for the guests, an excuse to don fancy and exciting clothes.

Panel on Material Culture of Everyday Life in Early Modern and Modern Japan: Artifacts from the Illinois State Museum: *Fashioning Identity in Early Modern Japan: Understanding the history of Seal Containers (*Inro*)*

Finn Atteberry* with Peter Shapinsky (mentor), History

During the Edo period (1600-1868) in Japan, shogunal laws dictated much of what a person could and could not wear based on status. Small displays of identity became critical to the representation of self for a variety of status groups. Enter the *Inro* (seal container), a small series of intricately designed boxes stacked on top of each other and connected via a cord which threaded through a small figurine called a *netsuke* (toggle) which secured the inro to one's belt and ended in a carved bead (*Ojime*). Each aspect of the *Inro* could be customized from number of boxes to color and design. Each piece was intricately crafted by a skilled artisan and offered not

only a display of wealth but acted as a treasured heirloom that could be passed through the generations. Combining scholarly research with hands-on investigations and observations, this project exhibits a close reading of one such inro as well as the *ojime* and *netsuke* attached to it, which can be found in the Condell collection within the Illinois State Museum collections. This *Inro*'s gilded exterior and intricate design depict the Eastern Sea Route (*Tokaido*) which linked the capitals of Edo (modern day Tokyo) and Kyoto, a route which teemed with political, commercial, and cultural traffic. Its various post-stations becoming the source of many poetic and artistic tributes. The toggle and bead further illuminate the identity and possible connections of the owner to the highway with depictions of individuals riding an ox and dogs playing along a waterway.

Increasing Access to Nature in Springfield for Girls of Color: An Internship with the Illinois Department of Natural Resources' Office of Community Outreach

Nancy Cano* with Kyle Blount (mentor), Public Health, and Vincent Flammini (mentor), Social Work.

The Illinois Department of Natural Resources' slogan is "Everyone Belongs in Nature," promoting the goal of inclusivity and accessibility to the outdoors. Although there have been significant advancements toward this goal, not all IDNR programming is accessible or inclusive. The importance of being outdoors is proven by its physical, mental and social benefits. Simple exposure to green spaces reduces the risk of several types of illnesses, such as cardiovascular disease and type II diabetes, along with mental illnesses such as depression and anxiety. It is crucial for children to be exposed to nature, yet girls of color in the United States have less access to nature than the overall population. Using social work concepts, such as the person-in-environment theory and trauma-informed care, implementing strategies that increase access to IDNR programming to girls of color in Springfield, Illinois is possible. With guidance of IDNR program coordinators, local partners, and literature on access to nature, a plan with recommendations for engaging girls of color in Springfield will be created. The recommendations will also include a summary of social work principles that can be applied to these strategies. Finally, the proposal will include evaluation metrics. This presentation details progress towards the completion of this plan and its major components.

Canary in the Crow's Nest: William Kidd's as an Extension of Henry Avery

Cameron Brown* and Peter Shapinsky (mentor), History

This presentation conducts a close reading of the primary source evidence related to the notorious pirate Captain Kidd to interrogate scholarly arguments linking piracy, the suppression of piracy, and the growth of the British Empire in the seventeenth and eighteenth centuries. Prior to the end of the seventeenth century, English support for piracy was integral to the growth of the wider empire. Colonial American support for piracy was present both on the docks and in the gubernatorial mansions throughout the colonies, leading the victims of piracy, particularly the Mughal Empire in the Indian Subcontinent, to claim that England was a nation of pirates, threatening their burgeoning empire. This support culminated in the 1695 capture of the Ganj-i-Sawai, in which Henry Avery captured a Mughal treasure ship and disappeared, only facing an English trial in absentia. Captain William Kidd's 1701 trial for piracy is thus often seen in scholarship as a watershed moment in English support of piracy, representing the moment in time the Empire officially turned against such support. However, a close reading of Kidd's trial record reveals that Kidd's trial is as much about Henry Avery as it is about William Kidd, linking the two figures in reputation despite their differences in esteem, practice, and success. Thus, though Kidd proves to be an important figure in the history of cultural mythmaking as well as legal theory surrounding piracy, one must contextualize discussions of Kidd with reference to Henry Avery to avoid overemphasizing Kidd's impact in the historical tradition.

Utilizing Infographics to Educate Asian Communities about Fatty Liver Disease

C.J. Campbell* with Lan Dong (mentor), English.

Non- Alcoholic fatty liver disease (NAFLD) and its progressive form, non-alcoholic steatohepatitis (NASH), are on track to rise dramatically globally through the upcoming decade. Current studies and models forecast that occurrence of NAFLD will reach 55.4% by 2040 with China slated for the highest increase in cases and many countries within the Asian Continent filling out the top predicted cases globally. Despite this projected increase in prevalence of liver disease cases, the standard treatment for these diseases focuses upon diet and weight management. This project offers an infographic that is rhetorically crafted for community and clinical settings, intended to educate the public about these liver diseases in an approachable and engaging way. The rhetorical structure presents simple and direct information while educating the audience the diseases' presentation, addresses misconceptions, and emphasizes Asian representation in the growth of NAFLD & NASH cases. Through illustrations, the infographic presents the liver's transformation due to fat deposits. The infographic guides the potential audience toward conversations with healthcare providers which will potentially lead to greater awareness of risk factors and proactive health interventions within Asian Communities.

The Disney Kingdom: How Disney Has Changed Fairy Tales

Alishwa Nisar* with Lan Dong (mentor), English.

Disney has always faced criticism for the films they produce and their business practices as a multimedia conglomerate, but the effect that they have had on storytelling is undeniable, especially when it comes to their adaptations of fairy tales. Beauty and the Beast, The Little Mermaid, and Tangled all have differ from their original tales but are also the primary way we engage with those fairy tales. Can we say that Disney's adaptations are wholly positive or negative? In this presentation, I seek to explore how the changes to the plots, themes, and messages of these movies reflect a changing audience and how we think of those original tales and what Disney's role has been in their popularity and preservation.

AI-Powered Consumer Journey: The Evolution of Data-Driven Business Growth


Oluwatomisin Adedoyin* & Rachael Akalia* with Jorge Villegas (mentor), College of Business and Management

The consumer journey has evolved from human knowledge-based marketing to AI-driven decision-making, significantly changing business strategies. Historically, brands relied on demographic segmentation and mass media advertising, but AI now enables hyper-personalization, real-time sentiment analysis, and predictive modeling. This study examines AI's transformative role in consumer behavior, integrating traditidional perspectives with modern advancements.A systematic review of peer-reviewed studies (2015–2024) from Google Scholar, McKinsey, Harvard Business Review, and MIT Sloan was conducted. Findings reveal that AI-powered personalization increases revenue by 10-15%. AI-driven pricing models enhance profitability by 23%, and AI-powered customer engagement improves lead conversion by 50%. In one particularly clear example of the vital role of AI, Netflix's recommendation engine drives 80% of its total watch time.Moreover, AI-enabled forecasting has reduced inventory costs by 50% and optimized supply chains by cutting the cost of goods by half. Even with these benefits, the ethical concerns have not changed. A 2023 study by Nature Machine Intelligence found that 72% of AI marketing models exhibit bias, disproportionately influencing consumer choices. Furthermore, 65% of consumers are concerned over the AI-driven personalization and the privacy and regulation challenges.AI is changing business and consumer interactions, using both traditional marketing strategies and AI predictive intelligence. This research provides a comprehensive and forward-thinking roadmap for businesses aiming to leverage AI responsibly while ensuring transparency and consumer trust. As AI adoption keeps evolving, addressing ethical considerations will be significant in sustaining long-term growth and competitive advantage.

How Music Participation Can Lead to Success in Corporate America

Melody Colonel* with Elise LoBue (mentor), Capital Scholars Honors Program

Children who engage in music programs through K-12 education or other means are more successful in Corporate America. Work productivity, advancement opportunities, and salary set those who participate in music programs apart from their non-musical peers through the development of soft skills enhanced at a younger age. By looking at music's impact on various general functions of a person and how they function, one can understand how the corporate workplace can utilize and reward these individuals with future opportunities. The skills developed in music classrooms can be applied and expanded upon throughout a career, leading to increased success.

Strategic Plan for EMCOR Group's Mechanical Construction Sector




Hamza Azhar*, Sharmeen Shafiq*, Tanzila Achchu*, Emmanuel Busari*, Ken Nwafor*, & Daniel Ake* with Sevilay Oral (mentor), Management Marketing Operations

Strategic planning is essential for maintaining a competitive edge in the evolving mechanical construction industry. Traditional business strategies often rely on static market analyses, limiting their adaptability to dynamic industry challenges. This study explores a data-driven approach to developing a comprehensive strategic plan for EMCOR's mechanical construction division, addressing critical challenges and identifying key growth opportunities. A multi-faceted analysis was conducted, incorporating market trend evaluation, competitive landscape assessment, and a SWOT analysis to determine strengths, weaknesses, opportunities, and threats. The study examined workforce development initiatives to mitigate labor shortages, supply chain risk management strategies to address material cost fluctuations, and the integration of advanced technologies such as AI and automation to enhance operational efficiency. Sustainability compliance and green building initiatives were analyzed to align with evolving regulatory requirements. Additionally, strategic differentiation approaches were formulated to strengthen EMCOR's market position. The final strategic plan was developed based on data-driven insights and industry best practices, ensuring actionable recommendations for long-term growth. Findings highlight the importance of proactive workforce training, resilient supply chain strategies, and technology adoption in driving operational efficiency and competitive advantage. Future work will explore dynamic modeling of market shifts and emerging industry trends to further refine EMCOR's strategic positioning in the mechanical construction sector.

Elena Dimaggio


Harshavardhan Bapat

ADHD, Color & Design

Sunnie Miles with Brytton Bjorngaard (mentor), Art, Music, and Theatre

Students in higher education with attention-deficit/hyperactivity disorder (ADHD) face unique obstacles. Adults with ADHD often struggle with attention, organization, and cognitive overload, which can severely affect academic performance and accessibility. Given that individuals with ADHD are less likely to earn a degree compared to their peers, there is a clear need for learning strategies designed to support students with ADHD in higher education.My research looks at the relationship between ADHD, color, and design to better understand how visual elements affect focus, engagement, and comprehension in college-age learners. By combining principles from psychology and graphic design, this study explores how structured layouts, typography, and color choices can improve information processing while reducing cognitive overload. It also explores the use of alternative learning tools, like visual aids, text-to-speech, assistive devices, and interactive eBooks. Good design goes beyond aesthetics, it serves as a powerful tool to direct attention, break down complex concepts, promote organization, and improve accessibility.

Analyzing the Impacts of Outdoor Recreation Activities on Students at University of Illinois Springfield

Anna Schurz* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability and Public Health

Outdoor recreation activities have been shown to have a significant positive impact on participants. The promotion of outdoor recreation activities by universities enhances the college experience of participating students by offering the opportunity to develop a sense of place, relieve their stress, bond with nature, and engage in physical activity. However, there is an increasing disconnect to nature, as especially students do not have regular interactions with the natural environment, emphasizing the need of these programs. This study investigates the implementation of outdoor recreation activities at the University of Illinois Springfield, a public university in central Illinois. Through a survey of participants that includes free response and multiple-choice questions, the research analyzes the effects of participation on students' mental and physical wellbeing, as well as the influence on their academic stress. The research further seeks to shed light on the motivations and barriers to campus outdoor recreation to understand how these programs can expand their impact. Overall, the study will provide insights to student benefits of outdoor recreation programs and identify opportunities to improve and expand their influence.

Community Gardening: A Pathway to Self-Sustaining Neighborhoods

Emily Rhodes* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability and Public Health

Food deserts are geographical locations in which residents' lack access to affordable and healthy food, particularly fresh fruits and vegetables. The east side of Springfield, Illinois, is home to the highest number of Black residents in the city and is disproportionately filled with food deserts. This project aims to understand the potential positive effects of community-based collaborative work to actively provide food in ways other than food related charities (such as breadlines) to empower and improve the health of those residing in food deserts through active engagement. This work is informed through a literature review and volunteer work with a community garden in east Springfield run by The Motherland Community Project, an organization that focuses on sustainable agriculture and innovative production, community development projects, conservation, and advocacy. This project will also explore the ways in which race and segregation impact the struggles and successes of navigating food deserts. These observations and understandings will be grounded in a recognition of positionality, as a white individual operating in a primarily Black community and organization working hands on with volunteers, communicating with volunteers and community members, and studying the organization's data. This project will highlight the development and persistence of food deserts, the ways that food deserts disproportionately affect marginalized groups, and the role of community gardening in promoting food autonomy.

Implementing and Differentiating an Environmental Education Activity on Water Quality for Students of Varying Ages

Gabriela Sanchez* with Kyle Blount (mentor), Integrated Sciences, Sustainability, and Public Health

The developing minds of grade school students provide fertile ground to learn about environmental issues and foster individual action. The discipline of environmental educationprovides insights into effective ways to teach environmental issues. This project will draw upon these insights and engage school students from a wide age range with an educational and fun hands-on activity to understand one of the environmental issues we face today, water quality. This activity will highlight the common impairments of water quality and the importance of protecting water quality in students' lives. Students will have the opportunity to use water testingstrips to test water from the UIS pond located on campus and drinking water. The project will collect feedback on the students' engagement with the activity, allowing for improvements in the activity between implementations. Then, drawing upon this feedback and experiences with implementing the activity across age groups, the project will provide recommendations that help educators understand thepreferences of each age group and adjustments that can help improve their learning and motivate student environmental action.

Is Partnership the Way? Exploring the roles of Private and Nonprofit Organizations in Disaster Management

Elijah Eshun* and Suyang Yu (mentor), School of Public Management and Policy

State governments face significant challenges in managing natural and human-made disasters. While much research has focused on government-led disaster management strategies, few studies have explored the role of private and nonprofit organizations in these efforts. Our study focuses on the collaborative responses between state/local government agencies and nongovernmental stakeholders within Illinois state. Specifically, our study investigates three key questions: (1) Who are the key nongovernmental partners involved in disaster preparedness and response at the local level? (2) What resources and services do these private and nonprofit organizations provide? (3) What roles do these stakeholders play in the risk decision-making process?Through interviews with 29 experts from local emergency management agencies and their partners, our thematic analysis reveals the following: first, the number and nature of nongovernmental stakeholders involved in disaster preparedness and response are diverse and often temporary, depending on the capacity of the local community. Second, the resources and services provided by these stakeholders vary, largely influenced by the length of the partnership and the trust developed through repeated disaster preparedness simulations. Finally, despite the involvement of nongovernmental organizations, government agencies continue to dominate the risk decision-making process.We conclude that government agencies must strengthen connections with nongovernmental organizations before disasters occur to mobilize local resources effectively and enhance response capacity. Our findings emphasize the need for structured collaborative frameworks for disaster management, particularly in resource-scarce rural areas. It contributes to disaster management theories by expanding the understanding of collaborative governance in disaster preparedness and response.

Negotiating Gendered Identities: An Ethnographic Study of Hizmet Young Adults in Canada

Julia Nash* & Adison Rumler* with Elise LoBue (mentor), Capital Scholars Honors Program

Hizmet is a word meaning "service," a quality exemplified by the Hizmet movement. Originating in Turkey, it was founded by Fetthulah Gulen on principles of education, language acquisition, immigration, and radical servitude for others. Although it is loosely affiliated with the Islamic religion, Hizmet does not strictly enforce religious beliefs and is largely apolitical. However, after the attempted military coup in July 2016, the Turkish government wrongfully labeled Hizmet affiliates as terrorists and began targeting them for discrimination, persecution and prison. Many had to seek asylum to escape indictment. One of the more popular countries in which Hizmet refugees have settled is Canada. Because of the cultural shift of growing up in Canada, the younger generations of Hizmet coming of age in a Western society have reported that Hizmet and Turkish culture introduce some challenges to integrating into Canadian life. The drastic differences between Turkish culture and the Western world have also created some tensions between the older and younger generations. These tensions have manifested in a new direction for our research, emphasizing the generational and gendered identities that conflict across sociocultural contexts. As a result, we have gained insight into the potential future of Hizmet in Western societies, including the decentralization of the movement in the younger generation's lives. These feelings of generational divide and uncertainty have been reflected in several interviews we have conducted as a part of our broader research on Hizmet and salutogenesis. This avenue of research is a facet of our larger work in progress.

Protective Factors Against Intergenerational Trauma Among Southeast Asian Americans

Kyla Leones*, with Frances Shen (mentor), Department of Psychology

Many Southeast Asian Americans (SEAAs) have experienced traumatic events, such as wars and displacement. Studies indicate SEAAs experience intergenerational trauma, wherein perceived parental trauma can affect the next generation's mental well-being and emotional distress due to parents' reduced capacity to form secure attachments with their children (Han, 2004; Ly, 2022). In this study, we examined whether collectivistic coping, post-traumatic growth, ethnic identity, and self-care practices serve as protective factors for SEAAs experiencing emotional distress caused by parental trauma. We recruited 151 SEAAs through Prolific to complete the Multiethnic Identity Measure-Revised (Phinney & Ong, 2007), Intergenerational Congruence in Immigrant Families-Child Scale (Ying & Han, 2007), Harvard Trauma Questionnaire-Revised (Mollica et al., 1992), Hopkins Symptoms Checklist-25 (Mollica et al., 1992), Collectivistic Coping Scale (Heppner et al., 2006), Post Traumatic Growth Inventory (Tedeschi & Calhoun, 1996), Self-Care Practices Scale (Lee et al., 2019), and a demographic questionnaire in an online survey. Using the PROCESS (Hayes, 2013) macro in SPSS, we examined the moderating effects of collectivistic coping, post-traumatic growth, ethnic identity, and self-care practices. We found that self-care practices and post-traumatic growth significantly moderate the relationship between intergenerational trauma and emotional distress but not ethnic identity development and collectivistic coping. Mental health providers working with SEAAs can promote post-traumatic growth and self-care practices to mitigate the adverse effects of intergenerational trauma on emotional distress.

Return to Taiwan: An Ethnographic Experience

Maricela Arce* with Neeraj Rajasekar (mentor), Sociology/Anthropology

In the summer 2023, the presenter participated in the UIS ECCE Global Experience: Taiwan, to explore their academic interest of Indigenous environmental justice, with an international focus. Once in Taiwan, the presenter traveled to Lanyu, an island off the southeast coast of the main island and met individuals belonging to the Tao Tribe. Lanyu is of special interest to the presenter due to the nuclear storage facility built on the island. The trip, en route to Lanyu, provided many adventures and created long-lasting memories from interactions with Indigenous peoples of various Taiwanese tribes. Using an ethnographic-inspired approach, this presenter will share observations, conversations and photographs to detail their learning experiences.

The Impact of Active Listening on the Development of Interpersonal Relationships

Catherine Kennedy* with Elise LoBue (mentor), Capital Scholars Honors Program

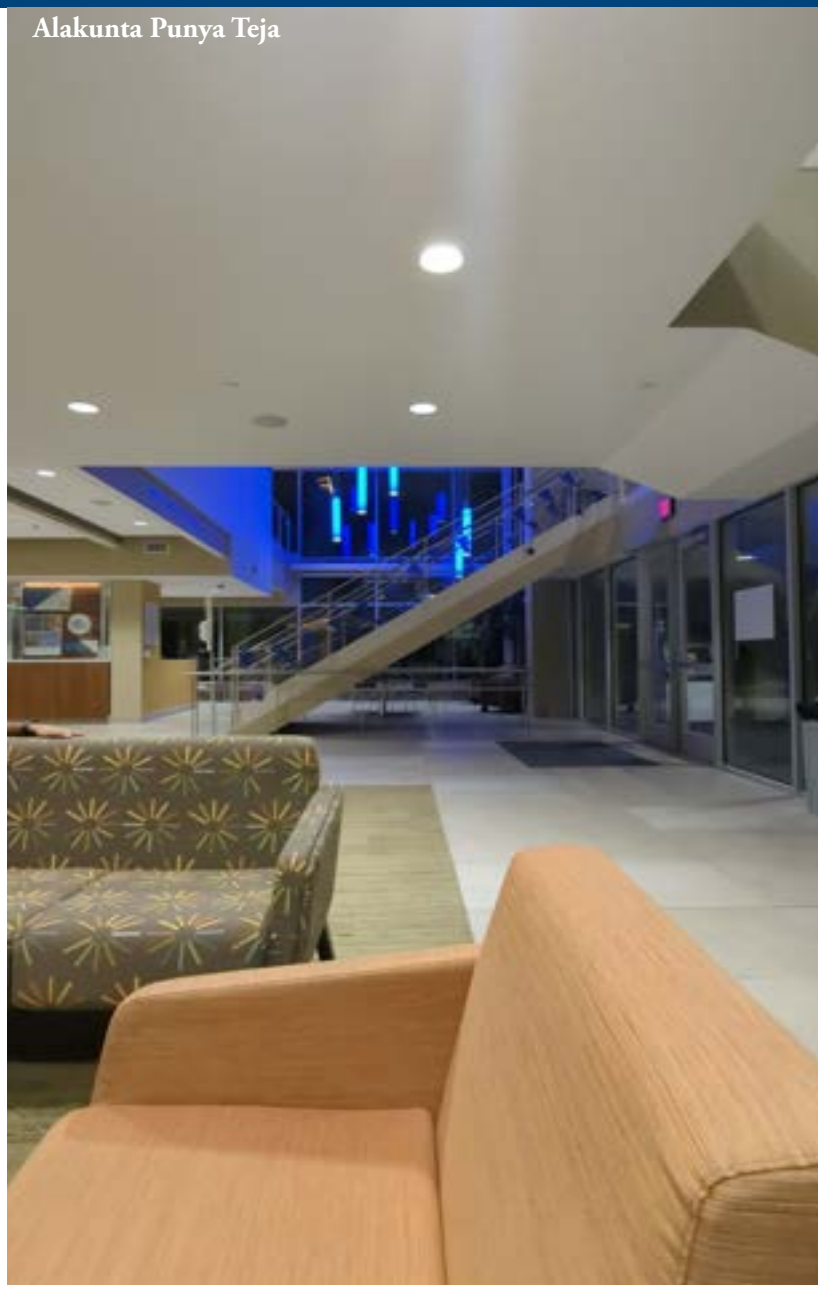
Feelings of being "heard" have suffered tremendously with the increased availability of technology and decreases in one-on-one conversation. Moreso than ever, listening is decreasing, replaced by online communication. This review article presents the benefits of active listening in everyday life. At work, feeling actively listened to and respected is significantly more important to employees than pay, and also increases employee belonging and productivity, helping employees create meaningful relationships (Kluger and Itzchakov). Mentally, individuals who utilize active listening have advanced emotional intelligence, can more easily create long-term relationships, are more empathetic and expressive, and tend to be happier on an overall level(Wang et al.). Strong active listeners can use their strengths to improve their communicative competence, increasing their attractiveness to others psychologically. Active listeners who combine listening with high social and task attractiveness were rated significantly more attractive socially by others when compared to those who do not utilize active listening to improve their communicative competence (Duran and Kelly). By successfully using awareness, reception, andperception to enact a concept coined as "sensitivity", active listeners are significantly more capable of building meaningful and lasting relationships where all parties involved feel respected and understood than passive listeners (Duran and Kelly). Active listening is a crucial skill that impacts all areas of life and can significantly improve one's ability to develop and maintain strong interpersonal relationships..

The Implications of the Americans with Disabilities Act on Autism Unemployment

Melody Colonel* with Isabel Skinner (mentor), School of Politics and International Affairs

The Americans with Disabilities Act of 1990 (ADA) was a first-of-its-kind act of legislation aimed at protecting the rights of disabled people in the United States. The ADA protects disabled people from discrimination in a multitude of areas, including employment, public accommodations, transportation, and many others (Americans with Disabilities Act of 1990 (Original Text)). However, the ADA is that it was a very broad piece of legislation which attempted to encompass the entire disability community in the United States. This allowed for many loopholes to be found and applied by corporations. ADA Amendments were passed in 2008 which broadened areas that had previously been unclear. The way disabilities have been tracked and measured over the last 50 years has changed significantly as disability classifications are altered as researchers learn more about the disabilities themselves. Autism Spectrum Disorder (ASD) and other cognitive disabilities have greatly evolved in how they are diagnosed, tracked, and treated, ultimately now being the culmination of multiple cognitive diagnoses grouped into a spectrum of severity (Daniels and Mandell). As the diagnosis process continues to change for ASD, the central research question for this paper is: What were the unintended consequences of the ADA of 1990 for those with cognitive disabilities, predominantly those with Autism Spectrum Disorder, and how have they hindered employment ratings of those with ASD? I find that the ADA and its 2008 amendments negatively impacted the employment and retention of employees with Autism Spectrum Disorder, hindering the community's ability to survive in American society.

Alakunta Punya Teja



Rithesh Raja

Anti-Oxidative Effects of Beta 1.2 Subunit

Frankie Molitor* with Natalya Zinkevich (mentor), Biology

Kv1.5 channels are important in vascular health and disease, making understanding their regulatory mechanisms critical. Last semester, I assessed the role of β1.2 subunit in proliferation of HEK 293 cells expressing Kv1.5 channel and β1.2 subunit. Results confirmed the Kv1.5 blocker, DPO, increased proliferation in Kv1.5 + β1.2 cells but didn't affect Kv1.5 only expressing cells, suggesting β1.2 inhibits proliferation and DPO negates this effect. This semester, I expanded my research, testing if β1.2 subunit protects cells from harmful effects of oxidative stress. Kvβ1.2 subunits are essential regulatory components that enable Kv1.5 channels to open at -30mV, within the physiological range. Since Kv1.5 channels influence cell regulation and oxidative stress is linked to cardiovascular disease, we investigated their interaction.Over four weeks, we plated HEK 293 cells expressing Kv1.5 + β1.2 on two dishes. One treated with DPO and another left untreated. We induced oxidative stress by adding hydrogen peroxide (final concentration 100μM) and acutely incubated the cells, taking pictures before and after exposure to oxidative stress. Bright field images (four frames per experimental condition) revealed lower cell numbers in DPO treated dish after exposure to H2O2 compared to untreated dish. DPO Toxicity was tested with Trypan Blue assay, determining it's not toxic to HEK 293 cells.ImageJ software will be used to analyze cell density in experimental trials. Preliminary image analysis coincides with our hypothesis suggesting the protective role of β1.2 regulatory subunit against oxidative stress.

Ascertaining the role of watershed processes in mediating Cyanobacteria growth in Lake Springfield, Sangamon County, IL

Ava Maria Mendoza* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability, and Public Health

Understanding the growth of Cyanobacteria in Lake Springfield is essential to preventing future harmful algal blooms and reducing unpleasant taste and odor in drinking water. Nutrient cycles and their contributions to surface water quality exert a strong influence on the timing and extent of algal blooms. When high concentrations of phosphate and nitrate enter surface water bodies via runoff, algal blooms may result. This presentation will detail research plans to examine the role of nutrient availability, and the hydrologic and biogeochemical process that control it, on Cyanobacteria growth in Lake Springfield. Specifically, this work will answer the question: How does the role of precipitation influence nutrient availability for Cyanobacteria in Lake Springfield? Using watershed, precipitation, Phosphorus, and total suspended solids (TSS) data from Springfield, Illinois's City, Water, Light and Power (CWLP), this work will employ the RHESSys ecohydrological model to analyze nutrient movement under different precipitation conditions in Lake Springfield. It is anticipated that periods following heavy precipitation and during which surface water contains high concentrations of nutrients and TSS will result in larger and/or more frequent algal blooms. The findings from this research will help provide clarity to ongoing debates about the relationships between climate-related changes to precipitation and Cyanobacteria growth and will assist Springfield's CWLP in developing improved monitoring and water management strategies to prevent harmful algal blooms.

Assessment of Kv 1.5 Channel's Ability to Protect Cells from Oxidative Stress

Alexander Rhodes* with Natalya Zinkevich (mentor), Biology

This project utilized HEK 293 cells expressing Kv 1.5 voltage gated potassium channels that mediate proliferation in vascular smooth muscle cells and respond to oxidative stress. The purpose of this research is to determine the effect that hydrogen peroxide has on these Kv 1.5 channels upon being treated with DPO (Kv1.5 channel inhibitor). Over the course of four weeks, HEK 293 cells expressing Kv 1.5 channels have been grown onto 100 mm dishes with cell culture media (10 ml) in the presence or absence of DPO; then the cells were exposed to 10 microliters of 100 millimolar hydrogen peroxide solution for 15 minutes. Brightfield spectroscopy images of both samples were taken before and after cells had been treated with hydrogen peroxide with no major differences noticed in concentrations. Image J and statistical analyses will be utilized to draw conclusions. To assess possible toxicity of DPO we used cell counting protocol utilizing a hemocytometer and Trypan Blue dye. Upon exposure to hydrogen peroxide, both samples demonstrated viability above 70% (87.2% in DPO-treated vs. 74.7% in untreated cells). Our findings suggest that Kv 1.5 channel without regulatory subunit is not sensitive to hydrogen peroxide, as DPO failed to decrease cell viability, or visibly affect cell morphology on spectroscopy images. This experiment also led to the optimization of cell counting procedure which maximizes efficiency while improving accuracy, to be used in the future.

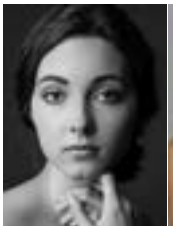
Asthma on the onset of Juvenile Idiopathic Arthritis in children of the United States: A pseudo-cohort, propensity score weighting analysis using the National Survey of Children's Health

Manisha Attaluri* & Riya Elizabeth George* with Yu-Sheng Lee (mentor), School of Integrated Sciences, Sustainability, and Public Health

Background: Asthma is the most common chronic condition in children, while the possible association of asthma with Juvenile Idiopathic Arthritis (JIA) is not clear yet. This study aimed to examine the association between JIA and asthma using a considerable, nationally representative dataset while controlling for possible confounding variables.Methods:Observations from the period 2016-2021 in the National Survey of Children's Health were analyzed using Propensity Score Weighting to diminish confounding effects. The sample consisted of 204,766 children without asthma and 16,587 children with asthma. Primary predictors of JIA were identified using the Least Absolute Shrinkage and Selection Operator (LASSO) regression model. Results: Asthma prevalence was higher among children with JIA than among those without JIA: 0.84 versus 0.20%. The odds of asthma associated with JIA were significant, (1.51, 95% CI 1.34–1.71, $p < 0.0001$). The other risk factors identified were household food insecurity, OR = 1.42, $p < 0.0001$, chronic physical pain, OR = 1.37, $p < 0.0001$, diabetes, and heart conditions. The current cross-sectional study had potential reverse causality in household smoking and limitation of establishing

temporality.Conclusions:This research presents an independent risk association between asthma and increased susceptibility to JIA. The data indicates a probable common mechanism or pathway between the two diseases. Despite the robust methods used, the study's cross-sectional design limits the causal inference. Future longitudinal studies are required to establish causality and examine underlying mechanisms. This study could have implications for targeted interventions to more effectively manage these chronic conditions in children.

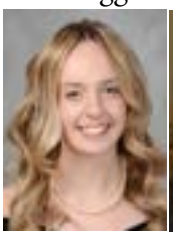
Bats: A Sustainable Solution for Reducing Pesticide Use in Illinois Agriculture




Kathleen Toomey* & Norah Wright* with Megan Styles (mentor), School of Integrated Sciences, Sustainability, and Public Health Environmental Science

Bats play a critical role in agricultural pest management by reducing the need for harmful insecticides. Exposure to pesticides, combined with diseases such as white-nose syndrome, has caused a decline in bat populations. This decline has led to increased insecticide use, which negatively affects biodiversity, human health, and ecosystems. Illinois depends on agriculture economically and is home to four species of endangered bats that could be negatively affected by increased insecticide use. This research emphasizes the importance of maintaining bat populations as a sustainable alternative to insecticides as pest control. The recommendations to achieve this are chemical-free farming, habitat preservation, maintaining clean water, and protecting native biodiversity. Research in Italy's apple orchards has shown that active bats in the area significantly reduce the amount of crops lost to pests. There are multiple steps to ensure healthy bat populations near agricultural areas: planting native trees, protecting water sources from pollution, reducing or eliminating chemicals used on agricultural land, removing invasive plant species from the area, and utilizing assistance provided by the USDA Farm Bill programs. Implementing these steps not only helps to support bat populations but also provides environmental and economic benefits, including cleaner water for all, healthier crops, and enhanced biodiversity. Overall, this research highlights the way that farmers and bats can engage in a partnership that benefits both parties.

Comparison of "green"-tagged macrophages and "red"-tagged endothelial cells




Olivia Woods*, Abigail Hemmer*, & Zamya Wade* with Natalya Zinkevich (mentor), Biology

Cell proliferation plays a crucial role in vascular biology, contributing to atherosclerosis, and in carcinogenesis, where tumor cells divide uncontrollably. We are studying cell fusion events in order to better understand carcinogenesis and improve cancer treatment strategies. We are studying the proliferation of mCherry-tagged (red) rat lymphatic endothelial cells (RLEC) and GFP-tagged RAW264.7 macrophages from GFP-expressing mice via fluorescent microscopy and ImageJ software. Utilizing sterile cell culture techniques, each cell line is introduced to a flask on Monday and incubated with 5% CO2 at 37°C. Media is changed on Wednesday, and cells are split into new flasks and frozen on Friday. Cell confluency is measured daily using brightfield microscopy. Fluorescent images of the cells are captured and analyzed with ImageJ software. A hemocytometer is used for cell counting. Our research aims to refine protocols for studying cancerous cell fusion events, with the potential to uncover new drugs and treatment strategies for cancer, endothelial disorders, and chronic inflammatory conditions. The proliferation rates of the two cell lines were compared by plating them at equal density and measuring confluency over the course of the week. We observed that green cells reached 80% confluency every 48 hours, while red cells reached 80% confluency every 72 hours. Over three weeks, ImageJ software was used to analyze the images and estimate confluency. Our findings suggest that plating more red and fewer green cells will increase the number of fusion events, thus maximizing the efficiency of future studies.

Comparison of Environmental Health and Biodiversity in Formerly Green/Blue, Yellow, and Redlined Areas in Springfield, Illinois

Salem Schultz* with Kyle Blount (Mentor), Integrated Sciences, Sustainability, and Public Health

From the 1908 Race Riot to the recent murder of Sonya Massey, Springfield has seen more than its fair share of publicized instances of white supremacist violence`. What fails to get much attention, even locally is that the income disparity between black and white households in Springfield is the worst in the nation; a fact which is intimately tied with our history of redlining. I will investigate how this history of racially based mortgage lending practices from the New Deal era and onwards have affected the environment of those neighborhoods into the present day. I will be doing a total of 6 observational periods for this study, 2 in formerly green/blue neighborhoods (classified as "best" and "still desirable"), 2 in yellow neighborhoods ("definitely declining"), and 2 in red neighborhoods ("hazardous"). I will be collecting observational data on species present and the number of individuals within those species for mammals, birds, and pollinator invertebrates, as well as water samples and regular air quality tests. Additionally, I will be creating a precise land cover map showing how much of each study area consists of lawn, tree cover, pavement, buildings, water, and forested area. I expect to find a gradient of all these environmental factors, with the poorest environmental conditions in formerly redlined areas, and the best in greenlined areas. My findings will hopefully lead to a more holistic understanding of the long-term environmental effects of redlining in Springfield, IL, and potential community involved solutions to those issues.

Construction of a library of random mutations in the yeast tyrosyl-tRNA synthetase

Micah Baptiste* with Noah Reynolds (mentor), Biology

Aminoacyl tRNA synthetases are enzymes that couple transfer RNAs (tRNA) with their corresponding amino acids and thus play a critical role in protein synthesis and overall cellular function. Recent studies have shown that mutations and defects in aaRS encoding genes can lead to aminoacylation deficiencies that trigger the integrated stress response and contribute to human diseases, including the neurodegenerative Charcot-Marie-Tooth disease (CMT). To investigate the effect of mutated aminoacyl-tRNA synthetases on the cellular stress response, we have developed a library of random mutations in the Saccharomyces cerevisiae tyrosyl-tRNA synthetase. Our overall objective is to better understand how disruptions to the tyrosyl-tRNA synthetase are influencing the neurodegenerative processes in CMT.

Dishonorable Discharges: Managing Stormwater in Springfield, Illinois

Steven Simpson-Black* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability and Public Health

Springfield has combined sanitary-storm sewers in its older neighborhoods and downtown business district. During heavy rains, the combined sewers overflow into nearby creeks untreated due to limited capacity to treat the sewerage at the treatment facilities. This overflow, known as a Combined Sewer Overflow (CSO), includes human waste and other sanitary waste. Cities are required to report CSOs and the wastewater that is discharged as part of the National Pollutant Discharge Elimination System (NPDES). The EPA has sent formal court-ordered mandates to cities like Springfield that require them to mitigate the overflows and to reduce or eliminate the occurrences to comply with the Clean Water Act and other federal and state regulations. Springfield has not yet been formally mandated to take action beyond mandatory reporting of discharges, but local officials are aware of the possibility of court-ordered mitigation and options for coming into compliance are being explored.In some cities, EPA-approved plans to mitigate discharges include "green infrastructure," or infrastructure that reduces stormwater runoff from buildings and parking lots through swales and green space. These methods may provide an effective solution to the discharge events while saving tax dollars.This presentation will outline a history of combined sewer systems in Springfield and existing ordinances dealing with stormwater. Examples of policy and infrastructure from other cities with combined sewers will be introduced. Potential solutions to reduce discharges, including using green infrastructure to divert stormwater, will be suggested for Springfield's central business district.

Effects of nitrogen addition on woody debris decomposition in various forests: controls and mechanisms

Aalia Azeem* with Hua Chen (mentor), School of Integrated Sciences, Sustainability, and Public Health

Global atmospheric nitrogen (N) deposition has had long term effects on forest ecosystems, including litter decomposition. Most litter decomposition studies indicated that N deposition slowed down the mass loss of litter significantly. However, the effects of N deposition on coarse woody debris (CWD) decomposition are not well understood. Very few field experiments examining N addition on CWD decomposition have been conducted. Therefore, it is important to understand how N additions influence CWD decomposition in forest ecosystems and its implication for forest carbon sequestration, especially under increasing climate change and N deposition environment. The primary objective of this study is to examine the treatment effects of N additions on CWD decomposition in different forest ecosystems, the controls that influence the effects, and the possible mechanism behind the effects. In this study, we synthesized the results of four research papers published since 2011. The studies were conducted in subtropical (1), temperate (2), and boreal forest (1), respectively. The annual N (either NH4NO3 or NaNO3) addition in these studies ranged from 32 kg/ha to 68 kg/ha. We found N additions indirectly slowed down the mass loss of CWD on average of 3.1% with a range of 2~6%. The decreased decomposition was mainly due to the shift of microbial community from fungi dominance over bacterial dominance because bacteria are generally less efficient in breaking down CWD. Thus, N deposition from pollution or fertilization could slow down CWD decomposition, leading to increased carbon sequestration in forest ecosystems..

Effects of redlining on urban tree canopies in Springfield, Illinois

Joshua Freetly*, Ryan Bowsher*, Leah Liebman*, & Hallie Furtak* with Amy McEuen (mentor), Biology and Environmental Studies

Redlining was a racist lending practice by the US government sponsored Homeowners' Loan Corporation (HOLC) that classified regions A-D, with D the highest loan risk region targeting predominantly Black neighborhoods. Research in urban ecology has found a correlation between historical redlining and tree canopy cover with lower cover in redlined areas. Our study sought to examine this relationship in Springfield, Illinois due to its high degree of redlining (41% of the city), and its still visible legacy. We sampled 25 trees in each region for diameter at breast height, maximum canopy width, tree vigor, distance between trees, and species richness. Tree canopy cover was also mapped and quantified using Geographic Information Systems (GIS). We predicted that class D regions would have smaller, less healthy, more distant trees and lower diversity. The results found no statistically significant difference in these variables among regions (n=100). However, tree canopy cover measured via GIS showed the predicted trend with a mean of 27.8% cover for region A decreasing to 11% cover in region D. This suggests the need for a larger sample size study in the future. It is important for governments to target redlined areas with greening projects to address historic discrimination.

Exploring connection: food insecurity and attention deficit hyperactivity disorder (ADHD) in U.S. children - A pseudo-longitudinal study from the National Survey of Children's Health data

Vighnesh Hasit Trivedi* & Joe Gallagher* with Yu-Sheng Lee (mentor), Integrated Sciences, Sustainability, and Public Health

Background: Attention deficit hyperactivity disorder (ADHD) is a neurodevelopment disorder. People with ADHD frequently encounter challenges in social interactions due to their inattention, impulsivity, and hyperactivity. Food insecurity (FI) involves a lack of consistent access to enough food in the household, leading to issues in living a healthy life. FI has also been found to be associated with neurodevelopmental disorders in children. Methods: This pseudo-longitudinal study analyzed 237,399 US children (3-17 years) between 2016 and 2022 from the National Survey of Children's Health (NSCH) data. ADHD was confirmed by a doctor or healthcare provider. A multivariable logistic regression was used to investigate the association between FI and ADHD (Yes vs. No).

Results: A total of 24,781 (10.4%) children reported having ADHD. The prevalences of ADHD in children in the US from 2016 to 2022 were 8.90%, 8.66%, 8.77%, 8.64%, 9.26%, 9.67%, and 10.47%, respectively. FI showed a dose-response effect on ADHD. Specifically, compared to children without FI, children with mild FI were 1.21 times more likely to report ADHD ($p < 0.0001$), and children with moderate to severe FI were 1.33 times more likely to report ADHD ($p < 0.0001$) after adjusting for covariates including age, sex, race/ethnicity, household income, type of insurance, adverse childhood experiences, anxiety, and depression.ConclusionWith this nationally representative data, we found an increased trend in ADHD prevalence among children in the US over the past seven years. Food insecurity demonstrated a dose-response effect on ADHD. Since this was a cross-sectional study, drawing conclusions about causation should be cautious.

Hairy Cell Leukemia (HCL) Research & Treatment at the National Institutes of Health (NIH)

Kyla Leones* with David Bertaina (mentor), History

This study is dedicated to deepening our understanding of the pathophysiology and pathogenesis of hairy cell leukemia (HCL) and exploring the diagnosis, treatment options, and protocols of the National Institutes of Health (NIH) at the National Cancer Institutes, Center for Cancer Research at Bethesda, MD. Recently, new treatment protocols and combinations have emerged through the efforts of other medical institutions, with their proposed results achieved mainly through clinical trials and patient participation. Some of these developments are no longer chemotherapies but targeted immunotherapies. One of the newer therapies includes administering Vemurafenib (oral BRAF gene inhibitor) and Obinutuzumab (intravenous monoclonal antibody) together (Park et al., 2023). In addition, other targeted therapies include Bruton Tyrosine Kinase inhibitors (BTKi), such as Ibrutinib (oral), and an intravenous anti-CD22 immunotoxin called Moxetumomab Pasudotox (Kreitman & Pastan, 2020; Paillassa et al., 2022). We will examine these treatment options and compare them based on their remission and response rates, durations, and potential side effects (minimal residual disease). Ultimately, this research aims to significantly contribute to disseminating knowledge about HCL, its treatment options, and the associated benefits and risks, thereby raising awareness about this disease. In addition, this presentation is a product of working directly with the HCL research team at the NIH.

Health Impacts of Nutritional Habits and Quality of Food across Countries

Sophie Eckhardt* with Elise LoBue (mentor), Capital Scholars Honors Program

This research examines the health implications of nutritional habits and food quality in the United States compared to other countries, emphasizing the role of processed and ultra-processed foods in contributing to chronic diseases. Drawing from interdisciplinary perspectives in nutrition, public health, and epidemiology, this paper identifies critical disparitiesin food quality and dietary practices between the U.S. and nations such as the Netherlands, France, Spain, and Mexico, as well as the lifestyle habits of Blue Zone populations. Findingshighlight how the predominance of ultra-processed foods in American diets correlates with higher rates of obesity, chronic disease, and reduced life expectancy. In contrast, countries with healthier food systems and cultural attitudes toward nutrition demonstrate better health outcomes. The study suggests that adopting practices such as stricter food safety regulations, reduced consumption of ultra-processed foods, and education on global nutritional practices could improve dietary habits and public health in the United States. These insights underscore the need for systemic changes to enhance food quality and promote healthier lifestyles, ultimately reducing the national burden of preventable diseases.

Helping Citizen Scientists of Granite City Identify Pollution

Jordyn K. Crouch*, Eva Collins*, Juan Rodriguez*, Mychael Overton*, & Nathaniel Stauffer* with Harshavardhan Bapat (mentor) & John L Ferry (mentor), Chemistry

Granite City, IL is known for its industrial atmosphere, even today the city remains active in its industrial activity, relying on steel mills. Due to its industrial past, there has been significant concern among residents regarding contamination in residential and public areas. Local citizen scientists collected samples spanning several locations over the past two years. In January, those citizen scientists reached out with concerns about potential soil contamination with high levels of metals. Soil samples were sent for analysis to determine the amount of contamination in and around Granite City. The CHE 302 Undergraduate Research class assisted by employing X-ray fluorescence (XRF), an analytical technique that uses X-rays to measure the elemental composition of samples. A modified form of USEPA Method 6200 was used for the samples. Analysis of results should provide insights into the elemental composition at different locations. Findings were reported to the citizen scientists of Granite City to address their concerns. Sample collection and analysis will continue as citizen scientists continue sending samples.

Honoring Indigenous Knowledge: Integrating Traditional Environmental Practices with Western Approaches

Saharra Murphy* with Kyle Blount (mentor), School of Politics and International Affairs, Political Science

This project will explore Indigenous environmental practices to find meaningful opportunities to incorporate traditional knowledge into Western environmental practices. Indigenous peoples and tribal nations have a deep understanding and relationship with the environment. Their respect for nature is reflected through their focus on sustainability and ecological balance. This project will also explore Western environmental approaches to find areas where Indigenous environmental practices would inform and improve Western environmental practices. To achieve this, I will be looking at land management techniques, knowledge of local ecosystems, fire management, water management, cultural values, and forest conservation. I will be using literature reviews, frameworks, and case studies. Some frameworks that will be used are two-eyed seeing, integration, and rights-based approach. This project respectfully identifies opportunities and synergies between Indigenous and Western knowledge systems. The goals of this project are to improve environmental conditions and promote collaborations that respect Indigenous sovereignty.

Hunting for Antimicrobial Substances from the Soil Bacteria of Springfield, Illinois


Madilyn Loudermilk*, Joe Humphrey*, & Alan Terrazas* with Samer AbuBakr (mentor), Biology

In the past few decades, worldwide consumption of antibiotics has increased greatly. One of the consequences of this consumption is the increased frequency of pathogenic bacteria acquiring resistance to existing antibiotics. Consequently, many antibiotics proved that they are no longer effective against infections. On the other hand, natural soil harbors over 109 microorganisms/ gram and provides an ideal reservoir for bioactive microbiota. The ability of soil microorganisms to produce antibiotics gives them an advantage when competing for food and water and other limited resources in soil, as the antibiotic kills off their competition. Most of the antibiotics used today are from soil microorganisms. In this study, screening of soil microorganisms with potential antibiotic activity was carried out. Soil samples were collected randomly from 3 sites in Springfield, Illinois. A total of 14 bacterial isolates were obtained. The inhibitory activities of the isolated bacteria were checked against *Escherichia coli* (ATCC 25922), *Staphylococcus epidermidis* (ATCC 12228), *Enterococcus raffinosus* (ATCC 49464), *Acinetobacter baylyi* (ATCC 333051), *Pseudomonas putida* (ATCC 12633), and *Klebsiella aerogenes* (ATCC 13048). Molecular techniques will be utilized to identify isolates that show antimicrobial activities.

Isopods as Bioindicators: A Review of Their Role in Environmental Monitoring

Kathleen Toomey* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability, and Public Health

Terrestrial isopods are commonly found in habitats around the world, and a growing number of scientists are turning to them as bioindicators for environmental monitoring. Isopods have the ability to accumulate heavy metals within their bodies and they also respond to changes in soil and air quality, which makes them a good option as an indicator of environmental quality. This literary review aims to look at existing research on the use of isopods as bioindicators with a focus on their sensitivity to pollutants in the environment. Such pollutants would be heavy metals (cadmium, lead, zinc) and also pesticides and microplastics. Additionally, this review will also discuss the methods for measuring contamination using isopods and compare them to other methods of measuring contaminants. The goal of this research is to combine these findings to highlight the potential of isopods as a cost-effective and minimally invasive way to measure pollutants in the ecosystem. Overall, this review should provide a better understanding of the role of isopods in biomonitoring of our environments.

Macroinvertebrate Communities in Lake Springfield and the Emiquon Preserve

Nathan Davis* with Tom Rothfus (mentor), UIS Field Stations and School of Integrated Sciences, Sustainability, and Public Health

Macroinvertebrate communities from Lake Springfield and the Emiquon Preserve were examined to evaluate differences in water quality. Macroinvertebrates, which include insect larvae, small crustaceans, and small mollusks, can be used to evaluate water quality, diversity, richness, and overall health of freshwater ecosystems. Lake Springfield and the Emiquon Preserve were chosen as they are geographically similar water bodies but are assumed to be antithesis of each other. Lake Springfield is composed of 1,605-ha and has pollution issues, associated with its mixed urban and rural setting. The Emiquon Preserve is composed of 2,723-ha and since 2007 The Nature Conservancy has worked to ecologically restore the preserve. This study was conducted at three sites, two on Lake Springfield (Maple Grove; Lindsey) and one in the Emiquon Preserve. Macroinvertebrate sampling was performed by collecting rocks at 1-meter intervals along a 20 meter transect parallel to shore. The macroinvertebrates living on the rocks were then removed for later identification. Macroinvertebrates were also collected with 1-meter square d-net sweeps every 5 meters (total 5 sweeps) along the same transect. Each macroinvertebrate was identified to the lowest taxonomic level possible. Specimens were used to evaluate water quality and diversity using a variety of diversity indices. Maple Grove displayed similar scores to the Emiquon Preserve. Lindsey had mixed results, primarily marked by very low numbers in the sweeps. This suggests that Lake Springfield may have ranges in water quality based on geography and use and indicates the need for a more in-depth analysis.

Microplastics in Croplands: Sources, Environmental Effects, and Human Health Risks

Brandon A. Meis* with Hua Chen (mentor), School of Integrated Sciences, Sustainability, and Public Health

Microplastics (MPs) are plastic particles ranging from 1 nm to 5 mm according to US EPA, with Polyethylene (PE) and Polypropylene (PP) accounting for over 51% of global plastic production. Global plastic production has already reached 367 million tons by 2020. With the increasing plastic use, MPs have become a significant environmental and health concern. This review analyzes 40 research articles, with the objective of examining MP sources in croplands, their effects on yield and nutrition, soil integrity, and risks to human health. MPs cause mechanical damage to plant roots, alter soil properties, and disrupt microbial communities. Studies have shown PP reducing soybean growth by 12% and decreasing nitrogen fixation by 17.1-27.5%, impacting soil microbial interaction. Additionally, studies with various soil samples have indicated an increase of 54.3% CO_2 and 9.7% CH_4 emissions. Studies have also found contamination of 50-300,000 MP particles/g in fruit and 20-70,000 MP particles/g in vegetables, raising concerns about human consumption. The human health risks include oxidative stress, immune dysfunction, reproductive toxicity, and potential carcinogenicity. Recent studies have found MPs in human blood, breast milk, placenta, and various tissues. Overall, MPs continue to be a growing concern. MPs contaminate soils, infiltrate plant tissues, impact ecosystem functions, and create risks to humans through consumption of contaminated foods. Therefore, understanding MPs interaction with our crops and human health is crucial to evaluating the overall impact of their presence, and developing strategies for reducing future risk.

Modeling Wind Turbine Site Suitability for Illinois Bats using ArcGIS Pro

Lindsay Broaddus* with Anne-Marie Hanson (mentor), Environmental Sciences

In the face of global climate change, wind farms are becoming increasingly common to reduce anthropogenic carbon emissions. Although the significance of wind energy for this purpose should not be understated, wind turbines have inadvertently caused the mass mortality of hundreds of thousands of bats throughout the United States due to collisions with moving blades. In the state of Illinois, a region rich in bat habitat and diversity, utility-scale wind energy developments are quickly expanding. As bats provide essential ecosystem services such as agricultural pest control and pollination, the Illinois Department of Natural Resources (IDNR) is pursuing innovative solutions to address this dilemma. For this reason, I employed Geographic Information Systems (GIS) to model Illinois wind turbine site suitability for bat conservation using Boolean Raster Overlay and sixteen individual parameters. The model, presented alongside wind turbine location and post-construction mortality (PCM) data, displays high, medium, and low suitability areas throughout the state. The results suggest that substantial bat mortality occurs regardless of turbine siting considerations. Therefore, further mitigative actions and technologies, such as various forms of curtailment, must be prioritized to address the mass mortality of bats due to collision with wind turbines.

Predator-prey dynamics in a state without predators

Christian Mirkowicz* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability, and Public Health

Any healthy ecosystem possesses a balance between predators and prey, with the population of both being dependent on the other. Most healthy ecosystems possess an apex predator as a rule. This however, is not the norm in the United States. In Illinois specifically, all large carnivores have been almost eradicated, and mesocarnivores like the bobcat specifically have been severely diminished. In the absence of this natural form of checks and balances on herbivores such as white tail deer, human hunters have been expected to manage the populations. Despite this, the number of hunters in the state of Illinois have decreased substantially over just the past decade. The goal of this literature review is to perform a population analysis of both predator and prey species to determine whether the decrease in population management by hunters will become a hindrance to managing white tail deer populations. Using data from the Illinois Department of Natural Resources on white tail deer populations covering factors such as deer fatalities to hunters, car collisions and disease, as well as predator populations, I will be able to surmise how urgently increased or decreased population management is required, and options for possible alternative strategies.

Reducing Plastic Waste in University Labs

Karmyn Flesch,* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability, and Public Health

Plastic waste is a universal issue, with microplastics infiltrating every part of our lives and planet. The production of plastics contributes to air and water pollution already, but increased production leads to increased waste, and that waste contributes to water pollution, air pollution, and climate change as they do not break down in landfills and instead release more carbon dioxide into our already warming atmosphere. Our labs should be the most sustainable part of our campus, but research shows that that is not necessarily the case, with the average university science lab throwing away six million tons of plastic per year. The number of single-use plastics in lab spaces is a large issue, but there is no one solution to solve this major issue. Instead, multiple proposed solutions must be examined and implemented to improve the system. The use of bio-based pipette tips, reusable pipette tip box inserts, and glass pipettes were all examined as potential alternatives to single-use plastics in university laboratory spaces. This project provides a thorough review of alternatives to single-use plastic lab materials as well as potential large-scale changes, such as plastic recycling services, to promote sustainability practices in university lab spaces. It includes an examination of ongoing sustainability practices at research-intensive universities, including the University of Illinois Urbana-Champaign, and their lab waste reduction strategies through interviews with laboratory managers and personnel.

State-Level Variations in Childhood Asthma Prevalence Before and During the COVID-19 Pandemic: A Pseudo-longitudinal Study from the National Survey of Children's Health Data

Heta Hirenkumar Vyas* with Yu-Sheng Lee (mentor) and Junu Shrestha (mentor), School of Integrated Science, Sustainability, and Public Health

Background: The relationship between COVID-19 and asthma among children is still debated. This study compared the children's asthma prevalence in the United States (U.S.) before and during the COVID-19 pandemic using the National Survey of Children's Health (NSCH).Method: This pseudo-longitudinal study analyzed 227,196 children (0-17 years) between 2017 and 2022. We defined 2017-2019 as the pre-COVID-19 era, while 2020-22 represented the COVID-19 pandemic. The prevalence was estimated to compare children's asthma before and during COVID-19. Results: Asthma prevalence in U.S. children decreased during the COVID-19 pandemic, with an overall 12% reduction in 2021 (Odds Ratio [OR]=0.88, p=0.0009) and 17% in 2022 (OR=0.83, p<0.0001). However, 12 states (Alaska, Arkansas, Arizona, Connecticut, North Dakota, Pennsylvania, Texas, Utah, Vermont, West Virginia, Wisconsin, and Wyoming) experienced an increased prevalence. Children in these states were more likely to come from larger households (p<0.0001), have adult smoking in the house (p<0.0001), reside in rural areas (p<0.0001), and lack health insurance or routine preventive care (p<0.0001). Additionally, children in these states engaged in more outdoor activities during the pandemic (p<0.0001) compared to children in the states with decreased prevalences. Conclusion: With this nationally representative data, we found that the prevalence of U.S. children's asthma generally decreased during the pandemic. However, 12 states showed an increased prevalence associated with behavior (e.g., smoking), healthcare, and family structure, which could have increased exposure to asthma triggers. Limitations include the lack of information about the diagnosis of COVID-19 and environmental factors in the NSCH data. Causal inferences should be cautious in this cross-sectional study.

The Effects of Calf Compression Sleeves on Balance Control in Collegiate Athletes

Haley Allen* & Kaitlyn Taylor* with Jae Yom (mentor), School of Health Sciences

Compression sleeves are cost-effective methods for post-exercise recovery on the lower extremities. Furthermore, maintaining balance is critical for athletic performance and injury prevention. We surmised that the compression sleeves can enhance sensory feedback from proprioceptors in the skin and muscles, which may improve balance control.Purpose: This study examines the effects of calf compression sleeves on balance control in collegiate athletes during the Y-Balance Test (YBT). Methods: Sixteen female athletes (19.75±1.34 yr, 68.0±7.9 kg, 171.60±8.33 cm) participated in the study. Each participant completed ten trials of the YBT under two conditions: with compression sleeves (CS) and without compression sleeves (NCS). Reach distances, normalized to leg length, were measured in the anterior (DA), postero-medial (DM), postero-lateral (DL), and composite (DCOMP). Paired samples t-tests were used to compare balance performance across conditions ($p<0.05$), and Cohen's d was used to assess the effect sizes.Results: CS compared to NCS, results in increased DCOMP (91±6.3% and 89±6.3%), DM (102±8.7% and 99±9.2%), and DL (104±8.4% and 101±9.0). Effect size, measured by Cohen's d, indicated a large effect on DCOMP (d=1.02), DM (d=1.39), and DL (d=0.79). Conclusion: The findings suggest that calf compression sleeves enhance balance control in female athletes' DCOMP, DM, and DL directions on the YBT. Furthermore, these compression sleeves have the potential to enhance balance in older adults as well. Future research should investigate their role in fall prevention and rehabilitation programs.

The modification effect of usual preventive care visits on the relationship between food insecurity and childhood diabetes: A propensity score-weighting analysis in machine learning from the National Survey of Children's Health data

Urja Nimitkumar Joshi* with Yu-Sheng Lee (mentor), School of Integrated Sciences, Sustainability, and Public Health

Background: Attempts to secure enough food consistently prove insufficient to deliver appropriate nutrition, leading to health issues, including Diabetes Mellitus (DM). The study of food insecurity effects combined with access to preventive healthcare on pediatric diabetes management remains under investigation. This study explored the association between childhood DM and food insecurity alongside research into how pediatric preventive care access serves as a mediator in this relationship. Methods: Research data from the National Survey of Children's Health (2016–2021) was analyzed using a Propensity Score Weighting to eliminate potential confounding effects. This study examined data from 109,022 participants aged 11 to 17, identifying 766 children with Type 1 DM. The predictors of Type 1 DM were determined using a machine learning method, the Least Absolute Shrinkage and Selection Operator regression. Results: Findings demonstrated that children from households with moderate to severe food insecurity were 1.55 times more likely to develop Type 1 DM compared to children from relatively food-secure households ($p < 0.0001$). Additionally, children lacking usual pediatric preventive care visits were less likely to have a DM diagnosis (Odds Ratio = 0.13, $p < 0.0001$). The usual preventive care visit was also found to be an effect modifier.Conclusions: This study found that food insecurity is associated with Type 1 DM. Among children from households experiencing moderate to severe food insecurity, those with usual preventive care were more likely to be diagnosed with DM than those who were without. Lack of usual preventive care visits may delay the treatment of this disease..

Tiny Titans of the Water: The Importance of Diatoms

Kayleigh Ambrose* with Tom Rothfus (mentor), UIS Field Stations and School of Integrated Sciences, Sustainability, and Public Health

Diatoms have been around for millions of years. There are over 100,000 species, each with different structures and ecological roles. Classified as single celled algae, diatoms thrive in aquatic environments, both freshwater and marine. As phytoplankton, they form the bedrock of the aquatic food web. Diatoms use photosynthesis to convert sunlight into energy and are powerful natural carbon sinks, capable of sequestering massive amounts of carbon dioxide and producing around 20% - 30% of the oxygen that we breathe. In freshwater systems, diatoms are important bioindicators of ecosystem health. Their sudden presence or absence can indicate a change in pollution levels or nutrient status. Diatoms can create a biofilm on the water's surface, providing habitats for other microorganisms or invertebrates. Even upon death, their silica shells sink to the bottom of the aquatic system and trap CO_2 for long periods. These tiny microorganisms are essential for not only sequestering CO_2 but also for the survival of other animals, such as other zooplanktons, plants, fish, amphibians and birds. In this research, we identify Diatoms in Lake Springfield and other Central Illinois freshwater bodies. During the identification process we will create libraries for future identification utilizing both the FlowCam and AI tools. New and previous samples have been imaged via a FlowCam at the UIS Field Station at Lake Springfield.

Urban Novel Ecosystems: Concept, Benefits, and Challenges

Chidi Onyewuchi* with Hua Chen (mentor), School of Integrated Sciences, Sustainability, and Public Health, Biology

A novel ecosystem is a self-sustaining ecological system that human activities have significantly altered, leading to a new combination of species and environmental conditions that differ from historical ecosystems. Urban novel ecosystems are human-altered ecological systems that develop in cities and other urbanized areas because of land use change, pollution, climate change, and introducing non-native species. The objectives of this study are to evaluate the benefits and challenges of urban novel ecosystems. The results showed that urban novel ecosystems can enable species adaptability, improve climate conditions in urban areas, and improve the overall quality of air and water. Post-industrial sites, for example, sustain a variety of native and non-native species by cultivating distinctive plant species on previously disturbed soil. These ecosystems can, however, also support invasive species, interfere with biodiversity, and change how ecosystems function. Urban novel ecosystems are becoming more common in areas dominated by humans and have the

potential to transform restoration and conservation efforts. To maintain the sustainability of urban development going ahead, an integrated strategy that balances ecological advantages and proper management of these urban novel ecosystems is recommended.

Using Saccharomyces cerevisiae as a model to test the pathogenicity of human tyrosyl-tRNA synthetase variants

Megan Garcia* with Noah Reynolds (mentor), Biology

Aminoacyl-tRNA synthetases are a group of enzymes that ensure the correct amino acid is attached to the correct transfer RNA (tRNA) molecule. This happens through a process called aminoacylation. There are twenty amino acids that are normally found in proteins, each of which has a specific corresponding aminoacyl-tRNA synthetase. Errors in protein synthesis due to changes in aaRS activity can lead to alteration of protein structure and function and can ultimately lead to disruption of cellular function. In humans, mutations in aaRS genes are known to lead to diseases such as Charcot-Marie-Tooth (CMT) disease, a neurodegenerative disorder affecting the peripheral nervous system. Patients diagnosed with CMT often have genes known to be associated with CMT sequenced to determine if they possess any known CMT causing mutations or to identify other likely disease causing mutations. If patients do not possess any known CMT mutations, it is difficult to determine if other mutations are causative of the disease without further study. Yeast cells offer a simple model system to study potential CMT causing mutations by introducing mutations into the yeast version of the gene to determine cellular effects. Using the National Institutes of Health ClinVar database, we selected variants in the human tyrosyl-tRNA synthetase (TyrRS) gene that are associated with CMT patients, but are unknown to be causative of disease. Five different variants that are predicted to be causative of CMT were inserted into the yeast TyrRS gene and their cellular effect determined.

Why Walkable Cities?

Teya Broyles* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability and Public Health

Sedentary lifestyles are known to increase susceptibility to various chronic health conditions such as heart disease, type two diabetes, obesity, high blood pressure, and overall diminished physical, mental, and emotional health. Living in a more walkable city – and therefore increasing physical activity – has been shown to reduce these risks. Past research has described that people who live in more walkable cities not only have reduced risk of these chronic health conditions and overall better health, but these cities often have stronger economic performance and improved environmental conditions. This literature review aims to identify what defines a walkable city as well as detail the benefits citizens gain from living in more walkable cities. To illustrate these concepts, this study will evaluate what factors are used in determining a city's walkability such as population density, diversity of land use, proximity to amenities like grocery stores and parks, intersection density, access to public transit, street design features like sidewalks and crosswalks, and overall pedestrian safety. It will also analyze public health metrics in cities with different walkability scores to determine how much of an impact a city's walkability may have on improving its citizens' health. Finally, the study will examine walkability and provide recommendations to improve walkability and associated benefits in Springfield, Illinois.

A Transformer Based on Feedback Attention Mechanism for Diagnosis of Coronary Heart Disease Using Echocardiographic Images

Saathvika Bandi* with Yanhui Guo (mentor), Computer Science

Coronary artery disease is a highly lethal cardiovascular condition, making early diagnosis crucial for patients. Echocardiograph is employed to identify coronary heart disease (CHD). However, due to issues such as fuzzy object boundaries, complex tissue structures, and motion artifacts in ultrasound images, it is challenging to detect CHD accurately. This paper proposes an improved Transformer model based on the Feedback Self-Attention Mechanism (FSAM) for classification of ultrasound images. The model enhances attention weights, making it easier to capture complex features. Experimental results show that the proposed method achieves high levels of accuracy, recall, precision, F1 score, and area under the receiver operating characteristic curve (72.6%, 80%, 82.8%, 81.3%, and 0.73, respectively). The proposed model was compared with widely used models, including convolutional neural network and visual Transformer model, and the results show that our model outperforms others in the above evaluation metrics. In conclusion, the proposed model provides a promising approach for diagnosing CHD using echocardiogram.

An Investigation of Students' Information Security Policy Compliance Behavior

Poojitha Kaithapuram* with Md Rasel Al Mamun (mentor), Management Information Systems

In this digital age, cybersecurity is becoming a markable concern across different sectors including educational institutions. Like government and business organizations, educational institutions are implementing very strict security policies to protect sensitive data, protect student privacy, and reduce financial, legal, and reputational risks. This research aims to investigate the factors influencing students' information security policy compliance behavior in higher educational institutions. For this purpose, this study develops a conceptual model through the integration of stewardship theory and identity theory and validates the model by analyzing survey data collected from graduate and undergraduate students. This study will contribute to identifying the factors that influence students' information security policy compliance intention and eventually help policymakers to create compliable security policies.

An Investigation of the Email Users' Phishing Attack Avoidance Behavior and Coping Styles

Hamza Azhar* with Md Rasel Al Mamun (mentor), Management Information Systems

Phishing attacks continue to be a significant cybersecurity threat, with recent statistics indicating that 96% of phishing attacks are delivered via email. Recent studies suggest that only technical measures are insufficient to combat phishing attacks. Thus, email users' security behavior plays an important role in combating phishing attacks. To investigate email users' phishing attack avoidance behavior, this study conceptualizes a research model through the theoretical lens of cognitive appraisal theory and technology threat avoidance theory. The study will administer an online survey to the email users to collect data and analyze it to validate the model. This study will help to combat phishing attacks and will secure email users from many-faced phishing attacks.

An Investigation of the impact of Generative AI on student's learning behavior

Anupriya Chalukya* with Md Rasel Al Mamun (mentor), Management Information Systems

With the innovation of generative AI, learning with the help of generative AI is becoming more and more popular for learning purposes. In recent years, there have been an increasing number of studies on learning behavior in higher education. However, to our knowledge, no research paper has been published yet examining the impact of generative AI on students' learning behavior. This study aims to investigate the impact of generative AI on students' learning behavior. For this purpose, the study develops a theoretical model by combining affordance theory and Socio-technical system theory and validates the model by analyzing collected data from students who used generative AI for their learning. This study will help to identify the factors for the effective use of generative AI for learning purposes as well as guide generative AI creators to add effective features for learning innovation.

Application of Deep Learning for Automated Plankton Recognition

Praise Idowu* with Tom Rothfus (mentor), UIS Field Stations and School of Integrated Sciences, Sustainability, and Public Health, & Elham Buxton (mentor), Computer Science

In 2021 Lake Springfield's drinking water experienced taste and odor issues caused by the compounds geosmin and 2-methylisoborneol (MIB). These compounds are produced by different species of cyanobacteria which can form large blooms. Blooms of this nature are not unusual in freshwater systems, especially when conditions are right, though Lake Springfield had not previously reported an issue of this magnitude. To predict when such issues may arise in the future, we began working with City Water, Light & Power (CWLP) in the Spring of 2022 to investigate both the conditions in the water and the plankton community. Since then, we have confirmed a relationship between the total number of particles and the levels of the compounds geosmin and MIB in the Lake.As a step toward building a predictive model, we are currently working to identify specific plankton perpetrators. We are examining the particle counts of 4 cyanobacteria genera (Anabaena, Microcystis, Plantothrix, and Cylindrospermopsis) and their correlation with geosmin and MIB levels. An automated microscope, the FlowCam is used to rapidly image thousands of particles. The imaging technology and the FlowCam's statistical classification program has aided building libraries for each of these planktons. While helpful, the FlowCam's classification is coarse and still requires manual sorting – a very daunting task when specimen counts are in the thousands and even tens of thousands. In light of this, we have been exploring training a Convolutional Neural Network model for automatic classification of the four aforementioned cyanobacteria genera, at a satisfactory level of accuracy.

Artificial Intelligence Usages, Vulnerabilities, and Security Challenges: A Literature Review

Maame Araba Amponsah Vander-Pallen* & Bernice Buabeng* with Md Rasel Al Mamun (mentor), Management Information Systems

The environment of future business organizations will be characterized by changes in market demands, time-to-market pressure, continuously emerging new technologies, and, above all, global competition. These increased competition and economic pressure force global companies to reduce business process execution costs and a widely used measure to achieve this goal is AI adoption. However, the security issues that artificial intelligence faces have grown more noticeable because of its extensive development and usage. This study aims to conduct a systematic literature review on Artificial Intelligence security. Reviewing the existing literature, this study will categorize the configuration and usages of AI and pair associated security issues. The result of this research will also suggest the generalized strategies that can be implemented in different categories of AI to reduce potential privacy and security risks. The research will help AI users and developers address the security issues of AI developed for specific purposes.

Developing a library of cysteinyl-tRNA synthetase mutations for resistance to selenite toxicity

Carmen Llopis Fabra* with Noah Reynolds (mentor), School of Integrated Sciences, Sustainability, and Public Health

Selenocysteine (Sec) is inserted into proteins at UGA codons using a special mRNA recognition sequence, a dedicated tRNA, and a specific elongation factor. However, there is no aminoacyl-tRNA synthetase specific for Sec, as Sec and Sec-tRNA are produced in tRNA dependent reactions. This free Sec can be later used as a substrate for cysteinyl-tRNA (CysRS) synthetase, resulting in Sec replacements of Cys residues in proteins. Due to the inability of CysRS to effectively discriminate between Cys and Sec, the accumulation of Sec in cells can lead to the production of tRNACys charged with Sec (Sec-tRNACys) and result in the misincorporation of Sec at Cys codons, causing selenium toxicity. A mutation in the active site of CysRS, H235N, has been identified to reduce the level of Sec misincorporated at Cys codons when introduced into *Escherichia coli* CysRS in vivo, thus reducing the toxic effects of selenite. This suggests that there is a possibility that other mutations in CysRS can reduce misincorporation of Sec and increase resistance to selenite toxicity. We created a library of random mutations in the *Escherichia coli* CysRS to identify novel variants that reject Sec incorporation and increase resistance to selenium toxicity. Using a gradual increase of sodium selenite concentrations, we screened for mutant sequences that would reduce the toxicity of Sec. This research provides insights into the molecular mechanism of CysRS specificity and selenium resistance.

Development of High-Performance Variable Stator Vane Actuation using Electro-Magnetic Force and Hall Effect State Estimation

Mihir Thosar* with Joshua Smith (mentor), Computer Science

Variable Stator Vanes (VSVs) offer significant performance improvements for jet engines, but traditional actuation mechanisms suffer from complexity, weight, and maintenance burdens. Electromagnetic actuation, while promising, often falls short in large-scale applications. This paper proposes a novel hybrid VSV actuation system that combines the benefits of both approaches. Our design achieves high availability, durability, and significantly faster response times compared to existing methods. This enables tighter control over engine operation, unlocking further performance gains and pushing the boundaries of jet engine specifications.

Emotion-Driven AI Innovations for Mental Wellness and Education

Yeobin Lee* with Sunshin Lee (mentor), Computer Science

This research explores the integration of AI-driven emotion recognition with laughter therapy to address pressing challenges in mental health and education. By analyzing real-time biometric data, the system predicts emotional states and provides personalized strategies for stress management and emotional intelligence enhancement. These innovations aim to transform mental wellness and educational practices by creating supportive, emotionally intelligent environments for individuals and institutions. This multidisciplinary framework bridges AI with healthcare and education, offering scalable, impactful solutions to global challenges.

Enhancing Malware Detection with Windows Internals and SIEM Integration

Kwabena Opoku Frempong-Kore* with Rishikesh Sahay (mentor), Management Information Systems

Ransomware attacks are the most prevalent on the Internet. There is an increase of 56% in ransomware gangs, according to the report of Searchlight Cyber, a dark web intelligence company. Cybercriminals target critical infrastructures such as healthcare, power grids, telecommunications, and financial services. Along with the high-value target, small and medium-sized companies are also targeted by these ransomwares. To protect these industries from ransomware attacks, suspicious and malicious activities must be detected as soon as possible. However, it is not easy to identify malware, especially if it has never been found. There are different tools and techniques for malware analysis, but no single tool can cover all aspects of malware characteristics. In this work, we use different tools, such as RegShot, Procmon, and Sysmon, to analyze the behavior of malware. Procmon and Sysmon are windows internals that can be very helpful in identifying zero-day malwares. Moreover, we also pull the logs from Windows in the SIEM tool like Splunk to analyze and identify the malware characteristics. It also helps in correlating events and reducing the false positives generated by intrusion detection systems. The results of this work highlight a comparative analysis of different tools and provide recommendations to consider while analyzing malware.

Enhancing Threat Hunting with Splunk and Generative AI: Leveraging Large Language Models for Automated Security Operations

Manjusha Sumasadan* with Rishikesh Sahay & Bell Punneliparambil Eapen (mentors), Management Information Systems

In today's cyberspace, organizations face challenges in detecting and responding to security incidents in real time. In the face of growing cyber threats, organizations need to perform threat hunting. However, it is overwhelming for organizations because hundreds and thousands of devices and applications are deployed in their infrastructure. Thanks to Security Information and Event Management (SIEM) tool like Splunk, which provides a platform for real-time log analysis that is helpful for threat detection and mitigation. However, the dependency on skilled human resources to analyze the logs generated by a variety of devices and applications is a cause of concern for organizations. Recently, the emergence of generative AI has offered a solution to reduce complexity in this. Existing SIEM solutions such as Splunk is also believed to provide an interface with large language models (LLMs). In this paper, our aim is to investigate how Splunk can be used in threat hunting along with an opportunity to improve security operations by leveraging the feature of having an interface with LLMs. In this work, a platform has been set up in which network intrusion detection tool, Suricata, is used to capture network traffic and generate alerts. These alerts are ingested into Splunk server for log aggregation and analysis, where LLM is deployed to analyze the logs and automate the detection of security threats. The findings of this work aim to demonstrate how the integration of LLM with Splunk, enhances the efficiency of security operations.

Exploring AI computing infrastructure solutions tailored to regional universities

Yukti Solanki* with Sunshin Lee (mentor), Computer Science

As the demand for AI and data analytics in research, teaching, and learning grows, regional universities like UIS face challenges in building AI computing infrastructures due to limited funding, a small research community, and a shortage of personnel for developing and ongoing maintenance. These constraints underscore the need to explore AI infrastructure solutions tailored to regional institutions. This study, part of the AI computing infrastructure project funded by UIS's SIF, investigates 1) Cloud solutions, e.g., Metal as a Service (MAAS) and OpenStack, for automating the deployment and management of physical hardware resources, 2) Orchestration engines, e.g., Juju and Heat, for streamlining complex, multi-cloud application workflows, and 3) Machine learning platforms, e.g., Kubeflow, for managing machine learning pipelines across Kubernetes clusters. Additionally, the research explores leveraging external supercomputing resources, e.g., UIUC's NCSA DeltaAI cluster, for faculty research and public cloud-based AI solutions, e.g., Google Colab, for student learning. Our findings provide a comparative analysis of AI software stacks, demonstrating cost-effective strategies for building AI infrastructures. By leveraging AI software stacks tailored to regional universities and external computing resources, institutions can reduce infrastructure costs, streamline deployment and management, and create scalable AI environments. This empowers regional universities to advance research, improve student learning experiences, and drive innovation.

Fraudulent SMS Attacks: An Exploration of Text Messages


Sai Pranitha Sree Goudu* & Surya Vamsi Chilukuri with Md Rasel Al Mamun (mentor), Management Information Systems

The widespread use of mobile phones and constant internet connectivity exposes individuals to numerous cyber-attacks. One such attack is smishing (SMS + Phishing), a form of social engineering in which attackers send fake or malicious text messages to deceive recipients into responding. Many individuals have fallen victim to this malicious tactic. Despite the increasing prevalence of smishing (SMS phishing) attacks, existing research primarily focuses on email-based phishing, leaving a gap in understanding the dimensions and tactics of fraudulent SMS attacks. Current detection models are limited in their ability to capture the thematic elements of smishing. This study aims to fill this gap by developing a framework from the existing smishing literature and validating the framework by analyzing benchmark SMS data collected from various public data sources. This research will contribute to the cybersecurity literature by extending the knowledge about smashing attack identification techniques as well as will contribute to protecting mobile phone users from falling victim to smishing attacks.

Geospatial Privacy Framework for Sharing Spatial Data

Collin Hayes* with Liang Kong (mentor), Mathematics and Philosophy

The ability to share geospatial data provides many benefits both in the public and private sectors. In the private sector, being able to share data across multiple agencies can enhance collaboration and analysis efforts. In the public sector, geospatial data is becoming more prevalent in social media applications to boost engagement. This increase in sharing of geospatial data poses a significant privacy risk to individuals and sensitive locations/assets. While current mitigation techniques such as geomasking and k-anonymity exist, they often sacrifice analytical utility and either heavily redact or completely remove visual context. This research aims to build a geospatial privacy framework which preserves analytical capability while obscuring actual locations through a two-phase approach. First, coordinates undergo a transformation, scaling, and reprojection into alternative coordinate systems. This transformation will be reversible via a secure key. Second, a generative adversarial network (GAN) will create synthetic satellite imagery by morphing original imagery while preserving key analytical features like road networks and terrain characteristics. This dual-layer protection enables secure data sharing while maintaining the context necessary for meaningful analysis.

Multi-Biometric Fusion for AI-Driven Emotion Recognition: A Comprehensive Study

Yeobin Lee* with Sunshin Lee (mentor), Computer Science

AI-based emotion recognition is crucial in various domains, including mental health monitoring and smart healthcare. Traditional emotion recognition methods predominantly rely on single biometric signals, such as facial expressions or voice, which often face challenges in accuracy, generalizability, and robustness across diverse environments and populations. These limitations highlight the need for integrating multiple biometric signals to enhance the precision and reliability of emotion detection systems.Recent advancements in multimodal emotion recognition leverage a combination of biometric signals, including electroencephalography (EEG), facial expressions, voice, heart rate variability (HRV), and galvanic skin response (GSR). Integrating these signals has shown promising improvements in system performance by capturing a more comprehensive representation of human emotional states. However, challenges remain in effectively fusing and optimizing these heterogeneous data sources to ensure computational efficiency and real-time applicability.This study systematically explores state-of-the-art multimodal fusion models, evaluating their strengths, limitations, and applicability in real-world scenarios. We investigate multiple fusion techniques, including early, late, and hybrid fusion approaches. Furthermore, we conduct preliminary experiments to validate the feasibility of these models using publicly available multimodal datasets. We also examine optimization strategies to enhance the deployment of emotion recognition systems on edge devices, mobile platforms, and real-time monitoring solutions.Our findings will provide an in-depth comparative analysis of different fusion strategies, highlighting their performance in terms of classification accuracy, computational efficiency, and real-time feasibility. The results will also serve as a foundation for future research directions, emphasizing key areas such as dataset expansion, model fine-tuning, and real-world testing.

Myocardial Ischemic Classification Using a Knowledge-Guided Polar Transformer in Two-Dimensional Echocardiography

Na Yang* with Yanhui Guo (mentor), Computer Science

Myocardial ischemia, characterized by inadequate blood supply to the heart muscles, is critical to cardiovascular diseases. Timely and accurate identification of ischemic segments is essential for prompt intervention and patient care. This study developed a deep learning Transformer model to classify myocardial ischemia in left ventricle short-axis (LVSA) two-dimensional echocardiography (2DE) images where a novel Knowledge-Guided Polar Transformer (KGPT) was proposed that integrated the unique characteristics of 2DE images with the prior clinical knowledge, based on the fact that the ischemic myocardium manifests more differences from the ventricle regions in the radial orientation compared to the normal myocardium on the echocardiography. 306 patients (aged 58.0±8.5 years) were selected from Harbin Medical University and underwent transthoracic echocardiography within 1-3 days prior to invasive coronary angiography (ICA). The echocardiography was performed by Philips EPIQ series ultrasound machine with an S5-1 transducer. The performance of the KGPT was evaluated with five-fold cross-validation and receiver operating characteristic curve (ROC) analysis. It achieved a test average area under ROC (AUC) of 0.8326+0.0906, with an accuracy of 79.50+5.40%, precision of 79.07+6.70%, recall of 80.79+7.87%, and F1 score of 78.43+6.56%. In comparison, a conventional Swin-Transformer model achieved test AUC of 0.7994+0.078, accuracy of 76.6+5.18%, precision of 78.47+4.51%, recall of 71.22+9.37%, and F1 of 70.73+11.76%. The differences were statistically significant ($P<0.05$). The KGPT model effectively classifies ischemic regions in 2DE images, presenting a promising tool for diagnosing myocardial ischemia and potentially revolutionizing the diagnosis and monitoring of myocardial ischemic diseases.

NeuroEase: An AI-Powered Tool to Aid Neuro-Divergence



Sree Lekha Kolla*, Himaja Bathala*, Sai Dinesh Munduru*, & Prajwal Verma* with Hei-Chi Chan (mentor), Mathematics and Philosophy

Neurodivergent individuals, including those with autism, dyslexia, and Tourette's syndrome, often encounter significant challenges in reading comprehension, information processing, and effective communication. In this presentation, we introduce "NeuroEase", a prototype of an accessibility-focused Chrome extension that integrates text summarization and a web-based tool with text-to-speech (TTS), speech-to-text (STT), and sentiment analysis features. NeuroEase offers a comprehensive solution to enhance digital accessibility for neurodivergent users.The text summarization feature condenses long-form content into concise, easy-to-read summaries, mitigating cognitive overload and improving readability. The text-to-speech functionality assists individuals with dyslexia and other reading impairments by converting written text into spoken words, facilitating better comprehension. Conversely, the speech-to-text module enables users with verbal communication difficulties to transcribe spoken words into written text, fostering seamless digital interaction. Furthermore, sentiment analysis aids in interpreting the emotional tone of textual content, supporting neurodivergent individuals in gauging emotional tone in any conversation, and enabling better social and professional communication.This tool is designed to foster a more inclusive and accessible digital environment, enabling neurodivergent individuals to interact with online content more effectively and confidently. We will also discuss our roadmap to expand its reach and functionality, including the development of a unified platform that integrates a desktop or system-wide plugin with mobile app capabilities.

SEIR Disease-Spread Modeling with Physics-Informed Neural Networks

Abhishek Soni* with Liang Kong (mentor), Mathematics and Philosophy

Epidemiological modeling is crucial for understanding and predicting disease transmission dynamics. Traditional SEIR (Susceptible-Exposed-Infected-Recovered) models rely on ordinary differential equations with fixed parameters, limiting their adaptability to complex real-world scenarios. This study explores the application of Physics-Informed Neural Networks (PINNs) as an innovative approach to enhance the flexibility and accuracy of SEIR modeling. We implemented a PINN architecture using PyTorch to model COVID-19 spread dynamics based on data from South Korea. Four separate neural networks were constructed to represent each SEIR compartment, with physics-informed loss functions enforcing adherence to epidemiological constraints. The model was trained on 489 days of confirmed and recovered case data using Adam Optimizer with L2 regularization and adaptive learning rate. Model performance was evaluated through comparison with traditional ODE solvers using identical parameters (β=0.132, γ=0.06, σ=1/5.2). The PINN-based model successfully captured SEIR dynamics while maintaining physical consistency with epidemiological principles. Loss convergence analysis demonstrated stable learning behavior, with final loss values reaching 10^-5 scale. Comparative analysis with classical ODE solutions showed comparable prediction accuracy, while the PINN approach demonstrated superior robustness when handling noisy data points. This study demonstrates that PINNs offer a promising framework for epidemiological modeling that balances data-driven learning with physical constraints, providing advantages in handling incomplete surveillance data while maintaining fidelity to underlying disease dynamics. Future work will explore the integration of time-varying parameters and additional compartments to model intervention strategies and vaccination effects, potentially offering more adaptive tools for public health response planning.

Smishing Attack: Understanding the Protection Motivation of Mobile Phone Users

Kenneth C. Nwafor* with Md Rasel Al Mamun (mentor), Management Information Systems

The evolving threat landscape has amplified the focus of phone makers and service providers on technical measures against smishing attacks, which have often fallen short of the multi-faced and diverse techniques employed by attackers. This makes the critical role of smartphone users' security behavior imperative for mitigating smishing threats. Existing literature shows that the specific behaviors of smartphone users in resisting smishing attacks have not yet been thoroughly studied. This research investigates smartphone users' protection motivation against smishing attacks by applying the theoretical framework of the emotional Appraisal theory and protection motivation theory. The research will contextualize a novel theoretical model combining the Emotional Appraisal theory and protection motivation theory and validate the model by analyzing data collected from smartphone users. The study will contribute to knowledge enrichment in cybersecurity and protect smartphone users from smishing attacks.

When AI Meets Pathology: Automating Bone Marrow Analysis for Precision Diagnosis

Hivanshu Tyagi* with Peng Kang (mentor), Computer Science

Analyzing bone marrow tissue images for disease prediction is traditionally a manual and resource-intensive process, leading to inefficiencies and potential inaccuracies. The reliance on human observation not only restricts efficiency but also introduces variability in results. Our system automates the crucial step of cellularity calculation, which is one of the most time-consuming aspects of the analysis. By leveraging automation, the proposed approach significantly reduces manual effort, minimizes errors, and enhances the overall predictive accuracy. The application achieves an accuracy of 80%, while reducing manual workload by 75% and lowering error rates by 15% compared to traditional methods. This system not only accelerates the diagnostic process but also ensures more consistent and reliable results, ultimately aiding medical professionals in faster and more accurate disease detection. By optimizing bone marrow analysis, our approach contributes to the advancement of automated medical diagnostics, improving both efficiency and effectiveness in disease prediction.

Hands-on Conservation: Examining the Effects of Zoo Based Environmental Education

Nadia Wilson* with Kyle Blount (mentor), School of Integrated Sciences, Sustainability and Public Health

Zoos play an important role in fostering environmental awareness among young people through hands-on learning. This presentation will investigate the impact of environmental education from zoos on children's environmental awareness, attitudes, and behaviors. Drawing upon existing literature and personal experience as an Education Intern at the Henson Robinson Zoo, this presentation will examine the effectiveness of the zoo's educational programs in engaging grade school students with wildlife conservation and environmental stewardship. Through observing, assisting, and creating some of the zoo's educational initiatives, it is evident that these programs can encourage curiosity, critical thinking, and an increased sense of responsibility towards the environment. By examining these outcomes, this presentation will highlight the importance of continued integration of environmental education into youth programming as a tool for encouraging long-term environmental responsibility.

Topics in English Education: Genre Study

Carissa Chrysokos* & Moriko Handford with Jennifer Martin (mentor), Education

For Dr. Jennifer Martin's class, Topics in English Education, we selected three books from a genre and then wrote something in that same genre. Carissa picked three memoirs How the Boogeyman Became a Poet by Tony Keith Jr., All Boys Aren't Blue by George M. Johnson, and Hey, Kiddo by Jarrett J. Krosoczka. Carissa then wrote a short memoir piece titled, "The Years of Required Education" that explores her middle school and high school experiences. Moriko picked three graphic novels Miles Morales: Straight out of Brooklyn by Saladin Ahmed and Javier Garron, Ladycastle by Delilah S. Dawson, Ashley A. Woods, and Rebecca Farrow, and On a Sunbeam by Tillie Walden. Moriko then created a graphic novel called Fixing the System which is about teenagers at a fictional Harriet Tubman High School where a bathroom ban for trans and non-binary teens just took place. Rather than accepting the new bathroom rules a group of cisgender kids hatch a plan to replace the bathroom signs with gender inclusive signs. This assignment gave us insight into the mechanics of these genres. As future teachers, we can create similar assignments giving students a chance to be creative in a genre they enjoy, while also allowing them to grasp the importance of writing about topics they are passionate about.

Rushi Patel

Harshavardhan Bapat

The Violet Margin

Violet Margin (formerly Alchemist Review) is a literary journal at the University of Illinois Springfield. Each year, they publish an annual print journal in April consisting of works from undergraduate students across the country, after having published work by only UIS students and alumni until 2019.

Violet Margin is a journal of prose, creative nonfiction, translation, poetry, and visual arts dedicated to publishing dynamic works by emerging undergraduate writers and artists across the country. With an appreciation for print culture, as well as digital technologies and mixed media, Violet Margin provides a forum for collaboration and exploration within the ever-evolving world of literary publishing. Violet Margin is edited by students at the University of Illinois Springfield.

Violet Margin (formerly Alchemist Review) is published annually by the English Department at the University of Illinois Springfield. It publishes creative writing including but not limited to fiction, poetry and creative non-fiction, art, and photography by new and experienced writers. Violet Margin is committed to providing an inclusive, safe and diverse space for undergraduate students across the US, as well as students and alumni of the University of Illinois at Springfield, to test their voices.

Violet Margin is committed to publishing diverse voices and aims to focus on those that have, throughout history, been marginalized and excluded from the literary canon. We especially encourage submissions from women, people of color, LGBTQIA+ writers, writers with disabilities, and writers of intersectional identities.

Managing Editor: Anum Sarvana*

Assistant Managing Editor: Georgette Kirkendall*

Poetry Editors: Madison Benson*, Madisyon Gilbert*, & Giles Harris-Patel*

Prose Editors: Annalise Avila*, Kayla Smith*, & Katie Madl*

Visual Arts Editors: Nicole Kaufman*, Daria Mueller*, & Rhiannon Swanson*

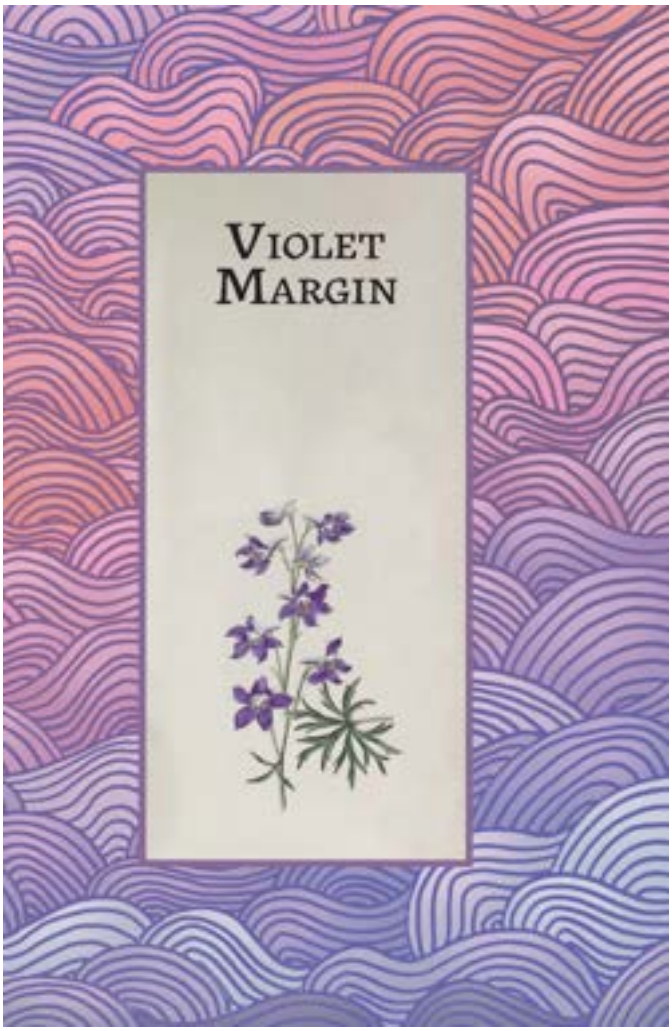
Marketing Editors: Natalie Gomez* & Rachel Sharer*

Prose Readers: Gaby Gorgonoi*, Janet Schawel*, Nicole Kaufman*, & Ashley Kelly*

Poetry Readers: Daria Mueller*, Rhiannon Swanson*, Natalie Gomez*, & Rachel Sharer*

Dr. Meg Cass (mentor) and Dr. Sara Lupita Olivares (mentor), Department of English and Modern Languages

Divya Gunjan



Outstanding Master's Thesis/Project Award

The Outstanding Master's Thesis/Project Award is funded through an endowment established by Nancy and Charles Chapin, along with gifts from other donors.

In addition to providing funding for the Outstanding Master's Thesis/Project Award, Charles and Nancy Chapin provided support for Brookens Library, the Chancellor's Fund for Excellence, and scholarships. Charles, associated with the Chapin & Chapin law firm for over 50 years, joined Brown, Hay & Stephens in 2002. He was with the First Marine Battalion in Okinawa. Mr. Chapin was a lifelong horseman, and a beloved family man. He passed away in 2015. Both Charles and Nancy exhibited an interest in local history, having contributed articles and booklets to various local organizations over the years. Nancy earned a Master's degree in Psychology from Sangamon State University (now UIS) in 1973 and was passionate about community service and philanthropy. The Sangamon Experience at UIS was one of her projects. Nancy passed away in 2020.

2023-2024 Outstanding Master's Thesis Awardee

Thesis Title:
The Politics of the Death Penalty: Sex, Party Identification, Youth Perspectives, and the Determinants of Support for Capital Sentencing.

Awardee: Isaac Farhadian

School of Politics and International Affairs

Committee Chair: Dr. Matthew Geras

Abstract:
This research paper analyzes the major determinants of support for capital sentencing among high school seniors. A large part of this study is based on a survey that was conducted at a high school where 283 seniors participated. Several survey questions pertaining to the death penalty, political ideology, perceptions of crime, trust in the court system, etc., were drawn from the General Social Survey (GSS) and incorporated into this survey. Major variables of focus for this study include sex and party identification and their impact on levels of support or opposition to capital punishment. Some driving questions for this paper include: Why are conservatives potentially more supportive of this punishment than liberals? How much of an impact does sex play in determining one's support for the death penalty and what lies at the root of this difference? What role and to what extent does political socialization and generation gap play in determining one's individual stance pertaining to capital sentencing? I explore these questions from a multidisciplinary lens and have performed qualitative and quantitative analyses based on the survey I administered. I conducted numeric and statistical cross-tabulation, as well as confidence intervals, z-tests, and regression analysis to compare high school seniors with the adult population surveyed in the General Social Survey (GSS). This research is unique because it will add data about younger peoples' attitudes about a contentious issue. Examining the perspectives of high school seniors on controversial issues holds significance, as they represent the future electorate. This analysis will provide researchers with quantifiable data on their positions regarding matters of national importance and will help contribute to the ongoing discussions about this cross-generational topic.

Guest Speaker

The Univeristy of Illinois, Springfield is deeply honored and pleased to present ***Aleksander Ksiazkiewicz*** *to deliver his keynote address to our campus community on Friday afternoon at 12:30. His topic will be "****Sleepy Citizenship: The Biopolitics of Rest in American Democracy.****"*

Sleep inequality is a persistent problem in the United States. Over a third of American adults do not get sufficient sleep and that proportion is higher among members of marginalized groups. We argue that this disparity is consequential for the health of our democracy because sleep is an essential resource in political life akin to money, time, and civic skills. As such, we argue that promoting adequate sleep is a national imperative not only for health, educational, and economic reasons but also as a necessary condition of an active civic and political life—exhausted citizens are in a poor position to exert the effort needed to engage in politics and may be more susceptible to biases in their reasoning.

Dr. Ksiazkiewicz recived his BA in political science in 2007 at the University of Alberta, Edmonton. In 2008 he recieved a M.A. in Social Science from the University of Chicago, where Eric Oliver was his advisor. In 2015 he received his Ph.D. in Political Science from Rice University in Houston, Texas.

He is currently a tenured Associate Professor at The University of Illinois, Urbana-Champaign, in the Department of Political Science.

Past Outstanding Master's Thesis/Project Award Recipients:

2022-2023
Connor Krater, History

2021-2022
Andrew Stokes, Environmental Studies

2020-2021
Angela Try, Communication

2019-2020
Nicholas Dabbs, English & Modern Languages

2018-2019
Rashaun DeBord, History

2017-2018
Sarah Lindholm, Biology

2016-2017
Jonathon Mark Redding, History

2015-2016
Amelia Owre, Environmental Studies

2014-2015
Hillary Rikli, Biology

2013-2014
Justin Ramey, Biology

2012-2013
Christopher Young, Environmental Studies

2011-2012
Sarah Collins, English

2010-2011
Stephanie Marie Ebersohl, English

2009-2010
Vera Leopold, Environmental Studies

2008-2009
Kelsi Megan Kerns, Communication

2007-2008
Heather Wikens, History

2006-2007
Denise Howard Long, English

2005-2006
Joshua Alan Doetsch, English

2004-2005
Patrick Pospisek, History

2003-2004
Tracy DiMezzo, Biology

2002-2003
Kristine Muschal, English

2001-2002
Laura E. Johnson, History

2000-2001
Madeline Gumble, History

Graduate Students – ask your faculty mentor to nominate you today!

go.uis.edu/outstandingmasters

Student Technology, Arts & Research Symposium
University of Illinois Springfield
Springfield, Illinois 62703-5407
http://go.uis.edu/STARS

Ethan Guinn