Program & Abstract Submissions

UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITY FORUM (URCAF)

WICHITA STATE UNIVERSITY

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VIRTUAL EVENT

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2020 – 2021

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Natural Sciences & Engineering Poster Presentation		
Presenter's Name	**Presentation Title**	**Abstract Page**
Taj Allen	Investigating the role of domain 4 of the anthrax protective antigen on stability and immunogenicity	5
Derek Baldwin	Revealing Palladin's Role in Metastatis by Directly Observing its Influence on Actin Polymerization	5
Stephanie Bristow	Thermal Performance Analysis of Bacteria and Bacterivore Interactions	6
Hanna Chastain	PARROT: An Orofacial Myofunctional Imaging and Pressure Mapping Device	6
Zachary Fischer*	Utilizing Matlab's Neural Network and Tall Array Capabilities to Analyze and Predict the Lifetime of Commercial Aircraft	7
Barrett Houchen	Macrophomina phaseolina Hot Spots and Correlations with Soil and Plant Factors.	7
Yesenia Huerta	Wearable Biosensors	8
Shritha Jagadheeswaran	Quantification of Uncertainties in Unbalanced Air Bearing Testbeds for Zero-G Simulations	8
Colton Keeley	Travelling Salesman Problem with Partial Coverage and Advertisement	9
Vidisha Indeewa Liyana Arachchilage	The development of a low-profile, wearable device for Real-time Ambulatory ECG monitoring	9
Cameron McGinley	Deep Learning Detection of Phishing Emails	10
Tommy Nguyen	Smart Wireless, Flexible Hybrid Electronic for Fall Risk Monitoring	10
Rupert Nunez	Spatio-Temporal Access to Healthy Food in Sedgwick County	11
Alexandra Olmstead	Development of a Sentence Buliding Therapy App for People with Aphasia	11
John Randall	AERODYNAMIC PERFORMANCE OF NOTIONAL INFLATABLE AIRFOILS	12

Annika Thomas	OPEN-SOURCE MICROSCOPE FOR CARBON FIBER ANALYSIS IN COMPOSITE PRINTING	12
Dang Tran	From Natural Language Instruction To Domain-Independent Robotic Planning	13

Natural Sciences & Engineering Oral Presentation		
Presenter's Name	**Presentation Title**	**Abstract Page**

Jennifer Alfaro*	Capturing CO2 in Atmosphere via Multinfunctional Nanofibers and Converting it into Biofuel	13
Sheilja Bhatt	Transparent Solar Cell	14
Jacques Blasi	The characterization of microglia in soy protein: a biomaterial-based approach towards neural regeneration	14
Jordan Cao	Continued Development/Testing of Improved Methods and New Antibodies for Immunohistochemistry	15
Jonathan Coleman	Creep of Ribbons in Honeycomb	15
James Davies	Site-Directed Mutagenesis of Palladin for Determination of Tyrosinate Formation Mechanism	16
Connor Devlin	Development and Evaluation of Split-Hopkinson Bar Apparatus for Testing Soft Materials	16
Stephon Edwards	Understanding People and Technology: A Theoretical Analysis of Time Delay within NASA's Autonomous Mission Operations	17
Allen George Philip	CAPILLARY FLOW MEASUREMENT OF 3D-PRINTED METALLIC WICK	17
William Johnston	Innovations in 3D Printing: Fibrous Structures and Mobile App Development	18
Trent Madden	Comparing the effectiveness and acceptance of passive shoulder exoskeletons based on torso design	18
Andrea Martinez	The Impact of Manufacturing Work Experience on Shoulder Muscle Activation Utilizing Shoulder Passive Exoskeletons	19
Katherine Moore	Tin Oxide and Third-Generation Photovoltaics	19

Gissele Mosqueda	IDENTIFYING MOTIVATIONAL FACTORS AFFECTING ASSIST-AS-NEEDED REHABILITATION	20
Michael Nguyen*	Should you follow manufacturer's recommendation? - A look into exoskeleton's effectiveness due to fitment.	20
Mmasi Obi	Converting Microplastics to Useful Fibers	21
Trevor Owen	Effects of Shoulder Angle Activation On Exoskeleton Suit Performance	21
Esmeralda Sanchez-Torres	CHARACTERIZING THE TOPOLOGY-PROPERTY RELATIONSHIP OF OPEN-CELLED POROUS STRUCTURES	22
Joseph Sekavec	Complex Analysis and Fluid Flow	22

Social Sciences & Humanities Oral Presentation		
Presenter's Name	**Presentation Title**	**Abstract Page**
Brenden Wood	Face Reveals, Do They Change Anything?	22

Social Sciences & Humanities Poster Presentation		
Presenter's Name	**Presentation Title**	**Abstract Page**
Latisha Davis	Utilization of Pre And Postnatal Resources among Black Women in Sedgwick County	23
Brianna Kirkhart	Visidental: Oral Health Education for the Visually Impaired	24
Jacob LaForge	Diversity Inclusion In The Classroom	24
Ava Munzinger-DeFrain	Bystander Intervention and Technology-Facilitated Sexual Violence: A Qualitative Analysis of College Students on Facebook	25

Taj Allen
Faculty Mentor(s): James G. Bann
Fairmount College of Liberal Arts & Sciences
Natural Sciences & Engineering Poster Presentation

Investigating the role of domain 4 of the anthrax protective antigen on stability and immunogenicity

The anthrax toxin protective antigen (PA) is the major immunogenic component of the anthrax vaccine, and consists of four domains with the fourth being of particular importance. Anthrax toxin neutralizing antibodies have been shown to be primarily directed at domain 4, which is the domain responsible for binding to host cellular receptors (CMG2 and TEM8) and thus preventing further toxicity. The methods that have already been performed consist of Circular dichroism (CD) spectroscopy and Gel filtration chromatography which has shown that the mutant protective antigen without domain four has no specificity towards CMG2, and is more stable than wild-type PA. Additional future testing includes seeing if the mutant will still form a heptamer which would show if domain four is required for its formation. The hypothesis of this study is that the reduced immune response to PA when CMG2 is bound is because CMG2 is blocking a key epitope or epitopes within domain four. As such, removal of domain four should elicit a significantly weaker immune response when compared to full-length PA- that is that the majority of the immune response to PA is because of domain four.

Derek Baldwin
Faculty Mentor(s): Moriah Beck
Fairmount College of Liberal Arts & Sciences
Natural Sciences & Engineering Poster Presentation

REVEALING PALLADIN'S ROLE IN METASTASIS BY DIRECTLY OBSERVING ITS INFLUENCE ON ACTIN POLYMERIZATION

Metastatic cancer cells sometimes break off from their point of origin and use motile structures composed of polymerized actin to travel elsewhere in the body. An actin-binding protein named palladin is often overexpressed in metastatic cancer cells. Previous research has shown us that a minimal actin binding region of palladin (Ig3) causes an increase in actin's polymerization rate. Now we aim to compare the effects on actin polymerization and organization by the Ig3 domain to that of full-length palladin. The Beck Lab hypothesizes that palladin plays a major part in promoting the motility of cancer cells throughout the body by increasing polymerization and coordinating the structure of actin filaments. The focus of our research is to use Total Internal Reflection Fluorescence (TIRF) microscopy to directly observe actin filaments in the process of polymerization. Observation of these filaments should allow us to capture instances of filament organization and crosslinking, which would help us to understand how palladin influences actin filament organization and what structures it regularly organizes filaments into. In comparing the effects of full length palladin to those seen previously with Ig3, we have found significant changes in the rate of polymerization, instances of crosslinking and filament organization. We aim to move forward using image quantification programs to quantify crosslinking between filaments, which would allow us to better define palladin's ability to promote highly branched actin structures. Defining this capability would help us to understand palladin's responsibility in constructing invasive cellular structures that may ultimately provide insight into the role it has promoting the metastasis of cancerous cells.

Stephanie Bristow
Faculty Mentor(s): Thomas Luhring
Fairmount College of Liberal Arts & Sciences
Natural Sciences & Engineering Poster Presentation

Thermal Performance Analysis of Bacteria and Bacterivore Interactions

Microbiomes have a significant role in global carbon emissions and can potentially shift in response to climate change. Bacterivores play a strong role in regulating soil biomes and therefore could alter the structure of these microbial communities if they were impacted by a slight change in temperature. We hope to estimate how bacterivores and their prey could shift in their relationships in the presence of one another across a thermal gradient. We cultured the bacterivore protist Paramecium aurelia on 3 bacterial treatments (E. Coli, S. enteritidis, and their combination). We then subjected each combined P. aurelia and bacterial treatment to a 12-37°C gradient of temperatures for 18-24 hours under exponential growth conditions. Each bacterial treatment was divided into a bacteria control, and 2 P. aurelia + bacteria plates (one for counting protists, one for measuring the effects of protists on bacteria) and replicated 5 times across 8 temperatures. Paramecium were counted individually after being pipetted and bacterial counts were conducted by hemocytometer. We predict inherent differences in temperature-dependent bacterial growth rates will have cascading impacts on the fitness of their predators. We also predict that differences in the number of bacterial cells in suspension versus in biofilms will affect the growth rates of Paramecium. The outcomes of this project will be critical first steps for elucidating the joint impacts of shifting climates and bacterivore communities on microbiomes.

Hanna Chastain
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Natural Sciences & Engineering Poster Presentation

PARROT: An Orofacial Myofunctional Imaging and Pressure Mapping Device

Orofacial Myofunctional Disorders (OMDs) are characterized by abnormal movement patterns of the mouth. Complications from OMDs include problems with talking, swallowing, and breathing. The tongue is a commonly assessed structure within the mouth to monitor complications from OMDs. The tongue's placement within the oral cavity, however, limits the accessibility to observe and record objective lingual behaviors such as spatial positioning, placement (passive, active), movement, and performance simultaneously. PARROT is a wireless orofacial myofunctional imaging and pressure device to objectively measure tongue behaviors such as spatial positioning, placement, and movement without impeding natural movement. Further development and refinement of PARROT as a wearable mouthpiece with integrated sensors continues, in addition to exploring PARROT's viability for telemedicine capabilities alongside clinical guidance. Results obtained from this study will assist in the advancement of PARROT and current clinical practices addressing functional complications such as dysphagia and sleep apnea.

Zachary Fischer*
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College of Engineering
Natural Sciences & Engineering Poster Presentation

Utilizing Matlab's Neural Network and Tall Array Capabilities to Analyze and Predict the Lifetime of Commercial Aircraft

The owner of any given vehicle will choose to repair said vehicle until the costs of repairing it start to overtake the cost of purchasing a new vehicle. This concept of diminishing returns is especially true with commercial aircraft. Not only do aircraft companies need to understand when the continual fatigue on an aircraft is enough to warrant a new part or aircraft, but they also need to understand how long each part will last to keep the plane from failing midflight. Engineers and maintenance departments have studied over the years to find a reliable model for aircraft life expectancy. My research aims to analyze a sophisticated model building method to accomplish this exact task. First the maintenance dataset and its accompanying nomenclature are analyzed and sorted into what are known as tall arrays for out-of-memory data storage. The cloud-based data storage system that many companies use for large data sets makes this a necessity. Then Matlab's machine learning capabilities are put to work creating a neural network to predict when failure will occur based on which parts are repaired and commented on within the reports contained in the dataset. The accuracy and viability of this method will be studied using a publicly accessible FAA dataset. The results of this research will produce a model that may be useful in notifying companies when their older models that are currently in circulation need to be retired.

Barrett Houchen
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Natural Sciences & Engineering Poster Presentation

Macrophomina phaseolina Hot Spots and Correlations with Soil and Plant Factors.

Macrophomina phaseolina is a fungal pathogen capable of infecting over 500 plant species across the world and one of the most important pests of soybeans in Kansas. Investigation has been conducted on M. phaseolina's presence, due to its effects on agriculture and crop yield. Conversely, minimal research has examined the fungal pathogen's significance in native prairie communities, its correlation with environmental factors, or its spatial structure. Our goals are to better understand M. phaseolina's behavior in native prairies in hopes to apply these insight to agricultural systems. In the summer of 2020, we quantified the spatial structure of M. phaseolina in a 15 x 15 m grid of untilled tallgrass prairie and correlated M. phaseolina's abundance with soil and plant characteristics. We found a high variability in the density of M. phaseolina and limited evidence for spatial aggregation of pathogen abundance. Additionally, bivariate analysis revealed weak correlations between pathogen abundance and individual soil properties and no correlation between pathogen abundance and plant variables. The results found rule out several key factors and suggest a better understanding of how physical disturbance and the mechanism of spread for M. phaseolina contribute to the large differences in density observed.

Yesenia Huerta
Faculty Mentor(s): Yongkuk Lee
College of Engineering
Natural Sciences & Engineering Poster Presentation

Wearable Biosensors

Recent and upcoming developments of wearable sensors that can be integrated with the human body are becoming more innovative in measuring and recording vital features. More specifically, biosensors can be miniaturized, thin, and flexible such that they can cause as little discomfort for a person as possible and to conform to the surface of the skin while they retain similar performances compared to traditional benchtop biosensing devices. In this study, we have successfully demonstrated two flexible solid state-based sensors for pH and Na+ detection. It was built on ultrathin metal wires, which can be bendable with minimal forces. For the pH sensor, 1% nafion membrane and 1mM 6-merceptohexanol (MCH) were applied on IrOx electroplated working electrode and/or Ag/AgCl reference electrode to significantly improve the response time, stability, and reliability of the sensor. For the Na+ sensor, Na+ ion selective membrane was drop-casted on the wires to detect sodium ions. Overall, the results demonstrated accurate and reliable readings of pH values and Na+ concentrations and potential for the use in the development of wearable biosensing devices.

Shritha Jagadheeswaran
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Natural Sciences & Engineering Poster Presentation

Quantification of Uncertainties in Unbalanced Air Bearing Testbeds for Zero-G Simulations

Research Objective:
The primary objective of this research is to quantify the uncertainties caused by torque imbalances in an air bearing platform, which is an experimental setup to understand the dynamics and control of a spacecraft's rotational motion. The air bearing platform has three reaction wheels whose rotation cause the platform to rotate about a given axis.

Statement of the Study Methods:
A method for analyzing and quantifying the uncertainty was developed using a stochastic simulation done during the initial stages of the research. Euler equations and dynamic equations of rotational motion along with kinematic equations were integrated in MATLAB to map the trajectory of a rotating object. A control test was done with no random error present in any constants/variables, followed by successive tests with increasing random error added to the initial conditions and Moments of Inertia were performed. The difference in results from each run with increasing random error and the control test were calculated and plotted, allowing us to understand the impact of the resulting uncertainty.

This method was adapted to the air bearing platform problem with necessary changes made to the code. An inertial measurement unit (IMU) measures the attitude of the air bearing platform in terms of three Euler angles and the respective angular velocities. The data obtained from the IMU was compared with data calculated using MATLAB's numerical integrator with the same initial conditions. The motion of the air bearing platform with

respect to time was plotted using the IMU readings and the data from the MATLAB code. The plots were then compared to quantify the uncertainty associated with unbalanced torque.

Findings and Interpretations:
The results from the air bearing platform produced results that were much larger than the results gotten from the MATLAB results. The experimental data presents disturbances which is consistent with the predictions of torque imbalances affecting the readings.

Conclusion:
With further analysis of both the Euler angles and angular velocity readings from both sets, the error between the two sets of data will be compared and the uncertainty occurring in the IMU due to torque imbalances can be quantified. Further work and research can be done on reducing the uncertainty, thereby, making attitude determination more efficient.

Colton Keeley
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Natural Sciences & Engineering Poster Presentation

Travelling Salesman Problem with Partial Coverage and Advertisement

This project focuses on a novel form of the travelling salesman problem, the travelling salesman problem with partial coverage and advertisement (TSPWPCA), where the primary focus is designing routes to maximize the potential number of customers served. The TSPWPCA model consists of a set of cities available as potential destinations for the user. Each destination has associated with it a specified demand, maximum capacity, time required to process the salesman, time to travel from one destination to another, cost of processing the salesman at each city, cost of travel between each city, maximum number of customers willing to travel to said city, the city's radius of serving customers, and cost/profit parameters for how effective/costly advertisement is in said area. Two separate methods are discussed for incorporating advertisement into the model, a linear quadratic optimal control problem enacted prior to route optimization, and a lognormal cost binary decision variable utilized in tandem with the route optimization. For both models, a proposed genetic algorithm with clustering is compared to the exact solution methodology in terms of time and solution quality. Sample problems of ten to thirty cities were used for comparison. Results from the twenty city examples found substantial improvements in solution times. Many thirty city examples could not be solved exactly within the hour timeframe allotted as a maximum, while the heuristic approach produced solutions in a fraction of the time. Findings support that the proposed mutation process can be adjusted to a non-NP hard formulation for even better results.

Vidisha Indeewari Liyana Arachchilage
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Natural Sciences & Engineering Poster Presentation

The Development of a Low-Profile, Wearable Device for Real-time Ambulatory ECG monitoring

With the rising aging population, there is a predominant need of a high-yielding and prolonged ambulatory ECG monitoring system due to substantial growth of number of people suffering from chronic diseases which has a significant influence on the US mortality rate. Usage of an ambulatory ECG device would enable the often detection of abnormal and irregular heartbeats which are not often attainable by the Electrocardiogram (ECG) at doctor's office. This study is focused on developing a compact ambulatory ECG device which would be more comfortable and user-friendly with the high quality of ECG signals in comparison to traditional ECG devices. In order to achieve the primary objective of this study, the leading step was to discover the optimal position for the placement of ECG electrodes on the chest using simultaneous comparisons of ECG signals obtained from traditional ECG lead I and II. The second step of this study was to design and micro-fabricate a miniaturized and flexible, Bluetooth- based circuit and skin-like electrodes for detection and wireless transmission of ECG signals. As the third step, the fabricated monitoring device and electrodes were assembled on a thin elastomeric membrane to offer a smooth lamination to the skin for user comfort and long-term ECG monitoring. Finally, human subject tests were performed using the developed ECG device to demonstrate real time ambulatory ECG monitoring.

Cameron McGinley
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Natural Sciences & Engineering Poster Presentation

Deep Learning Detection of Phishing Emails

Phishing emails are one of the most common and effective tools that cybercriminals use to gain access to an organizations' network or personal information. To prevent these attacks, email service providers use a variety of tools that can detect phishing emails by inspecting their metadata and URLs in the body. However, cybercriminals are able to bypass these filtering techniques by avoiding adding URLs to their messages and instead engaging victims in a conversation to advance their attacks. In this paper, we design a convolutional neural network that can efficiently identify phishing emails only using the text in the email body. The proposed model takes as input an embedding of body text and outputs a probability indicating the likelihood that the message is malicious. We evaluate our proposed model and find that it can identify phishing emails with high accuracy and a low false negative rate.

Tommy Nguyen
Faculty Mentor(s): Lee, Yongkuk
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Natural Sciences & Engineering Poster Presentation

Smart Wireless, Flexible Hybrid Electronic for Fall Risk Monitoring

Falls give a serious public health issue among the elderly (people aged 65 years or older) since they not only cause significant inquires and even mortality, but also result in enormous costs for healthcare services. In general, about 28~35% of older adults 65 years old or over and 32~42% of older adults 70 years old or over experience fall-related injury more than one time each year based on the World Health Organization (WHO) Global Report. The number of older adults suffered from fall-related injury will gradually increase as time goes on since their population is growing faster than any other age group; their population was 49.2 million in 2016 (about 15% of U.S. population) and is expected to reach 98 million by 2060 (about 25% of U.S. population). In addition, the

medical costs associated with falls for older adults was estimated as $56 billion dollars by 2020. In order to minimize adverse consequences of falls and provide adequate medical response and care, a cost-effective, reliable and immediate fall detection system is essential. Therefore, this research focuses on the development of a skin-wearable hybrid electronic system for fall risk monitoring, which offers signal fidelity for accurate fall detection and user comfort for long-term use. We have designed and fabricated the skin-wearable device including a 6-axis motion sensor to collect motion data for different human activities (e.g., walking, running, and falls). A number of deep-learning algorithms were tested using collected data to identify an optimized fall detection algorithm. The collective results will significantly improve the life quality and independence of older adults as minimizing adverse consequences of falls and fall-related injuries.

Rupert Nunez
Faculty Mentor(s): Dr. Laila Cure
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Natural Sciences & Engineering Poster Presentation

Spatio-Temporal Access to Healthy Food in Sedgwick County

Healthy food access and the local food environment have become an important issue for city and state governments. Since the 1990s, studies have been conducted across the world documenting the food environment at local, state and country wide scales. Most studies only analyze spatial accessibility, no studies have been found investigating the time-dependent availability of these sources.

The objective of this study was to create a detailed analysis of healthy food availability in Sedgwick county in terms of geographical location and time availability. We recorded the GPS coordinates and hours of stores and markets with produce available in Sedgwick county from Google Maps data. We extracted information about the population information using Census tract data from the Census Bureau. We then calculated distances from locations to the centroids of every census tract and estimated the following spatio-temporal accessibility measures:

- The number of stores within 2 miles for different time slots in a day per census tract.
- The time-weighted weekly accessibility index indicating the proportion of time during a week that a census tract has access to food.

Tableau was used to create custom maps displaying this data.

Our preliminary results show Healthy food is widely available during the most popular shopping times for more urban census tracts. Rural areas experience much longer drive times to get to healthy food. Northwestern Sedgwick county has the longest average distance calculated for all times and days.

Alexandra Olmstead
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Natural Sciences & Engineering Poster Presentation

DEVELOPMENT OF A SENTENCE BUILDING THERAPY APP FOR PEOPLE WITH APHASIA

The purpose of this multidisciplinary project is to develop a therapeutic sentence-building app for people with aphasia, a language disorder in people recovering from a stroke or brain injury. In a preliminary treatment study, people with aphasia learned the sentence-building task and reported improved quality of life. However, the existing therapy task relied on the Windows software program DMDX and required a speech therapy clinician to provide feedback and cueing. The goal of the current project is to present the task in an Android app so that people with aphasia can practice the therapy task at home. The app teaches the user to construct complete grammatical sentences by presenting a series of word pairs and providing immediate feedback on which word can come next. The app provides assistance when needed and allows the user to select the difficulty level of the sentences. In addition to guiding the user through the sentence-building task, the app will also gather reaction time and accuracy data to allow performance tracking. The significance of creating the app is that it will provide a new therapy tool to help people with aphasia improve sentence production.

John Randall
Faculty Mentor(s): Brandon Buerge
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Natural Sciences & Engineering Poster Presentation

AERODYNAMIC PERFORMANCE OF NOTIONAL INFLATABLE AIRFOILS

In support of an ongoing project focused on investigating the fundamental nature of deployable wing technology for inflatable drop-stitch structures, a program of small-scale wind tunnel testing was completed in the Fall and Winter of 2020-2021. The focus of this program was to assess the basic characteristics of structures and how small, simple, and lightweight modifications can aid in maximizing lift to drag ratios. To investigate maximizing lift to drag, efforts were focused on simple trailing edge modifications and boundary layer control through vortex generators to promote improved pressure recovery. The default airfoil has a maximum L/D of just over 8. The most promising modification, the simple triangular fairing, shows a modest increase in L/D to just over 12. The extended results are presented, along with implications for the performance and stability characteristics of deployable structures.

Annika Thomas
Faculty Mentor(s): Dr. Nicholas A. Smith
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Natural Sciences & Engineering Poster Presentation

OPEN-SOURCE MICROSCOPE FOR CARBON FIBER ANALYSIS IN COMPOSITE PRINTING

The purpose of open-source microscopy is to enable laboratories to have the power of microscopy at a reduced cost and with lower maintenance. Open-source microscopy also allows for a broader range of customization so the microscope can fit into the laboratory in which it will be utilized. Open-source microscopes have typically been used in biology or chemistry settings. This microscope will be used for examining the direction of carbon fibers in composite 3D prints. I will be building the OpenFlexure Microscope. The OpenFlexure Microscope is constructed with 3D printed parts, a Raspberry Pi, a Raspberry Pi camera module, various lenses, and objectives. This open-source microscope will use reflection illumination to capture its images since composite prints are not transparent. The open-source microscope will eventually be tested by observing 3D printed composites under its lens. By piecing images of the carbon fibers together, the angles of the carbon fibers can be measured.

Dang Tran
Faculty Mentor(s): Hongsheng He
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Natural Sciences & Engineering Poster Presentation

From Natural Language Instruction To Domain-Independent Robotic Planning

Domain-independent planning is the fundamental component in Artificial Intelligence System and Cognitive Robot, which is used to make deliberative decisions in complex scenarios. Different from domain-specific planners that are designed to solve hypothesized domains, domain-independent planners are applicable on an arbitrary wide-range of challenges: logistic system planning, temporal model checking, rescue robot planning, cognitive robotic decision making. Despite the significant efforts in developing general-domain planners, there is no research focus on user's intuitive interaction with general planners through Natural Language, due to the well-known complexity and ambiguity in human language's nature. Our project address this problem by proposing a multiple-layer translation model that converts Natural Language commands into corresponding problem descriptions, which can be directly compiled by general-domain planners like SHOP3, or Fast-Forward. The model contains a high-level dynamic syntactic analyzer, accepting the large type of natural language inputs, and tailoring them back into appropriate alternative expressions. A semantic analyzer is designed to find logical expression for the whole input discourse, solving anaphoric phenomenon, designing a logical model for discourse. In the last layer, our translation algorithm runs upon semantic representation in the previous layer, returns back appropriate formal planning description in PDDL-like syntax. The model is evaluated on a subset of linguistic corpus Wikihow, with more than 9000 well-selected instructing scenarios. Results show that the model can understand up to 40.94% of natural instructing scenarios, while ACE model is limited in comprehending any of these scenarios. The effectiveness of the approach has also been evaluated on a robotic assembly task by a Sawyer robot equipped with an anthropomorphic hand in a simulation environment.

Jennifer Alfaro*
Faculty Mentor(s): Dr. Ramazan Asmatulu
College of Engineering
Natural Sciences and Engineering Oral Presentation

Capturing CO2 in Atmosphere via Multinfunctional Nanofibers and Converting it into Biofuel

In 2020, there were numerous natural disasters such as the Australian and California fires that are linked to global warming. Carbon dioxide is one of the main gases that provoke global warming due to the absorption of sunlight and solar radiation. There is an increasing amount of CO2 being emitted worldwide, particularly in growing cities experiencing economic growth. In order to decrease the amount of CO2 in the atmosphere, and create a more sustainable way of producing fuel, this project is focused on the absorption of Carbon dioxide in the atmosphere through multifunctional nanofibers using the electrospinning method. Science and engineering have the duty to work together bringing new ideas and methods of reducing the carbon footprint.

In this study, we hope to bring awareness to our audience about the rapid change in atmospheric temperature caused by greenhouse gases, and how we, as scientists, can create new methods for not only decreasing greenhouse gases, but also discover new ways to use them as energy. This study will benefit environmental sciences and engineering by analyzing how Metal Organic Frames can be used for the capture of CO2 and formation of biofuel from this captured gas.

Sheilja Bhatt
Co-Author(s): Nikhil Pranjpe
Faculty Mentor(s): Ramazan Asmatulu
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Natural Sciences and Engineering Oral Presentation

Transparent Solar Cell

With deposits of conventional sources of energy such as natural gas, coal, etc. depleting around the world, and the increasing need of energy, scientists have begun turning to other sources. One of these sources is solar energy. The development of solar cells is very expensive and requires a lot of space which makes it highly impractical for generating a huge amount of energy. In order to fight this, scientists have begun developing transparent solar cells. "This drawback... is solved by turning any sheet of glass into a photovoltaic solar cell" (Miyazaki). These cells would provide power similar to conventional solar cells by utilizing light and converting it to energy. However, since they would be made of glass, they could be architecturally incorporated into buildings, automobiles and several other structures in order to minimize space utilization. An experiment was performed in an office building. "A standard floor of an office building was modeled to run computer simulation, and annual energy simulation was performed with Energy Plus" (Cossu). "When the optimum PV window is used, the electricity consumption was reduced by 55%" (Cossu). In conclusion, transparent Photovoltaic cells are beneficial despite the cons, and can be a significant source of energy in future times.

Jacques Blasi
Faculty Mentor(s): Li Yao
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Natural Sciences & Engineering Oral Presentation

The Characterization of Microglia in Soy Protein: A Biomaterial-based Approach Towards Neural Regeneration

Neural conduit implantation has been investigated to repair nerves. There is a critical need to optimize neural conduits to improve the therapeutic effect and reduce further neural injury from immunological response. Soy protein has been recently recognized as an attractive alternative source for biomedical applications such as tissue repair and drug delivery. Soybean protein has been shown to decrease the level of proinflammatory cytokine production of mononuclear cells from animal peripheral blood and therefore control immunological reaction in animal tissue. Meanwhile, soy protein has tunable structures and desirable mechanical properties. Numerous studies were performed to characterize the biocompatibility, biodegradability, and mechanical properties of the neural conduits. There is indication that SPI-collagen can be applied for nerve repair and regeneration. The proposed study aims to study the migration and molecular response of human microglial cells to the SPI-based scaffolding. Microglia have a variety of functions in the brain, including synaptic pruning, CNS repair and mediating the immune response against peripheral infection. We will investigate the mobility of microglia on SPI scaffolds and the molecular mechanism. The mobility of microglia will be assessed by analyzing cell migration on polylysine, collagen, and SPI-collagen coated wells. Along with mobility, we will analyze gene sequencing and micro-pathways of microglial cells. We will also study the chemokine generation from the cells on the scaffolds.

Jordan Cao
Faculty Mentor(s): Dr. William Hendry
Fairmount College of Liberal Arts & Sciences
Natural Sciences and Engineering Oral Presentation

CONTINUED DEVELOPMENT/TESTING OF IMPROVED METHODS AND NEW ANTIBODIES FOR IMMUNOHISTOCHEMISTRY

Immunohistochemistry has grown to become a powerful analytical technique to detect and localize the presence of specific cellular proteins at the molecular level. It has extensive uses within medicine to allow for greater efficacy when diagnosing patients, understanding diseases, and expanding possible treatment options. This study aims to apply the functionality of immunohistochemistry to better study the growth and morphology of two different squamous cell carcinoma cell lines sources from head and neck cancer cell lines, CAL27 and FaDu, on two different commercially provided multiwell slides. Additionally, this study aimed to observe how different commercially provided primary antibodies would detect specific proteins (ERa, p53, Palladin, ki-67) in both CAL27 and FaDu cells.

Both CAL27 and FaDu cell lines were grown in mother plates that were then fixed onto multiwell slides Lab-Tek and Lab-TekII CC² prior to immunohistochemistry. An established immunohistochemistry protocol was established and evaluated regarding its specificity for each antibody tested according to the avidin:biotin:enzyme complex based detection system. The results revealed dramatic differences in: 1) Morphology of the CAL27 and FaDu cells based on which type of multiwell slide they were fixed upon (Lab-Tek vs, Lab-TekII CC²); and 2) Signal intensity between the two cell lines for the anti-Palladin antibody.

Jonathan Coleman
Faculty Mentor(s): Suresh Keshavanarayana
College of Engineering
Natural Sciences and Engineering Oral Presentation

Creep of Ribbons in Honeycomb

Honeycomb cores are a low-density man-made cellular material often used in the aerospace industry to make lightweight, stiff sandwich structures. Although core is manufactured in the form of flat sheets, the numerous walls composing its repeating pattern of hexagonal cells possess creep properties which allow it to be permanently shaped under heat into a desired three-dimensional geometry. The objective of this research is to experimentally determine the creep properties of cell walls, which influence the bending capacity of the core. Single-layer cell walls prebaked at 450°F for ten minutes were allowed to cool before being raised to a temperature ranging from 100°F to 425°F. After reaching this temperature, they were forcibly conformed to known radii between 0.125in and 0.75in and held in this state for five minutes. They were then removed from the oven and allowed to relax. The radius of curvature retained by each specimen was measured using a digital microscope. The results of these experiments point to a linear relationship between the amount of creep deformation experienced by the cell walls and the temperature at which forming takes place. This data will be critical to the development and calibration of numerical models used to simulate the formation of large core blocks.

James Davies
Co-Author(s): Aarom Fater, Rachel Klausmeyer, Moriah Beck
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Fairmount College of Liberal Arts & Sciences
Natural Sciences and Engineering Oral Presentation

Site-Directed Mutagenesis of Palladin for Determination of Tyrosinate Formation Mechanism

Palladin is a protein that plays a key role in the binding and bundling of actin filaments in humans. Previous research into palladin revealed an anomalous tryptophan-like fluorescence emission that was hypothesized to be caused by the formation of tyrosinate form of the amino acid tyrosine. Tyrosinate emission, in general, is both controversial and often overlooked in the interpretation of fluorescence data, while the mechanism also remains a mystery. This study aims to determine the mechanism of tyrosinate formation in palladin under neutral pH conditions. To deduce the cause of the tyrosinate formation, site-directed mutagenesis of tyrosine and its nearby residues in palladin were performed. Ultimately our fluorometry data will test the hypothesis put forth in Szabo et al. that tyrosinate formation occurs due to proton transfer to a nearby acidic residue. Unfortunately, insolubility of the mutant protein has served as an ongoing limitation with this research. Therefore, additional vectors containing solubility tags have been sought out to allow for adequate mutant protein production.

Connor Devlin
Faculty Mentor(s): Dr. Suresh Keshavanarayana,
College of Engineering
Natural Sciences and Engineering Oral Presentation

Development and Evaluation of Split-Hopkinson Bar Apparatus for Testing Soft Materials

From automotive bumpers to cell phone cases and prosthetic implants, plastics and rubbers are widely used in modern product design. As such, it is important to understand the behavior of those materials across a variety of loading conditions. Previous research has shown that materials are not only sensitive to the magnitude of the applied load, but also to the rate at which the load is applied. One apparatus that was used to conduct this research is the Split-Hopkinson Pressure Bar, which generally consists of a series of coaxial metal rods that impact one another and apply compressive load to a test specimen. If the test specimen's dynamic response is similar to that of the metal rods, the test produces useful data. In the case of softer and lower-density materials like plastics and rubbers, there is an unfavorable interaction between the stiff metal rods and the soft specimen. Thus, the focus of this study is to select rod materials that more closely match the dynamic behavior of the test specimens. One-dimensional elastic wave theory and the findings of past research were used to select candidate materials, and mechanical testing was used to directly evaluate the performance of the candidate materials. Ultimately, a new test apparatus was built that can test softer materials and deliver high-quality data.

Stephon Edwards
Faculty Mentor(s): Ashley Cervantes,
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Natural Sciences and Engineering Oral Presentation

Understanding People and Technology: A Theoretical Analysis of Time Delay within NASA's Autonomous Mission Operations

During the evening of January 29, 1988, mankind arguably witnessed the greatest catastrophe in the history of space exploration. Undergoing its tenth flight under mission STS51, the Challenger space shuttle exploded seventy-three seconds into launch, killing the inspiration to our research, Ronald McNair, and the six other crew members abroad. Although this disaster could have been easily prevented beforehand, further research has shown that the inevitable wrongdoings of NASA's management was the primary catalyst for such an incident. Due to several unethical decisions made by NASA, the Challenger proceeded to takeoff despite the obvious warnings that preceded the spacecraft's demise. Through analyzing the Challenger Incident, this study seeks to identify the possible ramifications from such an example of disconnection between people and technology within space exploration. Specifically, NASA's autonomous (AI controlled, but independent from human influence) mission operations current possess a prevalent communication delay either between the control center on Earth and the operators in space or between the operators themselves during a space mission. If such a disconnection were to occur during the rectification of a serious incident within space, it could result in the spreading of misinformation throughout all parties within NASA and increase the chances of a catastrophic incident to occur. Within this study's findings, there is a clear correlation present between communication delay and various psychological assessments which includes: human performance, perceived stress/workload, task criticality/level of emergency, and human error probability (HEP) during a space mission operation.

Allen George Philip
Faculty Mentor(s): Dr. Gisuk Hwang
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Natural Sciences and Engineering Oral Presentation

CAPILLARY FLOW MEASUREMENT OF 3D-PRINTED METALLIC WICK

Heat pipes operate by utilizing the latent heat of an internal working fluid for high heat flux thermal management. Capillary structures, i.e., wicks, are at the heart of heat pipes. High capillary performance requires both high capillary pressure and high permeability. However, these properties are typically contrasting because high capillary pressure requires smaller pores whereas high permeability needs large pores. To simultaneously increase the capillary pressure and permeability, the non-uniform pore-size wick is manufactured using metallic 3D printer. Developed rate-of-rise test approaches are used to characterize the capillary performance of 3D-printed metallic wick structures. Here, the wick structure is lowered into a pool of liquid FC-72, which is used as a working fluid. The rate at which the fluid rises up in the wick structure is then recorded by measuring the fluid mass within the wick structure against time. The data, along with the sample's porosity and the effective pore radius, are then used to predict its permeability. The porosity can be obtained by knowing the mass of the sample as well as the mass of FC-72 required to flood the sample. The effective pore radius of the sample can be obtained using the equilibrium mass of the fluid. During experiments, it was found that a high precision mass balance with low stabilization time had to be used for desired repeatability. Using the rate-of-rise experiment, the traditionally-sintered metallic wick samples can be reasonably measured for the permeability and effective pore sizes for the validations. However,

the accurate measurements of permeability and effective pore radius are under investigations by minimizing the evaporations during the experiments. Once the experiments are fine-tuned, they will be performed on the new 3D-printed wick samples. The results obtained will provide valuable insights on the capillary performances associated with various pores sizes, as well as pore connectivity.

William Johnston
Faculty Mentor(s): Bhisham Sharma
College of Engineering
Natural Sciences and Engineering Oral Presentation

Innovations in 3D Printing: Fibrous Structures and Mobile App Development

Grass, feathers, and hair: these items are found frequently in nature, but it remains difficult to replicate them within the growing realm of 3D printing. Additive manufacturing - especially Fused Deposition Modeling - has skyrocketed in popularity in recent decades, but the process still has its limitations and remains inaccessible to some. This research answers the question: can fibrous structures be consistently fabricated using novel additive manufacturing techniques? Here, two print methods have been developed: a traditional technique that relies on the bridging capabilities of the printer, and a method of altering the G-code - or the machine's printing instructions - to extrude print material and pull away to create each fiber. For both methods, fiber parameters were prescribed, including fiber density, extrusion amount, and pull speed. These techniques produce fibers of differing characteristics, from cylindrical rods to hair-like fibers that can even be braided or curled. Impedance tube testing shows their effectiveness at absorbing sound, with high fiber density samples reaching a sound absorption coefficient of 0.9 at frequencies between 2500-3500 Hz. To further expand the accessibility of 3D printing, a virtual 3D printer iOS app was developed to teach its users about the role of G-code in 3D printing. Users can create a 3D model by manipulating the printer's axes, then view their design within an augmented reality environment. This research provides further innovation within the field of 3D printing by introducing two novel fibrous print methods while giving iOS users a virtual printer in the palm of their hand.

Trent Madden
Faculty Mentor(s): Nils Hakansson, Michael Jorgensen
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Natural Sciences and Engineering Oral Presentation

Comparing the effectiveness and acceptance of passive shoulder exoskeletons based on torso design

Passive shoulder exoskeletons are becoming more common in industry settings as companies seek to minimize injuries and enhance productivity. There are many commercially available exoskeletons, all of which are made unique by their modes of activation, structures, adjustability, and materials among other factors. An important point of variation is the design of the exoskeleton's torso segment. In most exoskeletons, this directs load from the arms to the waist. One common torso design consists of a central spine that extends along the back before branching into arm supports. A second common design leaves most of the back open by using two separated segments that extend along the sides of the back. In an effort to guide future exoskeleton designs and inform buyers, this study compared these two torso designs considering effectiveness and participant feedback. 19 participants (9 male, 10 female) performed several simulated drilling tasks with and without exoskeletons. Each participant tested four exoskeletons - two with "central spine" designs and two with "open back" designs. Muscle

activity in the upper arms, shoulders, and back was measured using electromyography. Muscle signals were normalized by comparing them to the maximum voluntary isometric contractions. Exoskeleton effectiveness per muscle and per task was quantified by comparing this normalized signal to the analogous signal in the no-exoskeleton condition. Participants rated subjective effectiveness on a five-point scale and commented on the perceived usefulness and comfort of each suit. These metrics were used to search for a significant difference between the "central spine" and "open back" designs.

Andrea Martinez
Faculty Mentor(s): Michael Jorgensen, Nils Hakansson
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Natural Sciences and Engineering Oral Presentation

The Impact of Manufacturing Work Experience on Shoulder Muscle Activation Utilizing Shoulder Passive Exoskeletons

Work-related musculoskeletal disorders (WMSD's) of the upper limbs remain a challenge in the workplace where workers perform repetitive and forceful motions. A relatively new device that manufacturing industries are drifting attention towards are wearable passive exoskeletons in hopes of reducing shoulder injuries. Although some studies have investigated the effects of passive exoskeletons on experienced workers, the majority of the research exoskeletons impact on muscle activation has been performed on participants who are inexperienced in industrial work activities. Thus, it is not generally known if passive shoulder exoskeletons would impact the shoulder muscle activation of experienced workers differently compared to inexperienced participants. In this study, a passive shoulder exoskeleton was investigated for five different overhead postures on twelve inexperienced participants and thirteen experienced participants. Electromyography (EMG) was utilized to collect and analyze the muscle activity on four different muscles. There were significant differences in muscle activity of the anterior and medial deltoid for certain postures when comparing experienced workers to inexperienced participants. The findings suggest there are significant differences in muscle activity, and how experienced workers utilize the passive exoskeleton compared to inexperienced participants. These differences may arise from the skillset experienced workers already have and how they know how to execute overhead tasks to minimize effort.

Katherine Moore
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Natural Sciences and Engineering Oral Presentation

Tin Oxide and Third-Generation Photovoltaics

Solar Energy is one of the most influential sustainable energy resources available today. With the ever-pressing issue of global climate change and the push for more sustainable and ecofriendly energy resources, it is essential to explore solar energy further. At the forefront of this research, is Third Generation Perovskite Solar Cells. Presently, Titanium Oxide is the industry standard for the electron transport layer however, Titanium Oxide is comparatively costly and requires high temperature annealing to produce useable products. Herein, Tin Oxide, synthesized via a Sol-Gel process, is explored for the first time ever as a cheaper, low-temperature alternative to Titanium Oxide. It was found that the bulk purchased tin oxide was not comparable to the Titanium Oxide power

conversion efficiency (0.5% vs 3.69%) but, when mixed in a 1:15 Titanium Oxide to Tin Oxide ratio a comparable power conversion efficiency of 2.7% is achieved. Additionally, the Sol-Gel synthesized Tin Oxide, mixed in a 1:15 ratio with Titanium Oxide achieved a 2.09% efficiency. Ultimately, with further refinement of morphology, it is concluded that Tin Oxide is comparable to Titanium Oxide as an electron transport layer in perovskite solar cells.

Gissele Mosqueda
Co-Author(s): Anna Tri
Faculty Mentor(s): Yimesker Yihun, Dr. Lisa Vangsness
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Natural Sciences and Engineering Oral Presentation

IDENTIFYING MOTIVATIONAL FACTORS AFFECTING ASSIST-AS-NEEDED REHABILITATION

Chronic diseases that lead to immobility frequently require rehabilitative therapy to restore mobility. However, the cost and lack of rehabilitative specialists make it difficult for patients to receive adequate care. One way to address these challenges is through at-home therapy that uses robot-based assist-as-needed (AAN) devices, which are wearable devices that enhance physical performance. This approach relies on assist-as-needed (AAN) algorithms that determine when patients need physical aid to complete therapeutic exercises. The purpose of this study was to understand human engagement with robot-based AAN devices. A sample of 10 healthy young adults underwent an experimental session that consisted of three tasks of daily living that targeted upper-arm mobility. Participants completed the New General Self-Efficacy Scale before each task. After each set of 5 repetitions, the difficulty of each task was manipulated, and participants made a Judgment of Difficulty (JOD). We found evidence that participants' JODs were informed by the objective difficulty of each task, the feedback they received in the form of task accuracy, and the physical effort they exerted. These three factors did not influence participants' task engagement and suggest that JODs and task engagement decisions are distinct, but still related constructs during rehabilitative therapy.

Michael Nguyen*
Faculty Mentor(s): Nils Hakasson, Michael Jorgensen
College of Engineering
Natural Sciences and Engineering Oral Presentation

Should you follow manufacturer's recommendation? - A look into exoskeleton's effectiveness due to fitment.

The implementation of exoskeletons in the workforce brings promise of mitigating injuries for employees that are at risk due to strenuous work, however; there are currently no standards or regulations for exoskeletons. With no standards in place, that introduces another risk of injury due to possible misuse of the exoskeletons itself. One area of concern would be proper fitment of the suit on the users to ensure the loads experienced are being redirected as they are designed. If not, the exoskeleton may not reduce fatigue as designed or may even be the cause of injury. Therefore, the objective of this study was to determine how effective exoskeletons will be during overhead activities. To fulfill this objective, EMG will be used to measure the muscle activity during 2 overhead drilling tasks with the shoulder at 90°. By filling out "fitment" criterion (waist, torso, cuffs) that will be used to compare the recommended exoskeleton settings based on the subjects anthropometry measurements compared to the

exoskeletons settings the subject wore during the experiment, then compare the EMG activity of targeted muscle groups to the two groups of fitment categories. The expected findings should be that those improperly fitted will have less reduced EMG activity in those targeted muscle groups and more EMG activity in other “at-risk” muscle groups due to muscle coactivation. Based on the expected finding, this implies the exoskeletons need to be fitted properly per manufacturer's recommendations in order to make full use of the exoskeleton and to mitigate misuse of the exoskeleton that could put the employee at risk for injury.

Mmasi Obi
Faculty Mentor(s): Eylem Asmatulu
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Natural Sciences and Engineering Oral Presentation

Converting Microplastics to Useful Fibers

Microplastics such as monofilaments are major pollutants in marine environment which affect marine lives and water quality. To solve this global menace, many researchers have been working on several ways of recycling these wastes and converting them into value added products. One of unexploited areas is the conversion of monofilaments into nanofibers which can be used for several applications - water purification, flame-retardancy, tissue engineering, antibacterial among others. In this study, we produced novel nanofibers through the electrospinning of polymeric solution consisting of recycled monofilament (RMFL), hydroxyapatite (HAP), and silver nanoparticles. The fabricated nanofibers were further characterized to study their wettability, surface morphology, surface chemistry, thermal degradation, and antibacterial capability. The developed nanofiber could be used as a protective layer against bacterial infection during wound healing process. Nanofibers consisting of recycled monofilaments and hydroxyapatite show the best hydrophilic-super hydrophilic transition with a change in water contact angle from 27.32 ± 3.80o to 0o in 1 minute.

Trevor Owen
Faculty Mentor(s): Michael J. Jorgensen, Nils Hakansson
College of Engineering
Natural Sciences and Engineering Oral Presentation

Effects of Shoulder Angle Activation On Exoskeleton Suit Performance

In aircraft assembly overhead work is a common task which can result in shoulder injuries. One proposed solution is the application of upper body exoskeletons worn by employees to reduce stress at the shoulder joints, possibly reducing shoulder injury risk and their associated costs. Therefore, the objective of this study was to see if exoskeleton suits provided benefit to the subject wearing them. The study was conducted in a WSU BME biomechanics lab, consisted of 30 participants (16 male and 14 female). Participants wore two different shoulder exoskeletons performing simulated drilling tasks at two different shoulder/elbow postures. The first position was a shoulder and elbow angle at 90 degrees to the vertical drilling upward. The second position was a shoulder and elbow angle at 135 degrees drilling upward. The exoskeletons shoulder angle activation is adjustable, 90 degrees for the first experiment and 120 degrees for the second experiment. Electrical muscle activity (electromyography) was collected from electrodes attached to the anterior and medial deltoids muscles and normalized to the muscles’ maximum voluntary contraction (MVC) levels. The muscles’ percent MVC is then utilized to compare muscle activity across participants, drilling exertions and exoskeleton shoulder activation angles. To assess the effects of

the exoskeleton shoulder angle activation a 2-factor ANOVA will be performed with independent variables of shoulder angle setting and drilling task, and the dependent variable of EMG percent MVC. It is expected that the EMG percent MVC will be different at both angle settings and between the two drilling tasks.

Esmeralda Sanchez-Torres
Faculty Mentor(s): Dr. Bhisham Sharma
College of Engineering
Natural Sciences and Engineering Oral Presentation

CHARACTERIZING THE TOPOLOGY-PROPERTY RELATIONSHIP OF OPEN-CELLED POROUS STRUCTURES

Additive manufacturing is the industrial production process of creating stronger, lighter, and cheaper parts. It is a runner-up against old-fashioned Subtractive manufacturing: an umbrella term for various controlled machining in which raw blocks are cut into parts. Additive involves 3D printing instead: a cost-effective alternative that adds on material, and therefore, reduces waste that occurs from constructing a single part.

The motivation for this research is 3D modeling and printing structures characterized by their complex geometry that would otherwise not be possible using traditional software and methods. Emerging software nTopology, a program based on implicit design and fields, drives the limits of modeling and what users can produce. To push the system, the author created the following models: lattices, gyroids, fibrous structures, and simple geometries. As lattices are the primary focus, those designs were printed using both FDM and SLA technologies.

Successful prints promote the employment of additive manufacturing in fields such as medicine, dentistry, and fashion. Implementation will aid in reducing energy and material waste.

Joseph Sekavec
Faculty Mentor(s): Thomas Delillo
Fairmount College of Liberal Arts & Sciences
Natural Sciences and Engineering Oral Presentation

Complex Analysis and Fluid Flow

In this study we modeled fluid flow and circulation over an airfoil. We started with the known solution in the circle domain, and used conformal maps to transform to the airfoil domain. We used tools from complex analysis and differential equations including Laplacians, the Joukowksi transformation, and other conformal maps. The open source mathematical computing software sage was used to build this model and create all images.

Brenden Wood
Co-Author(s): Juan Ocon
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Social Sciences & Humanities Oral Presentation

Face Reveals, Do They Change Anything?

Juan and I have been student teaching this semester. We're currently the head-teachers of our classrooms. So, we work with students, in-person and online, every day. However, neither of us have really shown our faces consistently to the online students. Some of them don't even know what we look like.
Our students just finished their 3rd quarter of the school year with our inconsistent face revealing. And we have records of their participation from that whole quarter. During the next quarter, we were thinking we could more consistently show our faces to the online students and record if that gets more participation or feedback from them.

The overall experiment is that we will record participation records and interaction patterns in the coming quarter to see if the teacher revealing their face contributes to higher participation from online students.

Latisha Davis
Faculty Mentor(s): Nikki Keene Woods, PhD, MPH
College of Health Professions
Social Sciences & Humanities Poster Presentation

Utilization of Pre And Postnatal Resources among Black Women in Sedgwick County

Introduction: Significant infant death disparities exist. African American women have the highest infant mortality rate at 18.8/1,000 live births compared to the average rate 7.4 per 1,000 live births in Sedgwick County. Non-Hispanic black women have a rate two to three times higher. Mothers can prevent causes of infant mortality by taking care of their health during and after pregnancy. Community services are available to improve health and reduce health disparities.

Research Question: Is there a relationship between the use of community resources that provide pre-and post-natal services and the high incidence of infant mortality among black women ages 18-65 years?
Methods: A Qualtrics survey was provided to participants via email and social media. All women had to be 18-65 years old, English speaking, and live in or near Sedgwick County Kansas. Responses were tabulated using excel and analyzed for trends. Descriptive statistics were used to summarize the data.

Findings and Interpretations: There were 59 participants, age range of 21-30 years old and most completing high school or higher 87% (n=33). Of the 19 community services listed in the survey 12 services were utilized. 40 (68%) of participants used at least one community service. The Women Infant and Children nutritional program (WIC) was the most selected service used 43% (n=32). The next most frequent were Healthy Babies and A Better Choice 11% (n=8), followed by Grace Med Health Clinic and The Treehouse 7% (n=5). Of the participants, 11% (n=4) of mothers reported an infant loss. Most women reported they trusted their services providers 93% (n=42).
Conclusion: African American women do use community services in Sedgwick county. Four women had babies die within the first year. Further research is needed to understand the high rates of infant mortality amongst African American women and the services needed during and after pregnancy.

Brianna Kirkhart
Faculty Mentor(s): Julie Martin
College of Health Professions
Social Sciences & Humanities Poster Presentation

Visidental: Oral Health Education for the Visually Impaired

Problem Statement: Oral health education programs aimed for children with visual impairments are nonexistent in the United States. These individuals rely on parents or legal guardians for their oral health care.
Purpose: It is essential to establish an oral education program designed specifically for children with visual impairments. This program will bring awareness to the lack of research, and the oral health education disparities in this population.

Methods: Cochran databases were utilized to search for scientific articles that contained research on oral health issues or programs aimed toward children with visual impairments (Key words searched were visually impaired, children, oral health education, caries, dental aids). American Foundation for the Blind was contacted, and their experts stated there has been no research involving oral education. An interview from a visual impairment adult who shared their experiences about how they learned about oral health. Local foundations or institutes such as Envision were contacted to inquire if there were existent oral health programs in place for children with visual impairments.

Results: Studies about oral health issues in specific oral health programs for children with visual impairments in the United States were nonexistent. According to the American Foundation for the Blind, there is research lacking her in the United States. It mentioned there are studies on oral health issues in children with visual impairments in Asia. Other articles suggest a specific oral health education program is recommended to be designed and aimed toward children with visual impairments for oral health improvement. The interviewee confirmed their only knowledge about oral health was from their parents. VisiDental education program is aimed to educate and improve the oral health of visually impaired children.

Conclusions: VisiDental revealed a need for a specifically designed oral health education for the visually impaired. This was created for children with visual impairments due to the lack of oral health education as well as nonexistent research for this target population. Non-profit organizations like Envision would be a starting point to incorporate oral health education for the visually impaired. It is recommended that further research is needed to identify communication barriers and innovation to implement oral health education.

Jacob LaForge
Faculty Mentor(s):
College of Applied Studies
Social Sciences & Humanities Poster Presentation

Diversity Inclusion In The Classroom

Inclusion of diversity in the classroom is more important now than ever before. I created a poster representing from inspirations that I had from traveling to South America as well as experiencing diversity first hand as a teacher. Introducing students to differences, cultures, and culturally inclusive lessons will expose kids to the necessary aspects to become successful and respectful people.

Ava Munzinger-DeFrain
Co-Author(s): Breanna Johnston
Faculty Mentor(s): Dr. Jennifer Demers
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Social Sciences & Humanities Poster Presentation

Bystander Intervention and Technology-Facilitated Sexual Violence: A Qualitative Analysis of College Students on Facebook

Sexual violence is a prevalent issue in college populations, which extends to their online communities. Behaviors that use technology to enable sexual violence are referred to as technology-facilitated sexual violence, or TFSV. On social media platforms such as Facebook, students may come across posts, pictures, or comments from their peers that range from inappropriate to dangerous or even illegal. However, prevalence rates of viewing sexual violence-related content are unclear, as is the range of problematic content. Furthermore, while a substantial literature exists on in-person forms of sexual violence, less is known about bystander intervention to prevent TFSV when students encounter it on social media. This study aims to address this gap in the literature by examining the types of TFSV college students report encountering and what they may have done in response. The purpose of this study is to identify the attitudes of college students on TFSV, which can help identify problem areas in current campus sexual assault intervention efforts. In the current study, 579 students at a large public New England were shown several vignettes of examples of TFSV on Facebook as part of a larger study. Participants were then asked to consider instances where they witnessed something similar on social media. Participants were asked to describe the incident, provide reasons why they did or did not intervene, explain how they intervened if indicated, and describe the reaction they received to any intervention. Participants' responses were qualitatively analyzed using thematic analysis and several overarching themes were identified and discussed.

**Virtual presentation not available*