



# **HONORS COLLEGE**

The University of Texas at Arlington

## **HONORS RESEARCH SYMPOSIUM PRESENTATION ABSTRACTS**

**APRIL 12, 2019**

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**LORENZO ALBA, MECHANICAL ENGINEERING**

*Design and Construction of a Wheelchair Mounted Assistive Robotic Arm*

Faculty Mentor: Dr. Panos Shiakolas

Many people who suffer from paralysis in the upper body require assistance with everyday activities such as eating and drinking. This assistance is usually provided by a caregiver or family member. The senior design team has designed and assembled an affordable modular wheel chair mounted modular robotic arm. The primary performance goal of the design is to lift a glass of water for the user to drink. Per the request of the project advisor, the robot is controlled using a National Instruments MyRIO microprocessor with control software written in LabVIEW so that the robot may serve as a platform to conduct robotics research. Open loop control of the robotic arm via a joystick has been implemented with development of closed loop control currently in progress. The implementation of both open and closed loop control systems will give the robotic arm additional utility as a research platform for advanced input devices.

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**SEDRA ALBOSSTANI, BIOLOGY**

*Characterization of the mitochondrial UPR regulated serpin SRP-1*

Dr. Mark Pellegrino

The mitochondrial unfolded protein response (UPR<sub>mt</sub>) is a regulatory stress response that is involved in the protection of mitochondrial function. In the model organism *Caenorhabditis elegans*, the UPR<sub>mt</sub> is regulated by an essential transcription factor known as ATFS-1. When mitochondrial function is compromised, ATFS-1 regulates the expression of a variety of genes, including *srp-1* which encodes an uncharacterized serpin. Serpins are part of a larger superfamily with classical roles in blocking protease enzymes but their function during mitochondrial stress is unknown. We sought to examine the role of this UPR<sub>mt</sub>-regulated serpin during mitochondrial stress. We find that *srp-1* gene knockdown by RNA interference enhances UPR<sub>mt</sub> activation during mitochondrial stress. Interestingly, *srp-1* displays a refined expression in a subset of four small interfacial epithelial cells. Furthermore, *srp-1* protein appears to localize to the endoplasmic reticulum suggesting inter-organelle stress crosstalk.

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**MOHAMMED ALI, SOFTWARE ENGINEERING**

*The Intelligent Problem Solver for Discrete Mathematics*

Faculty mentor: Dr. Christopher Conly

Online calculators have been on rise in the past few years. An online calculator for discrete mathematics is almost impossible to find. There are a few online calculators that take up this challenge but they have very limited functionality. This problem is mainly due to the fact that discrete math problems have their own set of rules that apply only to that problem. We wrote a modified forward chaining algorithm on wolfram programming lab that can solve discrete mathematics problems. We also created a beautiful front-end using React and materials-UI framework. An application program interface (API) will be used to connect the backend with the frontend. The problem that the user types will be put in proper format and sent to the backend to be processed. The step-by-step solution is then returned and displayed to the user.

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**THOMAS ARRUDA, AEROSPACE ENGINEERING**

*Design Synthesis, Refinement, and Analysis of a Three-Surface Next-Generation Regional Jet*

Faculty Mentor: Dr. Dudley E. Smith

The regional jet is an area of fierce competition among the airline industry, where every advantage in terms of operating cost and weight reduction are incredibly important. The study was concerned with possible advantages and disadvantages of a three-surface aircraft when compared to a conventional aircraft. The trade study focused on varying several aspects of the wing planform to find an optimal configuration and served as an introduction to preliminary aircraft design. The focus of this paper is on the individual contribution of the author to their group. The leadership and planning methods used along with industry software design training will be assessed as to their effectiveness. Effectiveness will be measured by the performance of the team according to a panel of industry members as well as through feedback from a mentor, Dr. Dudley Smith, an industry member with over 30 years of experience in the preliminary design field.

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**ALEXIS AUSTIN, HISTORY**

*Revolutionary Woman or Woman of the Revolution: An Analysis of Abigail Adams*

Faculty Mentor: Dr. David Narrett

Abigail Adams has been personified in a variety of ways since the publishing of the family letters by her grandson. The most common of these personifications today is Abigail as a revolutionary women who actively sought out the expansion of women's rights into nontraditional roles of the time. Though it is true that Abigail was an avid supporter of female education, reading through her letters sent to family and friends reveal a different woman than some biographies portray. Abigail was a woman of wit, intelligence, kindness, as well as a jealous woman who often complained about her circumstances. Overall, Abigail's letters display a complex woman who, in hindsight, we can consider a revolutionary woman but not an individual who would have considered herself as such.

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**AMAN BHARDWAJ, B.S. INFORMATION SYSTEMS**

*Correlation between Tutoring Hours and Letter Grades, GPA, Graduation Rates, and Class Drop Rates*

Faculty Mentor: Karen Scott

In this project, the relationship between the grades, GPAs of students who sought tutoring at UTA and the number of tutoring hours they received was studied. Subsequently, the relationships between overall graduation rates, class drop rates and tutoring hours were explored. The data comes from the University Tutorial and Supplement Instruction (UTSI), an on-campus organization that provides tutoring for many courses at UTA. Statistical tools were used to describe the relationships and the significance of these relationships was discussed in detail. Using Tableau, a dashboard was made to summarize the findings.

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**MADELINE CARLSON, MICROBIOLOGY**

*DivIVA localization during SepIVA depletion in *Mycobacterium smegmatus**

Faculty Mentor: Dr. Cara Boutte

*Mycobacterium* is a genus of bacteria best known for *Mycobacterium tuberculosis (Mtb)*, which causes tuberculosis. Proteins that are distinctive to mycobacteria can be studied in closely related species of *Mtb* in order to find potential new tuberculosis drugs based unique mycobacterial processes. In this study, the model organism *Mycobacterium smegmatus (Msmeg)* was used to study the protein, SepIVA. SepIVA is a protein found in *Mycobacteria*, which is thought to be similar to a group of proteins that function in assisting with cell wall synthesis during cell division and cell elongation. To study the possible functions of SepIVA, the localization of the protein DivIVA was observed, via microscopy. DivIVA is a better studied protein with known localization patterns in *Msmeg*. The results suggest that SepIVA is not involved in regulating the localization of DivIVA during cell division.

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**JOE CLOUD, COMPUTER ENGINEERING**

*Dynamic Movement Primitives in Shared Human-Robot Environments*

Faculty Mentor: Dr. Fillia Makedon

Robots assisting humans in the workplace and home has been the focus of much research and initiatives in recent years. As we operate in an inherently dynamic environment, it is important that these robotic counterparts carry out tasks in a safe, yet effective manner. In this thesis, we employ a modified version of the dynamic movement primitives framework (DMPs) to learn motor skills through demonstration. We experiment with a seven degree of freedom manipulator which is taught to perform a pick-and-place task in a human-shared environment. An obstacle avoidance term is appended to the DMP to allow it to steer around human obstacles, which are approximated by a vision system. Although the robot is actuated in joint space, the task is learned in Cartesian space to simplify the representation of obstacles. Thus, inverse kinematics is used to transform the DMP-generated trajectory to joint solutions and then performed by the robot.

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**PRINCESS EHIKHUEMEN, BIOMEDICAL ENGINEERING**

*Continuous Monitoring of Blood Analytes*

Faculty Mentor: Dr. Digant Davé

A current challenge in the healthcare field is the ability to continuously monitor blood analytes in real-time and with accuracy. The concentration of various blood analytes can change relatively quickly in critical care situations. The goal of this senior design project is to design a fiber optic biosensor that detects and analyzes specific proteins in the blood. In order to achieve this, a reservoir-receiver unit was designed to hold the fluid and the fibers were stripped, cleaved, etched and spliced. The fiber tips were finally coated with the specific capture chemistries and connected with an SC connector to a phase-sensitive analyzing system. A functional system was obtained with a spectral interference waveform that shows the binding of the protein to its molecule of interest. This was visualized by a phase shift in the graph that signifies a change in path length when binding occurs.

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**JOANNA GLOVER, SOCIAL WORK**

*Hospice Underutilization amongst African Americans and Latinx*

Faculty Mentor: Dr. Regina Praetorius

Some older Americans, especially minorities, will either choose not to receive hospice care or will choose to receive hospice when all other treatment options have been eliminated. Some key points that are possible reasons for underutilization include: late referrals, negative associations of hospice, and cultural or religious beliefs. Qualitative interviews were conducted with 8 primary caregivers who have a loved one receiving hospice care who were either African American or Latinx. Guiding questions were asked to confirm suspected reasons or determine possible additional reasons for underutilization. The common pattern that each primary caregiver presented as a problem is the lack of education and communication about the hospice philosophy and what services are included with hospice. Other problems for underutilization included generational differences, physicians not discussing hospice with families, and the stigma of dying soon after hospice enrollment.

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**KIRA GRIFFITHS, ACCOUNTING**

*The Impacts of the Tax Cuts and Jobs Act (TCJA) of 2017 on International Business*

Faculty Mentor: Dr. Stanley Seat

The Tax Cuts and Jobs Act (TCJA) of 2017 changed many aspects of the old tax code and created significant impacts on international business. Interpretations of the tax law, tax expert testimonies, and business publications were used to determine the economic impacts for both domestic and foreign businesses. The corporate tax rate reduction and implementation of the Global Intangible Low Tax Income (GILTI), Base Erosion Alternative Minimum Tax (BEAT), and Foreign-Derived Intangible Income (FDII) policies have greatly incentivized the holding of assets in the United States. The overall long-term economic impacts of this reform is still a matter of conjecture at this point and will become more apparent in the forthcoming years.

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**MEAGHAN HARRAGHY, INFORMATION SYSTEMS**

*Overcoming Issues of Implementing Wearable Technologies in Healthcare*

Faculty Mentor: Dr. Jerry Hubbard

As healthcare technologies have increased rapidly, the industry is lagging behind in implementation within non-experimental environments. Human bodies are full of data but offer challenges when capturing and analyzing information into valuable data for healthcare professionals. The purpose of the study was to evaluate the added benefits and obstacles of implementing various wearable technologies to track the state of a patient or the health of the caregivers. With a review of the Internet of Medical Things (IoMT) and the results from the participant survey and interviews with a total participation of n=12, the study explored obstacles and acceptance of wearable technology. The results showed employees are wary of their superiors accessing their data. Other obstacles to adoption include data security, infrastructure design, storage allocation, user adoption, and sensor hygiene. The benefits of increased sensor use would be early identification of diseases and overall increased awareness of individual health.

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**JOSEPH HERRING, MECHANICAL ENGINEERING**

*Integrated In-Wheel Powertrain Electric Vehicle Design*

Faculty Mentor: Dr. Raul Fernandez

Over 50% of the carbon monoxide, and 25% of the harmful hydrocarbons released into the air in 2013 were attributed to transportation. It is clear that the automobile industry is entering a new paradigm as resources are increasingly spent towards developing electric vehicles as a sustainable transportation source. NextGen Drive is a team of senior Mechanical Engineering students working with Dr. Yawen Wang in the Mechanical Engineering Department at The University of Texas at Arlington to research and develop the design of an integrated in-wheel electric motor powertrain solution for an electric vehicle that offers increased energy efficiency, delivers superior vehicle performance, and improved safety, over traditional automobiles. Some of the primary deliverables for this project include a technical data package of complete engineering drawings, as well as topology optimization for strength-to-weight ratio, and the 3D printing of a prototype.

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**LESLIE HUTCHISON, SOCIAL WORK**

*A Systematic Review of Child Sexual Abuse Interventions*

Faculty Mentors: Ericka Freeman

Child sexual abuse (CSA) disrupts all domains of an individual's life. When left untreated, greater negative outcomes can result. It is well-documented that interventions such as CBT, GB-CBT, and TF-CBT reduce symptoms related to CSA, but there is little evidence examining the degree to which each intervention is effective as it compares to another. In this study, the efficacy of CSA interventions (GB-CBT, TF-CBT, EMDR, AAT, group therapy, CBT, and psychotherapy) are compared and synthesized by searching databases: CINAHL Complete, PsycINFO, Psychology and Behavioral Sciences Collection, PsycARTICLES, Social Work Abstracts, and Family Studies Abstracts from January 1970 until March 2019. Title Screening, Full-Text Review, and Risk of Bias Assessment are used to screen for inclusion criteria and quality. A meta-analysis is conducted using Risk Ratio (RR) and Odds Ratio (OR) to synthesize results. Multiple screening tools are used to mitigate bias and critically acclaim data. Results and implications are discussed.

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**AMELIA JACKSON, MECHANICAL ENGINEERING**

*Assistive Robotic Arms*

Faculty Mentor: Dr. Panos Shiakolas

An estimated 58,000 individuals in the United States alone require assistance with eating and drinking. Current robotic technologies on the commercial market that attach to electric wheelchairs and are capable of performing motions associated with eating and drinking, cost around \$30,000. This exorbitant cost renders many persons with a disability reliant on other people for their basic care. In partial fulfillment of MAE 4188, our senior design group has designed and built a wheelchair attachable, assistive robotic arm capable of reaching a distance of two feet to retrieve a two-pound object. The target cost for the prototype is \$1500. In completion of this project, we will bring an affordable mobility solution to those who need it most.

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**FREDERIC JOHNSON, MICROBIOLOGY**

*Searching for Antimicrobial Peptide Genes Regulated by the Mitochondrial Unfolded Protein Response*

Faculty Mentor: Dr. Mark Pellegrino

The Unfolded Protein Response of mitochondria plays a regulatory role in mitochondrial repair as well as innate immunity. ATFS-1 is an important transcription factor for UPR<sub>mt</sub> that mounts a host defense program to promote mitochondrial homeostasis. A subset of ATFS-1-dependent genes share features of antimicrobial peptides (AMP) that act as host defense molecules to fight infection. To test whether these putative AMPs are involved in host defense during infection, we knocked-down their expression using RNA interference to examine the effect on host survival. Conversely, we also tested whether overexpressing each AMP individually in the model organism *Caenorhabditis elegans* could reduce host colonization of a pathogen by creating transgenic *C. elegans* expressing the AMP in the intestine and subsequently infecting them with the pathogen *Pseudomonas aeruginosa*. The results concluded that some of these tested peptides may indeed possess antimicrobial properties that promote host resistance.

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**ALEXANDER JOHNSTON, ELECTRICAL ENGINEERING**

*Efficient Control and Monitoring of a Mobile and Compact Energy Storage Module*

Faculty Mentor: Dr. David Wetz Jr.

As consumer electronics penetrate every day society, user demands make it critical for safe, efficient, and portable energy storage. Lithium-ion batteries are the most widely deployed battery today due to their high-power and energy density. While they are incredibly convenient, they also bring the challenges of regulating power and ensuring safe operation. Power electronic converters (PEC), are used to regulate a battery's voltage. Actively controlling converters presents a challenge whose improvement is focused upon here. In the research documented here, a PEC scheme has been assembled that enables a lithium-ion battery to actively supply and draw power onto and from a larger power system architecture, safely. The topology in which the components are connected, the overarching controller designed, and the implementation of a custom battery monitoring system will be discussed. The system can be conveniently packaged in a mobile, composite, safety enclosure for protection in the event of battery failure.

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**CHRISTIAN LOWERY, MECHANICAL ENGINEERING**

*Imaging and Measurement of the Transient Evolution of the Cross-Section of an Extruded Polymer Filament in Additive Manufacturing*

Faculty Mentor: Dr. Ankur Jain

Additive manufacturing (3D printing) is an exciting new manufacturing technique with potential for significantly enhanced capabilities compared to older techniques. In particular, it is known for its ability to create complex parts; however, due to bonding imperfections, the parts tend to possess inferior mechanical and thermal properties when compared to similar parts manufactured through other methods. Thus, the bonding of 3D printed parts was studied by collecting and analyzing data about the change in the cross-section of an individual filament, while varying printing parameters such as bed temperature. In addition, adjacent bonds were printed and studied while the same printing parameters were varied. It was discovered that thermal properties are optimized when temperatures are high and filament spacing is small. These results will help form recommendations for printing parameters to optimize the physical properties of printed parts.

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**LOLADE MAFIMIDIWO, ELECTRICAL ENGINEERING**

*Wireless Sensor System for Space Utilization Optimization*

Faculty Mentor: Dr. David Wetz

Optimization of public areas and infrastructure is key to accommodating the growing population in densely packed areas such as cities, metropolitans, etc. To effectively optimize a given space, its usage patterns need to be analyzed so as to help managers of the space identify pain points and create a more effective improvement plan. Using a sensor system is the most efficient and accurate method of monitoring the given space, especially on a continuous basis. Our Wireless Sensors system is an integrated sensor system that combines the millimeter wave sensor, coupled with an environmental sensor system—a combination of temperature sensor, humidity sensor and accelerometer—to provide insight on the utilization patterns and surrounding conditions of the monitored space. This data is then sent wirelessly via Bluetooth to the user for further analysis within our custom graphical user interface, all while still maintaining the privacy of those in the monitored area.

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**TRENTON MCNAIRY, BUSINESS MANAGEMENT**

*The Importance of Developing a Sustainable Competitive Advantage for Organizations*

Faculty Mentor: Jeffrey McGee

This research focuses on the importance of building a sustainable, competitive advantage within an organization, and highlights how the imitability of an organization's competitive advantage directly correlates with the long-term success of that organization. Additionally, this project touches on the hardships some organizations in the retail industry are facing in today's market and how the organizations who are not performing well are potentially being affected by the inflexibility and unsustainability of their firm's founding competitive advantage(s).

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**DIANA MONYANCHA, BIOLOGY**

*Characterization of F<sub>420</sub> Dependent Glucose-6-Phosphate Dehydrogenase H260N Variant Using Steady-State, Pre-Steady State and Kinetic Isotope Effects Methods*

Faculty Mentor: Dr. Kayunta Johnson-Winters

F<sub>420</sub>-dependent glucose-6-phosphate dehydrogenase (FGD) is an essential enzyme found within *Mycobacterium tuberculosis*, the causative agent of tuberculosis disease (TB). FGD catalyzes the conversion of glucose-6-phosphate (G6P) to 6-phosphogluconolactone, using the unique F<sub>420</sub> cofactor. This reaction is carried out as the first step of the pentose phosphate pathway. This current project will expand on previous work conducted on the H260N FGD variant, aimed at determining if Histidine 260 serves as an active site base. We have conducted, fluorescence binding, steady-state, pH dependence profiles, and pre-steady-state kinetic experiments on wild type FGD as well as the H260 FGD variant. The results suggest that H260N does not serve as the active site base. However, it plays an important role in catalysis. Here we aim to probe the FGD reaction mechanism using substrate kinetic isotope effects.

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**FIYINFOLUWA (JOYCE) MORENIKEJI, NURSING**

*Time to Professional Competence: Exploring Pre-nursing Students' Beliefs and Expectations*

Faculty Mentor: Dr. Regina Urban

Upon entering nursing practice, new graduate nurses (NGN) experience a knowledge and skills gap between their academic preparation and what they will encounter in clinical practice. Nursing theorists and experienced nurses estimate that it takes about 12 to 15 months of work-based experience before an NGN feels competent in their role as a registered nurse. No research has been conducted on pre-nursing students' beliefs regarding the time and training needed to become competent in their role as a registered nurse. Using an IRB approved comparative descriptive research design, online and on-campus pre-nursing students at UTA were invited to complete an 18-question Likert-scale and short answer online survey. Participants provided demographic information and answered questions regarding their beliefs. Most pre-nursing students in this study did not have a realistic expectation of the length of time typically offered for training or the time needed to transition to professional practice as an NGN.

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**JUVERIA MUHAMMAD, FINANCE**

*Relation between Monetary Policy Rate and Bank Performance for US and European Union from 2008 - 2018.*

Faculty Mentor: Dr. David Rakowski

Although, price stability is the main objective of most central banks, they also have an interest in promoting banking sectors that are both stable and efficient. Previous studies have found that banking margins and profitability are positively associated with the interest rate level. Before the 2008 financial crisis, both U.S. and European banks had high profitability levels, but following the crisis European banks have had low profitability levels relative to their U.S. counterparts which has raised concerns among policy makers and researchers. This paper attempts to shed light on this issue by determining how the relationship between monetary policy and bank performance has diverged for U.S. and European Banks after the 2008 financial crisis. The model is estimated from univariate regression analysis of bank performance measures of the largest banks in the U.S. and Euro-area, along with the policy rates of the respective regions for the past decade.

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**AMBER MULLENAX, SOCIAL WORK**

*Birthmothers ~ Services Provided Post-Adoption*

Faculty Mentor: Dr. Regina Praetorius

Birthmothers can experience long-term problems after placing their child for adoption including mental health issues, separation grief, sadness, anger, depression, suicidality, and anxiety. The lack of services post-adoption could be detrimental to their overall health. The objective of this study was to learn what adoption agencies provide to birthmothers post-adoption, and to understand if the services provided were meeting best-practice recommendations. The desired sample consists of a population of fifty adoption agencies in the Dallas-Fort Worth Motorplex. The sampling frame used to create the population consisted of "adoption agencies" and "Dallas-Fort Worth" keywords. A survey was used that provided the adoption agency with multiple choice and open-ended questions concerning services being offered to birthmothers post-adoption. Data were collected through website searches, phone interviews, and e-mails. The findings from this research study illuminate what is being offered to birthmothers post-adoption by adoption agencies regarding their mental health.

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**FARIHA MURSHID, BIOMEDICAL ENGINEERING**

*Evaluation of Flowrate-Diameter Relationships for Small-Diameter Vascular Grafts, Using a Computer-Modulated Biomechanical Testing System*

Faculty Mentor: Dr. Jun Liao

The need to prevent auto-transplantation in patients with cardiovascular diseases has led to the increase in interest in the use of artificial vascular grafts (e.g. tissue engineered or synthetic) as potential replacements for diseased blood vessels. Testing for flowrate-diameter relationships of artificial small-diameter vascular grafts using the biomechanical testing system can help to determine their suitability of being potential replacements, based on their mechanical characteristics. Phosphate buffered saline (PBS) is pumped through each sample over a range of flow rates, with the intention of mimicking extreme cases of increased blood flow through the blood vessels in the body under abnormal or diseased states. A high-resolution camera captures changes in the grafts. Generally, longer and/or wider grafts were observed to have experienced less significant changes in their diameters, as opposed to their counterparts. However, the degree of deformation has shown to be more directly related to their elastic properties.

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**VAIBHAVI NAGAR, ACCOUNTING**

*Effects of the Tax Cuts and Jobs Act of 2017*

Faculty Mentor: Dr. Stanley Seat

Reformations of the tax law in the United States of America have always been tremendously complicated, especially because they are used as a means to influence social policy. After the tax reform in 1986, the Tax Cuts and Jobs Act of 2017 is intended to bring about the most significant tax law changes in the country. Understanding the implementation of these changes is essential not only to all individuals, but also to specific industries on a firm-wide level. This study focuses on key areas of change made to the tax law through the execution of the TCJA, and highlights and simplifies variations relevant to individual taxpayers and specific industries to allow for an increased efficiency in future planning.

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**TIFFANY NGUYEN, BBA MARKETING**

*Marketing to the Mobile Masses: A Study on App Monetization*

Faculty Mentor: Lawrence Chonko

Cellphones are ubiquitous in today's world with varying purposes from work, to education, to entertainment, etc. These devices are essentially handheld computers with added functionality through mobile applications, or apps. A great majority of these applications are cleverly marketed as "free" apps, and yet the industry as a whole is a multi-billion dollar industry. This project serves to identify points of concern to casual and heavy spenders of mobile applications by finding what values and features consumers place in apps that compel the urge to spend. This thesis is separated into two major parts: 1) an in-depth analysis of the various models (free, freemium, paid, in-app purchases, etc.) of app monetization and 2) a statistical analysis of cell phone users' experiences with these models.

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**KIRSTEN OROBITG, BIOLOGY**

*Analysis of the Stress Response of Corals Exposed to White Plague Disease*

Faculty Mentor: Dr. Laura Mydlarz

Coral reefs are important ecosystems that sustain marine biodiversity and serve as a critical economic resource. Unfortunately, the increased prevalence of coral disease is decimating reef populations. Disease exposure triggers an intracellular stress response within corals that is mitigated by their innate immunity, which involves antioxidants and melanin synthesis. The overarching purpose of this project is to investigate why some coral species survive better than others when exposed to a disease. To do this, the variability in stress response between seven Caribbean coral species exposed to white plague disease was quantified using immunoassays. The assays measured the activity levels of two antioxidants (catalase and peroxidase) and a melanin synthesis cascade precursor (prophenyloxidase). This data will provide insight into why some coral species are resistant to disease, while others are susceptible.

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**RUPANDEY PAREKH, BIOLOGY**

*Study of Gene Function in Two Nuclear-encoded Mitochondrial Gene Duplicates in Drosophila Melanogaster*

Mentor: Dr. Esther Betrán

The nucleus houses most of the genes encoding mitochondrial proteins, called nuclear-encoded mitochondrial (N-mt) genes. In *Drosophila melanogaster*, twenty-four percent of N-mt genes are clustered into gene families. Unexpectedly, all tissue-specific N-mt duplicates show testis-biased expression; of these, fifty-two percent function in oxidative energy production. To understand these patterns, we study two N-mt duplicates (*COX4L* and *CG7514*). We hypothesize male sterility due to loss of gene function and deleterious somatic expression for the duplicates but not for their parents. A *CG7514* P-element insertion mutant unexpectedly showed a viability effect and was placed against a deficiency line to check if this mutation was the causative agent. CRISPR-Cas9 knockout of *COX4L* shows sterility phenotype and we are attempting to rescue it with a *COX4L* transgene. We overexpressed *CG1907* and its child *CG7514* using Gal4-UAS system and Actin5C-Gal4 to drive in soma. Against our hypothesis, overexpression via Actin5C-Gal4 was lethal for both genes.

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**SON PHAM, AEROSPACE ENGINEERING**

*Designing a Synthesis Architecture for Reusable Space Access Vehicles: A Case Study of the X-33*

Faculty Mentor: Dr. Bernd Chudoba

The demand for economical and sustainable access to space serves as an impetus for launch vehicle designers to pursue novel methods for designing highly-efficient vehicles. Focusing on the design of the former Lockheed Martin Skunk Works X-33/VentureStar project, this Honors Project presents a synthesis methodology utilizing *Hypersonic Convergence* to produce a solution space that meets the unique requirements of the reusable single-stage-to-orbit lifting-body space access vehicle. The methodology then determines the design point within the solution space, contingent on the convergence of its volume and mass through an iterative process. The architecture identifies the design drivers for capable implementations of minimum weight, cost, and maximum volumetric efficiency. The synthesis architecture illustrates a consistent comparison of MAE Senior Designs' two-stage-to-orbit Hypernova, XS-1 Phantom Express, and the single-stage-to-orbit DC-X by a fellow Honors student, all sized for the same mission of delivering a 1,360 kg payload to a low-earth-orbit of 185 km.

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**MACEY REED, PUBLIC RELATIONS**

*No Money, No Problems: The Rise of Social Media Campaigns*

Faculty Mentor: Jennifer Little

Social media campaigns are on the rise as they prove to be cost effective, efficient, and functional. One of the greatest concepts about social media is its ability to reach a large, mass audience nearly instantly and have direct, two-way communication with consumers. This work presents examples of successful campaigns that relied on social media to share the brand's message. Goodwill, The Romanian National Institute, and the Truth Initiative are three campaigns that exceeded company goals and stood out among the rest. Each campaign utilized public relations tactics and their ability to engage with its audience while leaving a lasting impression. Overall, it is proven that having a strong message, creative strategy, and selling an idea rather a message, will draw in the audience, formulate a connection with the product or message, and drive results.

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**JOY RONG, SOCIAL WORK**

*Exploring the Experiences of Older Chinese Immigrants and Adult Children Caregivers with Utilization of Formal Social Services and Support*

Faculty Mentors: Dr. Ling Xu and Dr. Noelle Fields

Current research has addressed the underutilization of healthcare services for chronically ill, older Chinese immigrants; yet one area of research that needs to be explored thoroughly is the experiences of both older Chinese immigrants and their adult children caregivers in a dyad. This study aimed to explore the experiences of older Chinese immigrants and their adult children caregivers with formal social services and support. Conventional content analysis was used to examine secondary data of dyad interview transcripts. The results were that four major negative aspects of service usage (language, transportation, immigration status, and inaccessibility) and two major positive aspects of service usage (translation and the church) emerged in the dyads' responses. Implications for social work practice will be to continue to provide translation services during the helping process, to advocate for accessible transportation for older adults, and to encourage social services and churches to partner together to reach immigrant communities.

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**ALEXANDRA SANCHEZ, HISTORY**

*The Yaqui and Porfirio Díaz: Explaining One of the Largest Forgotten Genocides of Modern Mexico*

Faculty Mentor: Dr. David LaFevor

Porfirio Díaz was President of Mexico from 1876 until his exile in 1911. Díaz and his *científicos* (technocrats) enacted economic, cultural, and agrarian reforms to modernize and bring “progress” to the nation. However, his authoritarian rule and reforms exacerbated rural poverty, especially among indigenous peoples. The Yaqui are a Native American people from Mexico’s northern state of Sonora who have a history of resistance and rebellion against the colonizing forces of Spain and Mexico. After decades of sporadic conflict, Díaz authorized the detention, deportation, and enslavement of thousands of Yaquis, resulting in the most widespread diaspora of a North American indigenous group. This work uses newspapers of the period and historical monographs written since the Mexican Revolution to prove that inherently racist Positivist thought influenced government and infiltrated society, leading to a socially-sanctioned Mexican destruction of Yaqui lives, culture, and lands.

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**DIVYANSHU SHARMA, COMPUTER SCIENCE**

*BASS- Better Advertising with Smarter Screening*

Faculty Mentor: Dr. Christopher Conly

Advertisers have been moving away from traditional advertising media and focusing more on targeted audience on Social Media platforms such as Instagram with the help of Social Media Influencers. These influencers create “sponsored” content that seems out of place. This reduces the users’ quality of experience. To ensure that advertisements blend naturally and smoothly into an influencer's social media the similarities between the advertisements and the nature of the influencers’ past content were analyzed using tools such as Computer Vision and Data Mining to generalize the trends among brands, themes, and objects that recur in the influencer's past social media posts. Once these trends were obtained, our matching algorithm ranked different influencers in order of natural fits for a given advertisement. Then it was up to the Advertiser to choose their favorite matching influencer.

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**MATTHEW SMITH, MECHANICAL ENGINEERING**

*Steering and Suspension Design for an Efficient Electric Drive System*

Faculty Mentor: Dr. Raul Fernandez

As the effects of climate change have left the horizon and become a present-day problem, the transportation industry is aggressively seeking to reduce harmful emissions. The majority of cars currently on the road are powered by a central engine connected to two or four wheels through a transmission, driveshaft(s), and other mechanical linkages. Each of these components, however, introduces significant inefficiencies and can result in net power losses greater than 15%. By replacing the central motor with four smaller motors placed inside the wheel hub, these mechanical inefficiencies can be eliminated. In this project, a steering and suspension system was developed to accommodate the inclusion of a drive motor inside the wheel hub. Additionally, a quarter-car analysis was used to determine the necessary spring and damping rates for optimal ride comfort.

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**WARREN SMITH, COMPUTER SCIENCE**

*Implementing Cybersecurity Framework for an Autonomous Ground Vehicle*

Faculty Mentor: Dr. Christopher D. McMurrugh

Autonomous ground vehicles are an emerging technology brought on by the advancement of computer vision and artificial intelligence. Autonomous vehicles have applications in many areas including military, industrial and commercial. Cybersecurity is a critical requirement for autonomous systems in the interests of safety and reliability. To investigate methods for securing autonomous systems, the National Institute of Standards and Technology (NIST) Risk Management Framework (RMF) was applied to the development of the AutoMav autonomous ground vehicle. AutoMav was constructed to participate in the 27<sup>th</sup> Annual Intelligent Ground Vehicle Competition at Oakland University in Rochester, Michigan. A threat model was constructed against an example use case scenario, known as a threat concept. The threat model was then used during the design of the vehicle’s control system to develop security features and avoid major vulnerabilities.

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**ANICA SNYMAN, MANAGEMENT**

*Exporting and the Effect it has on Small and Medium-Sized Businesses*

Faculty Mentor: Dr. Deepak Datta

The goal of this project is to gain a better understanding of the benefits and challenges faced by small and medium-sized enterprises (SMEs) when exporting on a global scale. This research will establish the positive impact that exporting has on SMEs, as well as determine whether exporting leads to superior organization performance and discuss under what set of circumstances this superior performance can be expected. The research project will also discuss what leads to failure and highlight the general need and importance of governments to make a greater effort to disseminate information, eliminate unnecessary red tape, as well as make programs more responsive to the changing needs of SMEs. Lastly, the project will look at solutions that address challenges preventing effective exportation and provide insight as to what can be done at both a national level, as well as an individual level to reach these solutions and goals.

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**ELIDA SORTO-RAMOS, AEROSPACE ENGINEERING**

*Designing a Synthesis Architecture for Reusable Space Access Vehicles: A Case Study of the DC-X*

Faculty Mentor: Dr. Bernd Chudoba

The Delta Clipper Experimental is a reusable space access vehicle designed by McDonnell Douglas in the early 1990s to demonstrate the feasibility of a single-stage-to-orbit vertical takeoff and landing system. This Honors Project presents the adaptation and application of the *Hypersonic Convergence* synthesis methodology for sizing dissimilar space access vehicle configurations including the DC-X, Hypernova, XS-1, and X-33. The Hypernova and XS-1 are conceptual designs created by the MAE senior design class while the X-33 is modelled by a fellow Honors student. A comparison of vehicle performance for configurations each sized to perform the mission of delivering a 1,360 kg payload to a 185 km orbit is visualized. Determining the size of each vehicle requires the convergence of weight and volume during the iterative sizing process. The results visualize a solution space with optimal volumetric efficiency for each vehicle to forecast the ideal configuration of a space access vehicle.

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**ALFREDO URIBE, ACCOUNTING**

*Taxation: A Social and Economic Influence*

Faculty Mentor: Dr. Stanley Seat

Taxation is long-standing staple of human society and government. From early civilizations to the present, it has not only been a consistent revenue stream, but also an agent of influence. There is historical evidence that the practice of levying taxes has the ability to be a coercive force in the marketplace, as well as in the public thought. As a result, understanding how it was able to do so by analyzing tax policies and their effects can be a useful endeavor as it provides insight into future applications of tax law. Even today, in the context of the Tax Cuts and Jobs Act of 2017 and the many reforms before it, there is much to be learned that could lead to a more productive use of taxation to generate social and economic change.

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**COURTNEY WALTHER, NURSING**

*The Registered Nurse's Lack of Knowledge, Practice, and Patient Teaching of Nutritional Needs*

Faculty Mentor: Dr. Denise Cauble

There is a lack of registered nurses' knowledge related to nutritional needs of patients. Furthermore, poor self-care in their own lives regarding healthy eating may lead to inadequate patient education and poorer patient outcomes in managing their health. Barriers identified for RNs include: not having a nutrition course, feeling that patient teaching of healthy eating is of lesser importance, a paucity of time and confidence to do so, or thinking it is the job of a dietician. The purpose of this research is to identify RNs nutritional knowledge and how nurses' nutritional education and practice affects their teaching and patient outcomes.

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**HANNAH WATERMAN, MUSIC THEORY**

*The Last Rock Star? Decoding Subversion in Marilyn Manson's Antichrist Triptych*

Faculty Mentor: Dr. Graham Hunt

The traditional notion that music influences ethical character became especially influential in Postwar America, with the emergence of rock music marketed specifically towards rebellious young people. In the rock industry, controversy became lucrative, and the constant profit-oriented drive to subvert the status quo pushed rock music in various extreme directions. This trajectory reached its pinnacle in the late nineties with the emergence of Marilyn Manson, who combined aspects of punk, metal, and electronic music with “shocking” (and sometimes offensive) visual imagery and fiercely contrarian messages. Several journalists have claimed that Marilyn Manson is “the last rock star.” This paper will evaluate that claim by identifying the band’s predecessors in the history of rock music and determining some criteria for “rock star” status, analyzing the use of subversive narrative in Marilyn Manson’s *Antichrist Triptych*, and finally arguing that these albums were *terminally* subversive in their particular lineage of rock music.

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**RACHEL WEERESINGHE, AEROSPACE ENGINEERING**

*Detailed Workings Regarding the Aerodynamic Research Center Arc-Jet's Control Panel Instrumentation*

Faculty Mentor: Dr. Luca Maddalena

The updated gas control panel to be installed at the Aerodynamics Research Center (ARC) will better suit the needs for testing for the new national-level hypersonic research facility. An update was needed due to the previous system being a few decades old; however, the control panel was modeled similarly to that of the older system with different specifications and less parts. The panel contains the following parts: adapters, ball valves, pneumatic valves, bonnet valves, solenoid valves, spring actuators, pressure transducers, thermocouples, piping, pressure gauges, a dome regulator, an electronic pressure regulator, relief valves, and a sonic flow nozzle. The gas control panel was modeled to meet the following criteria: cost efficiency, flow rate regulation, and pressure regulation. The criterion for this gas control was to take in pressures of 2400 psi and reduce the pressure down to less than 75 psi.

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