COLLEGE OF ENGINEERING AND SCIENCE

2021 SENIOR PROJECTS CONFERENCE

PREPARING ENGINEERS AND SCIENTISTS FOR TOMORROW

WELCOME

Welcome to the 2021 College of Engineering and Science Undergraduate Senior Projects Conference!

We are excited to have alumni, parents, faculty, students, and friends of the College attend this conference. Your attendance helps us provide our senior students with a forum to exhibit technical and soft skills that they have learned in their curricula. During the conference, you will have the opportunity to see how our undergraduates have overcome limitations due to the coronavirus pandemic to solve a variety of problems, often resulting in deliverable prototypes.

Many of the projects presented today will have an immediate impact for industrial and government sponsors, saving them time and money. Other projects add to ongoing faculty research, and some projects provide solutions for more generalized problems in engineering and science. Each project tackles an ongoing challenge that we must address.

We hope that you will participate in this event by completing evaluation forms that are available in the presentation rooms. Your objective assessment of the students' work and the quality of the presentations is extremely valuable to us and is used by many of our programs as part of their continuous improvement process. Also, please feel free to suggest topics for future projects and ideas for improving the conference. Our shared goal is to strengthen and enhance the preparation of our graduates for the transition into professional practice. Thank you for helping us achieve that goal.

Dean, College of Engineering and Science
Max Watson, Sr., Professor

DIRECTORY OF PRESENTATIONS

Integrated Engineering and Science Building (IESB)

BIOMEDICAL ENGINEERING

1:00 IESB 224

Penguin Paramedic

Refrigeration is an easy task to accomplish in a hospital or pharmacy setting; however, not all clinical applications take place in a stationary establishment. Administration of medications in an ambulance saves time and lives. Unfortunately, keeping these medications at the appropriate temperatures of 2-8˚C in an ambulance poses many challenges, including temperature stability, availability of space, power consumption, heat output, and securability. Penguin Paramedic is a medical refrigeration device that maintains cool medication temperatures in an ambulance for patients receiving pre-hospital care in order to increase stability of temperature-sensitive medications. The device achieves this outcome by utilizing thermoelectric coolers controlled by a negative feedback loop. These small coolers provide the necessary temperature range for medication storage without expelling large quantities of heat while also minimizing power consumption. Introducing the Penguin Paramedic into ambulances would expand storage capabilities in pre-hospital settings, save time in emergency rooms, and prevent medication waste.

Team Name: N/A
Team Members: Vincent Sedminik, Sandra Shahriar, LaVaie Simpson, Sadie Villarrubia
Sponsor: N/A
Advisor: Dr. Bryant Hollins

1:30 IESB 224

Stab-N-Grab

Within a growing market in neuromodulation-based SCS pain therapies, lead migration is a common issue in chronic back pain treatment. Our device focuses on addressing this issue with anchoring methods and aids to improve spinal cord stimulation (SCS) anchoring procedures. The device is designed to have a simple and intuitive deployment while maintaining a secure lead position over long-term applications. During SCS surgeries, leads are stabilized to the fascia through anchoring techniques which vary between physicians. Lead migration can be traced back to improper anchoring techniques and has resulted in treatment failure and revision surgery. Our goal is to minimize current errors in manual anchoring methods for physicians to reduce surgical time, cost, and lead migration. By addressing these three major factors, a device has been created that will optimize SCS anchoring procedures. This device will offer a semi-automated method of securing the percutaneous leads to the fascia, increasing the technique's availability to medical personnel.

Team Name: N/A
Team Members: Kayla Babin, Taylor Burreson, Aaron Morgan
Sponsor: Wavegate Corporation
Advisor: Dr. Bryant Hollins

BIOMEDICAL ENGINEERING

2:00 IESB 224

Bike Buddy

Each year in the United States, 1,500 children are born with an upper limb difference and 32,500 individuals have major amputations. The loss or malformation of an upper limb can greatly impact one's ability to participate in everyday and common activities. This may motivate one to use an adaptable device and/or prosthetic as it will allow individuals to better participate in these activities. Our client, a ten-year-old female whose upper limb difference was caused by Amniotic Band Syndrome, has no phalanges with partial palm formation, and maintains full wrist flexion/extension. The client can perform most tasks without assistance and only requires occasional adaptations to participate in certain activities. Her inability to properly grip objects with her left hand presents difficulties—especially, in the form bike riding. So, an adaptive device was designed to give the client more control for steering and balance while riding her bike. It is an attachment to the bike that can be removed and reattached to any standard bike handle, can securely attach to the limb, allows the client to maintain 75% of her wrist flexion, and costs ≤$75 in raw materials to manufacture.

Team Name: The Bready Bunch
Team Members: Brooks Courtney, Terrance Lymon, Bethany Perez
Sponsor: N/A
Advisor: Dr. Bryant Hollins

2:30 IESB 224

The ESCAPE

One in four mechanical heart valve recipients experience disturbances in their sleep patterns, with 31% of those individuals experiencing subclinical insomnia, and 17% experiencing moderate to severe insomnia. The disturbance, caused by the "ticking" noise of the valve closing, greatly impedes on a patient's quality of life. Our team has addressed the decrease in the quality of life of mechanical heart valve recipients by reducing the closure noise of a mechanical heart valve. To be considered a functioning heart valve, each design had to exhibit several measurable factors taken from ISO 5840 standards before their noise magnitude could be compared. If the valve was considered functionally sound, the valve's closure noise level was compared to the control valve's noise level to determine whether the design significantly altered the sound magnitude.

Team Name: N/A
Team Members: Tommy Nguyen, Garrett Rushing, Thomas Williams
Sponsor: N/A
Advisor: Dr. Steven Jones

BIOMEDICAL ENGINEERING

3:00 IESB 224

A.A.R.M. Brace

Ankle injuries are one of the most common injuries around the world. The standard procedure for treating ankle injuries is to allow full incremental weight-bearing and mobility with rest. The current devices on the market either utilize specific materials to reduce the forces on the ankle for adequate weight bearing practice with full immobilization of the ankle, like an Aircast, or allow for free range of motion of the ankle, like the Bionic Stirrup Ankle Brace. Orthopedic boots and stiff ankle casts do not allow for ankle movement, and other devices like braces do not provide any ROM limitations. There are no mainstream devices that allow for a comfortable transition from full immobilization to free motion. The A.A.R.M. Brace, the Adjustable Ankle Range of Motion Brace, will allow consumers to transition gradually from complete ankle immobilization to free range of motion in order to encourage accelerated healing. This gradual transition will be accomplished utilizing physical pins that will be adjusted by a physician or physical therapist as they feel the patient is able to withstand settings comfortably. These pins can limit dorsiflexion and plantar flexion at separate degrees of freedom.

Team Name: N/A
Team Members: Wilton Barlow, Taznama Islam, Tyler McLane, Sean Tilmon
Sponsors: N/A
Advisor: Dr. Bryant Hollins

3:30 IESB 224

PITCH Overhead-Motion Monitoring System

Athletes participating in overhead-motion sports, such as baseball, are at high risk for injury to the ulnar collateral ligament (UCL). Persistent instability of the UCL often subjects athletes to extreme pain or soreness along the inner elbow, typically during and immediately after performing an overhead motion. Acute UCL tears are isolated events often associated with abrupt and severe medial elbow pain where an athlete may report a sudden sensation of "giving away" in the elbow. We are developing a device to objectively monitor risk factors of UCL injuries. Our device contains three IMU sensors located on the shoulder, elbow, and wrist to collect data to be transferred via Bluetooth communication for processing. The acceleration and orientation data can then be used to calculate common risk factors: velocity, arm slot, elbow flexion, shoulder rotation, and pitch count, which is representative of overuse and fatigue. With our wearable overhead-motion monitoring system presenting this information to the athlete, coaches, or trainers, we hope to benefit users by monitoring their training and providing accurate biomechanical analysis in order to reduce UCL injury risk.

Team Name: PITCH
Team Members: Abdulah Alzayer, Leandra Aponte, Emily Boylan, Kaitlyn Coughlin
Sponsor: N/A
Advisor: Dr. Bryant Hollins

BIOMEDICAL ENGINEERING

4:00 IESB 224

Heal & Seal

The Heal & Seal system is designed to sustain wound healing in diabetic foot ulcer (DFU) patients under ambulatory conditions. Patients with DFUs face two major problems: First, patients fail to seek medical attention when foot ulcers begin to form; instead, they self-treat with over-the-counter products such as bandages and gauze that are not made for proactive wound healing. Second, once patients seek a physician, they are told to offload the wound; however, they often stand or walk on the wound regardless, which can destroy the proactive dressing applied by the physician. Therefore, Heal & Seal was created as a proactive treatment in healing DFUs while also providing a protective seal and durable reinforcement against the external environment. The system consists of two parts: A primary chitosan-genipin (CG50) hydrogel and a secondary protective barrier. The CG50 hydrogel was tested for absorbance, pH regulation, and shear elastic durability to ensure it was capable of promoting wound healing. The secondary protective barrier was tested for absorbance, pH regulation, shear elastic durability, and compressive strength to verify that it could withstand ambulatory conditions and maintain healing. Finally, the complete system was tested under compression to validate the secondary barrier's ability to protect the primary hydrogel.

Team Name: N/A
Team Members: Caroline Harvey, Elizabeth Kibodeaux, Nicole Wright
Sponsor: Dr. Mary Caldorera-Moore
Advisor: Dr. Bryant Hollins

4:30 IESB 224

Hydraulic Environmentally Responsive Ankle

Over half of trans-tibial amputees experience lower back pain caused by prosthetics being unable to alter in length like a normal lower leg would. Common trans-tibial prosthetics can help absorb the shock of walking, but they fail to compress like a natural ankle does. The prosthetic's inability to compress leads to limb length discrepancies that consequently create an uneven gait when the patient is walking. H.E.R.A. is a Hydraulic Environmentally Responsive Ankle that will compress, move, and feel similar to a normal ankle when the patient is in motion. The current hydraulic ankle prosthetic on the market costs patients over $3000 and fails to create gait symmetry similar to normal walking. It is not always covered by insurance, and it is too heavy for patients to have normal walking patterns. H.E.R.A is a lightweight, strong prosthetic that can compress like a normal ankle and allow for a patient's gait to be comparable to normal walking.

Team Name: H.E.R.A.
Team Members: Blythe Babin, Katie McKenzie, Heath Schooley
Sponsor: N/A
Advisor: Dr. Bryant Hollins

CHEMICAL ENGINEERING

The U.S. drug global supply chain is an area that has received the attention of the federal government in recent years for a variety of reasons[1]. On February 12, 2020, the former FDA commissioner Scott Gottlieb raised the alarm of potential impacts of COVID-19 on the drug supply chain to a U.S. Senate Committee on homeland security[2]. In July of 2020, India published a list of 53 key starting material (KSM) and active pharmaceutical ingredients (API) that they wanted to produce domestically. P-aminophenol was one KSM identified in this document and is used to manufacture acetaminophen (paracetamol).

Louisiana Tech Chemical Engineering students were asked to design a process that produced 30,000 metric tons per year of p-aminophenol from commodity chemicals. The kinetics were justified from literature data. The system was modeled using the process simulator ChemCAD and priced using cost equations from Turton, Shaeiwitz, Bhattacharyya, and Whiting (2018). Topological and parametric optimizations were explored along with different chemical routes to the product. The recycle streams increased the complexity of the simulator significantly, but were required to accurately model the system. Process hazards will be identified and suggestions to mitigate hazards will be presented.

1. "Securing the U.S. Drug Supply Chain: Oversight of FDA's Foreign Inspection Program", House Committee on Energy & Commerce, December 10, 2019.

2. "Roundtable: Are We Prepared? Protecting the U.S. from Global Pandemics", U.S. Senate Committee on Homeland Security and Governmental Affairs, February 12, 2020.

1:00 IESB 212
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Jordan Crittenden, Meredith Maberry, Julia McCown
Sponsor: N/A
Advisor: Dr. James Palmer

1:20 IESB 212
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Kendall King, Timmon King, Nicholas Lee
Sponsor: N/A
Advisor: Dr. James Palmer

1:40 IESB 212
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Brennan Adams, Dominque Anderson, Logan Hearn
Sponsor: N/A
Advisor: Dr. James Palmer

Break

CHEMICAL ENGINEERING

2:20 IESB 212
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Reese Cristadoro, Cody Long, Vance Stewart
Sponsor: N/A
Advisor: Dr. James Palmer

2:40 IESB 212
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Logan Maville, Sajeivan Nallanathan
Sponsor: N/A
Advisor: Dr. James Palmer

1:00 IESB 214
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Destiny Lee, Dylan Morgan, Amelia Parrenin
Sponsor: N/A
Advisor: Dr. James Palmer

1:20 IESB 214
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Travis Daigle, Allison Hill, Jarod Keers
Sponsor: N/A
Advisor: Dr. James Palmer

1:40 IESB 214
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Reed Arceneaux, Phillip Lamartiniere, Christopher Thibodaux
Sponsor: N/A
Advisor: Dr. James Palmer

2:00 IESB 214
Economic Optimization and Hazard Analysis of p-Aminophenol Production

Team Name: N/A
Team Member: Onyadeeka Bailey, Jordan Ponder, Jack Shanks
Sponsor: N/A
Advisor: Dr. James Palmer

CHEMISTRY

1:00 IESB 318

Rapid Determination of Bromine in Louisiana Rice Husk with XRF

The use of methyl bromide as a pesticide in Louisiana has been outlawed at the federal level, but still sees continued use. A rapid test was developed to determine bromide in Louisiana rice and rice husk samples using x-ray fluorescence (XRF). The samples were prepared in two different ways: raw rice and rice husk were ground to a powder, pelletized, and directly analyzed for bromide, and bromide was extracted from raw powdered rice and rice husk using soxhlet extraction with water and ethanol followed by centrifugation before XRF analysis as liquid samples. Numerous samples of rice and stalk were collected from Louisiana rice farms. The XRF data from both rice stalk processing methods produced a variety of bromide concentrations from 0 to 20 ppm, leading to the conclusion that methyl bromide is still being used as a pesticide during the growing process. Similar XRF data from the rice itself did not reveal any bromide at the ppm level, leading to the conclusion that even when methyl bromide is used, the level of bromide in the rice product is acceptably low. From this study it can be deduced that bromine has not been entirely phased out of the rice growing business as it should be, but is not a danger for the consumption. Further study would include testing rice and rice husk samples from more farms to produce a larger data set and streamlining of the powder/pellet test for bromide determination.

Team Name: N/A
Team Members: Rachel Honeycutt
Sponsor: N/A
Advisor: Dr. Sven Eklund

1:15 IESB 318

Chitosan-Genipin Hydrogels for Wound Healing

Hydrogel biomaterials composed of the carbohydrate polymer chitosan are beneficial for wound healing applications due to chitosan's innate antimicrobial and hemostatic properties. Previously, Caldorera-Moore and colleagues have reported on the synthesis and characterization of chitosan-genipin hydrogels. To further optimize these hydrogels for clinical use, this capstone chemistry project has focused on evaluating the effects of chitosan-genipin hydrogel synthesis and post-processing techniques on free amine groups in the hydrogel network. These free amines provide chitosan with its antibacterial properties; however, as crosslinking occurs the number of free amines available decreases. Through a ninhydrin assay, the concentration of free amines was calculated as a function of batch-to-batch variability, rinsing time, and uniformity within the hydrogel network. Using a p-test and Tukey honestly significant difference test, the changes in concentration of free amines for the treatment groups were found to be statistically insignificant. To further understand the crosslinking mechanism, the chitosan-genipin hydrogel precursor solution was cured at 50Â°C within the spectrometer to obtain real-time 1H NMR spectra as crosslinking occurred. Calculating the remaining concentration of free amines and exploring the mechanism for the crosslinking reaction allows for the optimization of these wound healing devices.

Team Name: N/A
Team Members: Megan Ward
Sponsor: N/A
Advisor: Dr. Mary Caldorera-Moore

CHEMISTRY

1:30 IESB 318

Analysis of the Thermochemical Capabilities of Human and Animal Hair Waste as an Alternative Source of Bio-Renewable Energy by Use of Bomb Calorimetry

The extinction of fossil fuels has been a controversial topic for many years pushing the demand to search for an alternative bio-renewable source of energy. As the global population continues to grow exponentially, the demand for fossil fuels will also significantly increase as time goes on. As a result, scientists have explored different sources capable of producing harvest-able energy to keep up with projected energy demands in the midst of the rapidly declining fossil fuels. One bio-renewable source of potential energy that has yet to be researched thoroughly is hair waste from humans and animals. Therefore, the objective of this research project is to explore whether hair has the thermochemical potential to produce sustainable energy like that achieved by fossil fuels. To answer this question, the enthalpy of combustion of various human and hair types was determined using a bomb calorimeter calibrated against a benzoic acid standard. Preliminary results show that hair produces a miniscule amount of energy and would not be a viable replacement for thermochemical applications previously achieved using fossil fuels.

Team Name: N/A
Team Members: Tyra Tatyanna Perkins
Sponsor: N/A
Advisor: Dr. Marsha Cole, Mrs. Jessica Wasserman

1:45 IESB 318

Determination of Heavy Metal Leaching from Children's Face Paint

The cosmetic industry has been expanding and developing rapidly over the past few years. This progression spurs the need for adequate research, of which there has been extraordinarily little. This includes cosmetics designed for children, where there is even less research. In this document, the composition and toxicity of children's Halloween face paint was tested using X-Ray Fluorescence along with multiple skin and stomach leaching tests. It was determined that some pigment contained Chromium, a toxic metal. A calibration curve was created, and the concentration in the face paint and left in the stomach and skin was calculated. While the concentrations discovered were low, research in the future should explore lasting effects and the other toxic components in cosmetics.

Team Name: N/A
Team Members: Amia Galindo
Sponsor: N/A
Advisor: Dr. Sven Eklund

2:00 IESB 318

Determination of Heavy Metal Contaminants in Electronic Nicotine Delivery Systems via X-ray Fluorescence

The prevalence of adolescent vaping has become a public health crisis of epidemic proportions. Developments in electronic nicotine delivery systems (ENDSs) have created discrete units capable of delivering unprecedentedly high doses of nicotine alongside other harmful substances. One relatively under-researched harmful substance present in new vape products is heavy metals in END solutions and aerosols. This study aims to determine heavy metal contaminants in various ENDS. It was hypothesized that heavy metals would be present in concentrations in the parts per billion (ppb) range and that cheaper devices with fruit flavors that attract adolescents would display the highest concentrations of heavy metals. X-ray fluorescence (XRF) was used to experimentally determine heavy metal concentrations in the solutions and aerosols of three different brands of ENDS. XRF confirmed the presence of zinc, copper, and nickel in parts per million (ppm) concentrations in the solutions of two different fruit flavors of the cheaper disposable ENDs, partially confirming the experimental hypothesis. XRF showed zinc in one of the two remaining END brand solutions. Further research is needed to determine the health implications of these heavy metal contaminants.

Team Name: N/A
Team Members: Margaret Boston
Sponsor: N/A
Advisor: Dr. Sven Eklund

2:15 IESB 318

Using Rice Husk and Sugarcane Bagasse in Hardened Cement Paste

One of the most used building materials in the world, if not the most used, is cement. However, with the high production of cement, specifically ordinary Portland cement, comes the high production of greenhouse gases. To counteract the emissions of these greenhouse gases, the addition or substitution of various products have been tested with the cement. The use of byproducts mixed in with the cement can provide the necessary countermeasure that is needed for today's climate. Rice husk and sugarcane bagasse are both waste products that are not being used in any other line of production which means they usually end up in landfills making them both abundant and inexpensive to obtain. When combusted, both the rice husk and the sugarcane bagasse become ash that has pozzolanic properties. What makes these waste products useful is the high silicon dioxide that is found within them can be used as partial replacements of OPC. The purpose of this study is to quantitatively evaluate the compressive strength, corrosion, and porosity resistance of hardened cement paste infused with rice husk ash and sugarcane bagasse ash so that it may partially replace OPC.

Team Name: N/A
Team Members: Sevario Robles
Sponsor: N/A
Advisor: Dr. Joan Lynam

2:30 IESB 318

Synthesis and Cellular Uptake of an MK2 Inhibitor

Alcohol-induced liver disease (ALD) is the fourth leading cause of preventable death in the United States and is caused by the chronic consumption of alcohol. Progression of ALD can produce hepatic inflammation, causing liver failure through the development of fibrosis, cirrhosis, and hepatocellular carcinoma (HCC). Hepatic inflammation is stimulated by macrophage response to alcohol metabolism, where intracellular mitogen-activated protein kinase-activated protein kinase 2 (MK2), a downstream effector of the MAPK family member p38, continually upregulates the production of pro-inflammatory cytokines. Therapeutic inhibition of MK2 using cell-penetrating peptides (CPP) has been previously investigated as a possible novel treatment modality for chronic inflammation. To investigate whether a CPP MK2 inhibitor could be delivered to hepatocytes to treat inflammation, an anti-inflammatory CPP (KAFAK) was synthesized, and its cellular uptake was evaluated within activated HepG2 human hepatoma cells. Using fluorescence imaging, the cellular uptake of KAFAK into the hepatocytes was found to be successful, demonstrating a delivery mechanism for potential therapeutic applications involving liver inflammation.

Team Name: N/A
Team Members: Alasdair Masson
Sponsor: N/A
Advisor: Dr. Scott Poh

2:45 IESB 318

Mechanochemical Synthesis of Cerium Beta-diketonate Complexes

Lanthanides are unique elements in the periodic table due to their propensity for the +3 oxidation state and their bonding which is predominately electrostatic in nature. The lack of covalent bonding in trivalent lanthanide cations is due to the shielding of the 4f valence orbitals by the filled 5s2 and 5p6 orbitals. Cerium is unique amongst the lanthanides because it has an accessible +4 oxidation state. Therefore, the electronic nature of the ligand used for coordination chemistry can be used to tune the oxidation state of cerium. The +3 oxidation state of cerium can be selectively stabilized by the use of electron withdrawing ligands, such as hexafluoroacetylacetone (Hfac), a widely used and commercially available beta-diketonate ligand. A common cerium beta-diketonate starting material, $Ce(hfac)_3(H_2O)_3$, was accessed mechanochemically by reaction of cerium trichloride hydrate and Na(hfac). $Ce(hfac)_3(H2O)_3$ crystals suitable for single crystal X-ray diffraction (XRD) were obtained. These crystals were then characterized using infrared (IR) spectroscopy, powder X-ray diffraction (PXRD), and elemental analysis. The results of the characterization showed that crystals still had impurities in the form of dinuclear complex. Further reaction of these crystals with 2,2'-bipyridine (BPY) was also carried out to determine the suitability of these materials for displacement reactions.

Team Name: N/A
Team Members: Bruce Labedis
Sponsor: N/A
Advisor: Dr. Elisabeth Fatila

Break

3:15 IESB 318

Regulation of Inflammatory Cytokine Expression by MK2 Inhibitor Peptide

Mitogen-activated protein kinase activated protein kinase 2 (MAPKAP2 or MK2) is a kinase that is part of a cascade pathway responsible for releasing proinflammatory cytokines that play a major role in chronic inflammatory diseases. MK2 inhibitor peptides have been developed to regulate this pathway and reduce the expression of cytokines responsible for this proinflammatory response. In our lab, we synthesized our inhibitor peptide based on the MK2 inhibitor sequence found in prior research. Our goal was to identify the selectivity and effectiveness of our peptide in inhibiting MK2 expression and proinflammatory cytokine expression.

Team Name: N/A
Team Members: Bryan Freeman
Sponsor: N/A
Advisor: Dr. Scott Poh

3:30 IESB 318

Utilization of Ammonium Chloride as an Alanine Racemase Inhibitor

Anthrax can be a deadly disease, which means that finding the optimal method of killing the *Bacillus anthracis* spores that cause anthrax is important to prevent infections. Difficulties arise due to the proclivity of the bacteria to form an endospore, which is a defense mechanism that protects the bacteria during unfavorable conditions. When conditions are favorable for growth of the bacteria, the endospore loses its resistant properties, entering the germination state. Therefore, it is advantageous to force the spore to enter the germinating phase, so the bacteria can be killed more easily. L-alanine has been found to be a germinant at high enough concentrations. However, the endospore contains Alanine Racemase (ALR), which inverts L-alanine into D-alanine, a non-germinant. If ALR was inhibited, then low concentrations of L-alanine would cause germination, allowing for the bacteria to more easily be killed. Several assays were performed using various concentrations of ammonium chloride, and fluorescence of the conversion of L-alanine to pyruvate was measured using a spectrophotometer. It was discovered that higher concentrations of ammonium chloride hinder other enzymes necessary to carry out the reaction, and lower concentrations of ammonium chloride do not produce a significant result regarding the concentration of L-alanine.

Team Name: N/A
Team Members: Dylan Groh
Sponsor: N/A
Advisor: Dr. Rebecca Giorno

3:45 IESB 318

Determination of BHT (Butylated Hydroxyanisole) Vapors from Cereal Packaging Using Gas Chromatography (GC) and Flame Ionized Detector (FID)

Food safety - which covers the entire food production process, from the beginning of food processing to the end of food packaging - has always been of great concern. The antioxidant BHT (Butylated hydroxyanisole) is present in our food as well as on the package to increase the shelf life of the food. The use of inks on packaging and the waxy plastic inside the cereal box may contain BHT which can migrate into the food during storage or shipment in varying temperatures and might affect taste and flavour and, more importantly, cause toxicity in the food. The gas chromatography (GC) technique with flame ionized detector (FID) will help determine the amount of butylated hydroxytoluene (BHT) mitigating from the plastic package at varying temperatures. Before the plastic package is run for the chromatography, it is heated at a certain temperature. The gas/vapor is collected during the condensation process, and ready to run for chromatography, results in chromatogram that can be used for quantitative analysis and compared between different samples collected at different temperatures. This method is accurate, sensitive, and highly reproducible, making it ideal for analyzing residual antioxidants in polymer food packaging.

Team Name: Prabal Jaki Banjar
Team Members: Prabal Jaki Banjar
Sponsor: N/A
Advisor: Dr. Sven Eklund

4:00 IESB 318

Separation of Components Using Rotary Paper Centrifugal Chromatography Technology

In order to separate materials produced today for areas such as medicine, forensics, and the chemical industry in general, a new analytical and preparative method of rotary centrifugal paper chromatography has been developed, which can separate larger quantities than the average thin layer chromatography. Research involved the fabrication of 25 cm dia. methacrylate discs that sandwich several layers of chromatography paper. The rate of separation is increased by rotating the chromatography paper as a mobile phase is introduced through slots in the discs. This provides centrifugal force to the mobile phase and greatly increases the rate of separation. The compounds are separated as concentric rings instead of typical spots. The separated compounds in mobile phase solvent are then collected in vials as they exit the edge of the paper. In addition, we added the capability of UV-Vis detection of the separating bands by using a mini spectrometer with fiber optic transmission of the signal, which creates peaks similar to those in high-performance liquid chromatography. The materials and methods used along with results and conclusions gathered will be presented. Further research will include application of the new technique to areas such as separating and analyzing plant extracts and forensic samples.

Team Name: N/A
Team Members: Alicia Kalinowsky
Sponsor: N/A
Advisor: Dr. Sven Eklund

4:15 IESB 318

The Application of Xerogel in Paint and Cement

Fly ash is a byproduct from burning coal in power plants and is either used in concrete or cement (class C) or placed in landfills (class F). Many researchers and companies are trying to find uses for class F fly ash. One application we are researching is the synthesis of a xerogel made from class F fly ash. Xerogels are highly porous materials that can be added to various products to make them more lightweight and less thermally conductive. The fly ash was treated with sodium hydroxide at 350°C for one hour, followed by neutralization with with hydrochloric acid, then combined with ammonia and air dried or oven dried to produce a xerogel. In this research, we produced xerogel adjusted to three different pH values, and characterized the material with x-ray fluorescence (XRF), x-ray diffraction (XRD), infrared (FTIR), and scanning electron microscopy (SEM). The results of the xerogels added to paint and to geopolymer cement to lower their thermal conductivity will be presented. Hopefully, this type of research can lower the cost of xerogel, get fly ash out of landfills, and create new applications for engineers and chemists in the near future.

Team Name: N/A
Team Members: Sarah Norwood
Sponsor: N/A
Advisor: Dr. Sven Eklund

4:30 IESB 318

Synthesis and Application of Lipoprotein Receptor Protein-1 Ligand for Blood Brain Barrier Permeability

One of the main obstacles that there is for drug delivery, specifically macromolecules, to go into the central nervous system (CNS) is the blood-brain barrier (BBB). With the use of receptor-mediated transcytosis (RMT) pathway then some macromolecules can permeate the BBB and go into the CNS. One promising receptor is the RMT. The RMT is the low-density lipoprotein receptor-related protein 1 (LRP1). It has been reported that an ligand peptide of LRP1, Angiopep-2, was permeable to BBB and was able to deliver covalently conjugated drugs to the CNS. The downfall of LRP1 ligand is that there is no substantial LRP1 ligands to successfully conjugate with drugs of the LRP1 ligand for delivery into CNS. Because of this, our goal was to identify novel LRP1 ligands in order to investigate the LRP1-mediated RMT, and we were able to get a novel peptide which is the following: L57 (TWPKHFDKHTFYSILKLGKH-OH). A high BBB permeability of L57 was shown by way of *in situ* brain perfusion assay in the mice. This showed the first artificial LRP1-binding peptide with BBB permeability is what we discovered to be L57. This will help in the development of RMT-based drugs for treating many CNS diseases.

Team Name: N/A
Team Member: Savanna Gonzalez
Sponsor: N/A
Advisor: Dr Scott Poh

CIVIL ENGINEERING

1:00 IESB 124

New Office and Warehouse for Tech Industries, Bossier City, Louisiana

Our team was tasked with the design of a site including an office, a warehouse, and a covered parking area. This project required structural design, as well as design of the foundations, parking lot, drainage, and grading. These designs were made to fit within the client's desired architectural layout drawings, and we considered the provided soil report of the site when creating them. The office and warehouse require secondary drainage in order to prevent water pooling from heavy rainfall. Drainage design was performed with requirements per Bossier City. The main priority of this design is to deliver a safe, cost-efficient, and overall satisfactory design. The design process follows ASCE 7-10, IBC 2015, and ACI 330R-08.

Team Name: N/A
Team Members: Garrett Anders, Guy Bretches, PJ Hasten, Jared Headrick
Sponsor: Aillet Fenner Jolly McClelland, Inc.
Advisor: Dr. Jay Xingran Wang

1:30 IESB 124

Bridge Replacement on Linwood Ave. in Caddo Parish, Louisiana

The Linwood Ave. bridge is a 250-ft. concrete slab bridge made up of thirteen spans. It was built in 1977 and is located just south of the Linwood Ave. intersection with Southern Loop in Shreveport, Louisiana, within Caddo Parish. The decaying of its wooden piles presents the need to replace the bridge with better withstanding piles and to perform any other possible improvements. It is also noted that backwater from Wallace keeps flooding Linwood so a hydraulics analysis of the area is needed as well to make sure the design is performed according to sustainable measures. The goal of this project is to design a replacement bridge in a manner that would address the existing issues and adhere to the client's needs. The parameters of this project include designing the superstructure, substructure, and foundations for the new bridge, performing hydraulic analysis of the area, determining watershed boundary and drainage area characteristics, and preparing preliminary construction plans. The calculations and decisions of the design must be according to all codes that are applicable, such as AASHTO LRFD Bridge Design Specifications.

Team Name: N/A
Team Members: Jeffery Aycock, Victoria Christian, Julianna Demaree, Chase Menendez
Sponsor: Public Works/Engineering
Advisor: Dr. Shawn Sun

CIVIL ENGINEERING

2:00 IESB 124

Intersection Improvement of US 165 and Lonewa Road, Monroe, Louisiana

The Hwy165/Lonewa intersection is approximately ten miles north of I-20 in a fast growing area of Sterlington, Louisiana. With new development comes issues with capacity and intersection safety. The State of Louisiana Department of Transportation and Development recommended performing a traffic study, reviewing the crash data, trip generation, and sight distance, and designing alternatives that will improve the intersection. Design alternatives for this intersection included new traffic lights or j turns. With overall safety the main goal in mind, all possible design alternatives were carefully considered.

Team Name: N/A
Team Members: John Barthol, Chandler Davidson, Zachary Laborde, Dylan Miller
Sponsor: Natalie Sistrunk, P.E., PTOE; Bridgett Skinner, P.E., PTOE
Advisor: Dr. Nazimuddin Wasiuddin

2:30 IESB 124

Shiftail Canal Flood Control Culverts Rehabilitation/ Replacement

The Shiftail Canal Flood Control Structure is located approximately 500 feet north of Louisiana Highway 169 (LA 169) crossing under Twelve Mile Bayou Levee System. The scope of the project consists of the assessment of the existing Shiftail flood control structure that includes 4-72" corrugated metal pipes penetrating Twelve Mile Bayou Levee Segment. We are required to investigate the best and most feasible design option for replacement or rehabilitation of the flood control structure. Also, the assessment must include cost estimates for the different design options with recommended specifications and justifications for selection of the recommended design.

Team Name: N/A
Team Members: Terral Davis, Wallace Mills, Colton Schriver, Zihao Song
Sponsor: Administrator at Caddo Levee District, City of Shreveport, with Mr. Ali Mustapha, PE
Advisor: Dr. Shaurav Alam

3:00 IESB 124

Kinsey Scout Reservation Dam

The Boy Scouts of America have a tract of land in DeSoto Parish with a pond that is used for water-based merit badges. They are in need of another pond that will supply water to be sold for fracking, which will help fund the local chapter. That pond is to be held in place by an earthen embankment dam. Both the pond and the dam must be designed. The scope of work includes determining the watershed area, a hydrologic analysis and a hydraulic analysis, a dam profile, seepage and slope stability analyses, consolidation settlement calculations and a spillway design. The team is partnered with Louisiana Tech Construction Engineering Technology students to create a cost estimate and sequence of construction.

Team Name: N/A
Team Members: Brandon Bolen, Sydney Bratton, Daniel Hill, Noah Perkins, Alec Reddoch
Sponsor: Nixon Engineering Solutions with Mr. Kurt Nixon, P.E., P.L.S.
Advisor: Dr. Elizabeth Matthews

COMPUTER SCIENCE

1:00 IESB 216

Bulldog Maps

Bulldog Maps is an Android application designed for students and visitors new to Louisiana Tech University's campus. This application provides its users with the following: a marker indicating the user's current location, map markers displaying the location of specified buildings on Louisiana Tech's campus, and an optional AR image to display the information of each building.

Team Name: The Legends
Team Members: Vivian Carr, Conan Howard, Stephanie Niemiec, Jonathan Ruppel, Logan Simmons
Sponsor: N/A
Advisor: Dr. Kevin Cherry

1:30 IESB 216

EduBot

EduBot is a Discord server management bot designed specifically for use by teachers or professors in Discord servers that they set up for their classes. Our bot abstracts away tedious aspects of server administration such as grouping students and creating channels for group assignments, large-scale role assignment, bulk message deletion, or removing groups of members at the end of a quarter or semester. In addition to server administration features, EduBot supports content moderation functionalities such as an automated profanity filter, voice and text chat muting, spam protection, and server locking to prevent misuse of the server by unruly members. EduBot also provides helpful features such as user polls, scheduled notifications, assignment reminders, and breakout room functionality to better help teachers use their server as an effective and convenient means of communicating with their classes without many of the hassles associated with server administration.

Team Name: Team Caplet
Team Members: Landon Jackson, Cody Johnson, Prasil Mainali, Eric Pitts, Anuj Shrestha, Anthony Toussaint
Sponsor: N/A
Advisor: Dr. Kevin Cherry

COMPUTER SCIENCE

2:00 IESB 216

Kill the Phish

Our team tackles the all too common threat of finding malicious links when surfing the internet or checking emails. Our goal is to create a way for people to more easily identify links as dangerous or safe by using a browser plugin. By using a plugin, browser threat detection is easier and more available for the general public. If active, the plugin provides a small, resizable popup element that appears when hovering over any link in the browser. This popup shows whether the link is dangerous or safe by using text and imagery. Furthermore, if the link is dangerous and clicked, then the browser is redirected to a final warning page to determine whether the user truly wants to continue forward to the dangerous link. Our product was developed using common web development tools and languages such as HTML, JavaScript, JSON, and Google's SafeBrowsing API, which checks URLs with the Google Safe Browsing server and retrieves their status. Our final project provides people with an easy, in-browser option to identify links as safe or dangerous!

Team Name: Gods of Rods
Team Members: Tetchi Assamoi, Landry Baudouin, Frankie Cook, Matthew Karloski, Emily Robinson
Sponsor: N/A
Advisor: Dr. Kevin Cherry

2:30 IESB 216

Pocket Chef

Pocket Chef is an Android application for organizing groceries and simplifying cooking. The application maintains an inventory of the users' groceries and generates recipes based off that current inventory. Groceries are dynamically added to the application through image recognition or manual entry. The app will also notify the user of groceries near expiration, suggest commonly used items in their grocery list, and allow users to enter their own recipes. The goal of this project is to simplify cooking, track stored products, and give recipes at home.

Team Name: Pocket Chef Inc.
Team Members: Ricardo Aranaga, Jacob Bordelon, Kyle Rousselle, Linh Nguyen, Jhamon Phillips
Sponsor: N/A
Advisor: Dr. Kevin Cherry

3:00 IESB 216

Visual Workout Planner

The Visual Workout Planner is a React-based website designed to make finding information on exercises for each muscle group easier. The primary features include SVG models of the human body with selectable muscles, as well as a database hosted by FaunaDB which stores information on the exercises. Selecting a muscle will pull data on all exercises pertaining to that muscle from the database and display the information in organized boxes for the user.

Team Name: Coding Gains
Team Members: Chad Bealer, Caitlin Burke, Jeremy Choyce, Tram Doan, Andrew Maurice
Sponsor: N/A
Advisor: Dr. Kevin Cherry

COMPUTER SCIENCE

1:00 IESB 218

Anchor

This web application displays news articles alongside specific data to help audiences understand prejudices from a variety of media outlets. Using data mined from the article's contents, the objectivity, sentiment, and biases identified in each article are revealed and displayed using sentence highlighting and other indicators. Based on this data, users can use the app to see whether an article is biased in some way, and then determine how much they want to rely on or trust the article's information.

Team Name: The Dream Team
Team Members: Sydney Anderson, Beverly Coronel, Marco Flores, Lewis Johnson, Reginald Thomas, Promise Ward
Sponsor: Dr. Pradeep Chowriappa
Advisor: Dr. Mike O'Neal

1:30 IESB 218

ShopBot

ShopBot is a robot that does your shopping for you. Whether you need an item purchased once or multiple times on a schedule, ShopBot will place the items on your shopping list on order for you when they are in stock. By connecting with major retailers, there is almost nothing you cannot buy.

Team Name: Red Stick Tech
Team Members: Matthew Alvidrez, Behram Dossabhoy, Andrew Hall, Austin Harvey, Brian McKay, Damion Owens
Sponsor: Dr. Lorraine "Lori" Jacques
Advisor: Dr. Mike O'Neal

2:00 IESB 218

LIDAR Glasses with Wireless Haptic Feedback

The project focuses on the idea of using LIDAR sensors mounted onto glasses to relay information on motors in wristbands that will output haptic feedback. This is intended to help the visually impaired see objects that are within 6 feet and provide some better-detailed information on how close the object is via vibration motors. The user can turn on the LIDAR sensors on the glasses and start receiving feedback immediately using two wireless wristbands each with attached haptic motors. The closer the user gets to an object, the more intense the feedback will be.

Team Name: Robert and the Davenports
Team Members: Kaleb Crysel, Robert Davenport, Alexander Floyd, David Love, James Love, Jonas Kety
Sponsor: Cody Fontenot
Advisor: Dr. Mike O'Neal

COMPUTER SCIENCE

2:30 IESB 218

The Apple Watch Health Monitoring App

The Apple Watch Health Monitoring App is an application that utilizes data from a user's iPhone and/or Apple Watch to monitor the user's activity. If the user's data suggest that he/she is incapacitated or deceased, then the application generates and sends an alert to each contact on the user-created contact list. The Apple Watch Health Monitoring App is split into two applications: (1) an iPhone application and (2) an Apple Watch application. The Apple Watch application monitors a user's vitals via a blood oxygen level sensor and also the user's activity using an accelerometer. The iPhone monitors user activity via an accelerometer and uses data collected from the iWatch to determine if the user is incapacitated. If the user has a lack of activity and does not respond to a prompt, an SOS alert is sent out to a contacts list. The problem addressed by the app is that many times individuals, specifically elderly individuals who live alone, may experience a fatal tragedy, and will not be found until days or weeks later. This application could save these individual's loved ones some heartache by knowing he/she passed with no delay.

Team Name: The Smart Apples
Team Members: Joseph Ham, Deanna Kaufman, David Milam, Jerome Reed, Blake Till
Sponsor: Dr. Mike O'Neal
Advisor: Dr. Mike O'Neal

3:00 IESB 218

Object Finder Assistant

The Object Finder Assistant is an iOS and watchOS - based application that utilizes convolutional neural networks, cloud computing (AWS), secure networking, and voice recognition to help users locate lost items in their homes. The user can ask the Object Finder Assistant using text or voice commands to locate an item such as keys or remote control, and the application will return the last known location in the form of the room name and the time it was last seen in that location. This information is delivered to the user via audio and text together with a picture of the room with a box drawn around the item.

Team Name: Wii Excel
Team Members: Branson Hanzo, Nathan Hegab, Clark Foster, William Francis, Devon Knudsen, Josh Romero
Sponsor: Dr. Pradeep Chowriappa
Advisor: Dr. Mike O'Neal

CONSTRUCTION ENGINEERING TECHNOLOGY

1:00 IESB 220

Capstone for Construction

PADS Construction has been asked to bid and schedule the construction of the Rice Creek Waste Water Treatment Plant located in New Boston, Texas. We were provided a set of plans and specifications for the project which are to be used to find the needed quantities and dimensions for performing the takeoff for the project. We will use HCSS Heavybid software for completing the estimate and Primavera P6 software for the scheduling of the project.

Team Name: PADS Construction
Team Members: Avery Coggins, Dawson Huckaby, Scott Quigley, Peyton Wicker
Sponsor: N/A
Advisor: Mr. Reginald Jeter

1:30 IESB 220

New Boston Rice Creek Waste Water Treatment Plant

Triple B&C Construction is considering bidding for the New Boston-Rice Creek WWTP project. After assessing and analyzing the plans, we decided that this would be a good project for us to bid on. The bid winner is to construct an Aeration Basin, including a 4" PVC underdrain and the select backfill and two clarification chambers. They must also construct the concrete structure of the Chlorine Contact Chamber. The bid winner must furnish and install the 4" diameter PVC pipe, set the equipment for the Aeration Basin and clarifiers, take care of any dewatering, and form, cure, patch, and rub the concrete structures that are visible above ground. In order for our bid to be successful, we must precisely calculate quantity take-offs for our materials; estimate the labor, material, and equipment; and estimate the production of work items. After that, we must produce or bid and create a CPM schedule to construct the project.

Team Name: Triple B&C
Team Members: Aliyah Ballot, Bryce Bonin, Peyton Braun, Wes Thibodeaux
Sponsor: N/A
Advisor: Mr. Reginald Jeter

2:00 IESB 220

New Boston Rice Creek Wastewater Treatment Plant

We have chosen to take on the challenge of putting together a bid and schedule for the New Boston Rice Creek Wastewater Treatment Plant. By using documents given to us from Heritage Constructors, INC, we will be using HCSS Heavy bid for the estimate of materials, labor, equipment, and Primavera P6 for the schedule.

The portions of the Wastewater Treatment Plant in which Skyline Construction is responsible for are as follows: Aeration Basin, Clarifiers, Chlorine Contact Chamber, PVC piping, installing equipment, assigning subcontractors to other related items, and earthwork.

Skyline Construction will be constructing the concrete walls and foundations for the Aeration Basin, Clarifiers, Chlorine Contact Chamber.

Team Name: Skyline Construction
Team Members: Killian Conger, Leon Green, Jordan Johnson, Elizabeth McClure
Sponsor: Heritage Constructors, INC
Advisor: Mr. Reginald Jeter

CONSTRUCTION ENGINEERING TECHNOLOGY

2:30 IESB 220

Rice Creek Wastewater Treatment Plant in New Boston, Texas

Ten Point Construction will be responsible for the construction of a new wastewater treatment plant in New Boston, Texas. Several structures are necessary to complete the job. Ten Point Construction is responsible for creating the Aeration Basin, Floating Aerators, two 65ft Clarifiers, and the Chlorine Contact Chamber. The project will consist of excavation and backfilling for a large portion of the lot, particularly for the Aeration Basin's surrounding PVC Drain Line. Ten Point will be estimating the materials/equipment needed, as well as the labor. Work required for other portions of the project will be subbed out.

Team Name: Ten Point Construction
Team Members: Braden Floyd, John Sanderson, Dakota Scott, Kade Weathers
Sponsor: Heritage Constructors Inc.
Advisor: Mr. Reginald Jeter

1:00 IESB 222

Mountain Creek Regional Wastewater System Peak Flow Storage

Our company, Good Construction Co., has been tasked with building the Mountain Creek Regional Wastewater System Peak Flow Storage project. This is an update to the current wastewater treatment plant in Midlothian, Texas, that includes the addition of a coarse screen and peak flow storage basin and the expansion of the existing influent pump station. We will be performing the quantity take-off for the materials; estimating the materials, labor, equipment, and production for the work items; developing a bid package that includes bonds, insurance, general conditions, overhead, and profit; and creating a CPM schedule to construct the project in the allotted project time.

Team Name: Good Construction Co.
Team Members: Saul Garza, Will Hilburn, William Skinner, Jacob Smith
William Tosten
Sponsor: Heritage Contractors, INC
Advisor: Mr. Reginald Jeter

1:30 IESB 222

Peak Flow Storage Facility for TRA

TBPK Contractors, LLC is tasked with the reconstruction of a peak flow storage facility for the Trinity River Authority of Texas Mountain Creek Regional Wastewater System. The jobsite is located at 1717 Auger Road, Midlothian, Texas 76065. The scope of work will include, but is not limited to, excavation of the storage basin, construction of concrete structures, installation of PVC piping, equipment, dewatering, formwork, and construction of concrete. The estimate will use HCSS HeavyBid, while the scheduling portion will come from Primavera P6.

Team Name: TBPK Contractors, LLC
Team Members: Turner Bridges, Blake Canales, Pete Carroll, Kevin Jameka
Sponsor: Heritage Contractors, INC
Advisor: Mr. Reginald Jeter

CONSTRUCTION ENGINEERING TECHNOLOGY

2:00 IESB 222

TRA MCRWS Peak Flow Storage

H.C.A Construction has been tasked with the construction of a peak flow storage for Trinity River Authority Mountain Creek Regional Wastewater system. The project will include construction of the following: 7-million-gallon peak flow storage basin, entrance improvements at two locations, the security fence, a new influent pump along with the piping, hoist structure, electrical upgrades, and associated civil improvements. The project will include an estimate that will be completed using HCSS Heavybid, and a schedule that will be completed using Primavera P6.

Team Name: H.C.A Construction
Team Members: Abraham Delfin, Silas Knight, Nathan McClain
Sponsor: N/A
Advisor: Mr. Reginald Jeter

2:30 IESB 222

Trinity River Authority - Peak Flow Storage Basin

Acting in conformance with The Trinity River Authority of Texas, RBTJ Contractors will be estimating and bidding on the addition of a Peak Flow Storage Basin to the existing Mountain Creek Regional Wastewater Storage System. Various outlying structures alongside the basin, as well as demolition of some existing site elements, will also be included for consideration. Forming of the bid and schedule will be conducted with HCSS Heavybid and Primavera P6, and general project outlines for construction methods and site planning will be achieved using Bluebeam Revu.

Team Name: RBTJ Contractors
Team Members: Russell Daniels, Brad Dearing, Jaylen Giesbrecht, Trey Hammons
Sponsor: Heritage Contractors Inc.
Advisor: Mr. Reginald Jeter

3:00 IESB 222

Kinsey Scout Reservation Dam

This is a 28.7' zoned earthen embankment dam on a tributary of Keatchie Bayou. It is currently under construction and when completed will have a maximum storage capacity of 196.4 ac-ft. The pool level is maintained by a siphon pipe, with an armored principal spillway and a grass emergency spillway. Our Construction Engineering Technology Capstone group is working alongside the Civil Engineering Capstone group to provide a cost estimate and construction time estimate.

Team Name: Wilson & Sons Construction Company
Team Members: Daniel Beck, Colton Moore, Walker Simmons, Todd Wilson
Sponsor: N/A
Advisor: Mr. Reginald Jeter

CYBER ENGINEERING

1:00 IESB 226

cov3rt Framework

With the rise of cyber threats, people have begun to manage complex yet repetitive workflows with standardized frameworks. One example of this is Metasploit's abstraction of exploitation complexity. Despite the prevalence of covert channels in cyber attacks, no standardized tools exist for creation, management, and deployment of network covert channels. We provide a framework and deployable application to fill this space which does not currently exist in the security field.

We implement a modular design within our cov3rt framework to manage covert channels, or as we call them, "cloaks." For our project, we assume that the quality of our cloaks (covert channel implementations through our framework) is not required to be ideal or entirely real-world. Through the use of the Python library Scapy, the team has been able to create a framework which imports and utilizes cloaks in a graphical and command-line manner. The cov3rt framework provides penetration testing and risk management teams with a singular tool to create, manage, and deploy covert channels, and our modular design allows these teams to integrate the framework into their own scripts. In addition to the technical benefits of the cov3rt framework, the tool provides the general public with a greater awareness of covert channels to seek and mitigate risks in personal networks.

Team Name: LAN Turtles
Team Members: Justin Berthelot, Samuel Dominguez, Daniel Munger, Christopher Rice
Sponsor: N/A
Advisor: Dr. Miguel Gates

1:30 IESB 226

Computer Car Keys

The objective of Computer Car Keys is to utilize external media devices, such as USB storage devices, as a hardware two-factor authentication tool. Encryption is employed to obfuscate selected data to effectively "lock" the information. A "key", or an external media device that is chosen by the user, is required to both encrypt and decrypt the information. Windows and Unix shell commands have been integrated as tools within Computer Car Keys and are utilized to identify the locations of external media devices and their corresponding unique identification. Functionality to format the desired external media device with the necessary file system is present, which allows the user to both create a new key or reset a preexisting key. Using Python, we have ultimately developed a software that secures information on a system with an external media device and multi-factorization.

Team Name: Phishy Salesmen
Team Members: Kevin Doyon, Benjamin Hargrove, Dawson Markham, Scott Young
Sponsor: N/A
Advisor: Dr. Miguel Gates

CYBER ENGINEERING

2:00 IESB 226

Project Red

This project consists of the planning and execution of a penetration test on an undisclosed organization. The planning phase consisted of doing reconnaissance, preparing, and ensuring we had the necessary permissions to begin the testing phase of the project. We began by doing a scan of all the ports on the approved networks and dug deeper into particularly vulnerable hosts. This gave us a general idea of who/what we wanted to target and how we planned to do so. We initiated a social engineering attack that utilized email and phone spoofing to convince employees to give up their login information. Physical security was also put into question. We've been in constant communication with the organization's IT department to ensure we're all on the same page and prevent unnecessary alarm. The members of our team who are more experienced in security protocols were able to pilot the rest of the group while they gained experience by implementing offensive cyber tactics. We've been able to get a closer look into the faults and vulnerabilities of the organization and hope that we can give them a better understanding of their networks, staff, and overall security.

Team Name: MSM
Team Members: Chris Given, Michael Levesque, Zach Rogers, Ryan Utley, Anna Wolf
Sponsor: N/A
Advisor: Dr. Miguel Gates

2:30 IESB 226

ICE Phishing

The ICE Phishing platform covertly observes and records a target's credentials in a phishing scenario by masquerading as remote web content while logging any important information they might divulge. Relying on a backend API, a database, and a doppelganger reverse proxy that, once deployed, the services interact in a docker cluster private network. ICE Phishing can be used by security professionals to efficiently create and track custom phishing scenarios with a simple web interface dashboard.

Team Name: Go Phish
Team Members: Aaron Miller, Nicole Robles, Andrew Schoonmaker, Jillian Stalder
Sponsor: N/A
Advisor: Dr. Miguel Gates

3:00 IESB 226

Computer Vision Multi-Factor Physical Security System

Due to our desire to produce a more hardware-based project, we began thinking of ideas that would allow for seamless integration between hardware and software. We came up with the idea of a smart door lock that could provide enhanced physical security through multi-factor authentication (MFA). After sourcing the individual materials, we worked to get each component working separately. We were able to utilize source code from the component manufacturers in order to get the basic function of each component including facial recognition.

Team Name: Pi Visionaries
Team Members: Christopher Bouton, Matthew Eldridge, Louis Miller, Peyton Page
Sponsor: N/A
Advisor: Dr. Ankunda Kiremere

ELECTRICAL ENGINEERING

1:00 IESB 228

Boat Obstruction Avoidance System

The boat obstruction avoidance system is designed to both alert and divert away from unseen obstructions under the surface of the water. This will be done by utilizing three sonars, one forward facing and two at 45 degrees from center. This will provide an adequate field of view to know both that there is an obstruction out front, and in which direction the system needs to turn. The system also includes a three-tier LED system that shows the operator if there is an obstruction 8 feet away, 6 feet away, and 4 feet away, at which point the obstruction system will take over. The colors of each tier varies as well, with the 8 foot marker being green, the 6 foot marker being yellow, and the 4 foot marker being red, at which point all LEDs will be on and the system will be in avoidance mode. Avoidance mode is when the linear actuators will be told which direction to turn based on the range finders' input. The actuators may also be controlled when there is not an obstruction with a joystick input from the operator.

Team Name: Boat Obstruction Avoidance Team (BOAT)
Team Members: Brayden Davis, Steven Powell, Joseph Smith, Travis Williams
Sponsor: N/A
Advisors: Dr. Matthew Hartmann

1:30 IESB 228

Data Acquisition System for Particle Physics Experiments

A data acquisition system is a multi-system, modular device that captures data from sensors. As a modular system, a data acquisition system is configurable and expandable to suit experimental design. The group's data acquisition system is designed to capture data from an analog signal generated by a cosmic ray impacting a scintillator. A change of energy state within the scintillator material generates a photon, and a photomultiplier tube connected to the scintillator generates a current. The photomultiplier tube uses this current signal to produce an amplified voltage signal. An analog to digital converter translates the signal to discrete data. The data is recorded in real-time via network connection to a lab computer. The data acquisition system has a single 8-channel analog to digital converter capable of external, internal or software triggering. The system produces high-resolution data with a 12-bit digitizer with a sampling rate of 250 MS/s. The system is highly configurable with programmable event size and pre/post trigger. The system will provide a tool for Louisiana Tech to expand its experimental capabilities in the future by offering accessible, high-quality data that can be customized to the user.

Team Name: DAQula
Team Members: Mitchell Adams, Scott Hotard, Josh Jones, Nick Trichel
Sponsor: Dr. Rakitha Beminiwattha
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

ELECTRICAL ENGINEERING

2:00 IESB 228

Electric Heating for Fly Ash Based Geopolymer Cement

The goal of our project is to develop an electric heating system for fly ash-based geopolymer cement (FABGC). Our heating system improves on the existing solution implemented by Dr. Shaurav Alam by reducing the time needed to heat the samples to a target temperature of 50-70 degrees Celsius and reducing the size of the heating system. We have developed two approaches to electrically heat the FABGC. The first approach is induction heating. Our induction heating circuit works by generating an oscillating magnetic field in an induction coil, samples placed inside the coil are then heated by eddy currents induced in the sample. The second approach we have been developing is dielectric heating. Dielectric heating utilizes alternating electric fields to rapidly switch the direction of dipoles which generates friction and in turn heat. To produce this dielectric heating effect, we have repurposed a microwave oven magnetron. The magnetron used by microwave ovens emits high-frequency electromagnetic waves that are used to create dipole motion. By modifying the circuitry of a microwave oven, we can control the magnetron using a custom control system.

Team Name: Geo-Heater Team
Team Members: Stephen Timothy Gordon, Kurt Ashton Glorioso, Diego Arturo Segura Ibarra
Sponsor: Dr. Shaurav Alam
Advisors: Dr. Prashanna Bhattarai

2:30 IESB 228

Crisis Situations in Self-Driving Cars via Novel Machine Learning

As a relatively new technology, many Americans still do not believe in the safety of self-driving vehicles, but we believe that exploring crisis management and decision making is an important step in helping sway public opinion in favor of this technology. For our project, we have been exploring the application of machine learning (ML) to assess and act on crisis situations in self-driving cars. To demonstrate this, we have fabricated a remote control (RC) car fitted with various sensors that will utilize ML algorithms to demonstrate the basic functionality of self-driving cars. Our design utilizes a Raspberry Pi 4B which serves as our primary controller and runs the ML algorithms which teach the car to navigate lanes and recognize objects such as traffic signs. Overall, our project aims to explore a novel machine learning topic that will help a model autonomous vehicle navigate a certain crisis situation. By doing this, we hope that our project may help improve autonomous vehicle technology going into the future.

Team Name: Machine Learning in Self-Driving Cars
Team Members: Mark Hidalgo, Nolan Matthews, Jim Vanchiere, Alex Yoes
Sponsor: N/A
Advisors: Dr. Jinyuan Chen

ELECTRICAL ENGINEERING

1:00 IESB 210
Multiple Guitar Effects Unit

The goal of our senior design project is to design a multiple guitar effects unit that will process and modify an electric guitar signal using three different effects circuits: overdrive, fuzz, and tremolo. Our design primarily targets consumers, who are guitar players looking for a user-friendly device, that is innovated based on common guitar effect problems. (These problems include minimal versatility, manual daisy chain order switching, and various units.) To solve this, each effect includes adjustments for sound alteration using potentiometers and/or switches with LED on/off recognition. They are also each interconnected using true by-pass switching which enables the user to switch the order in which the guitar signal goes through the effects by employing an internal switching network.

Team Name: Multiple Guitar Effects Unit
Team Members: Nate Chopin, Elzin Hitchens, Cole Perilloux, Suede Taylor
Sponsor: N/A
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

1:30 IESB 210
Surgical Metal Detector

In dangerous environments such as military combat or explosives storage, there is a hazard of bullets, grenades, or shrapnel hitting a victim. Even with no fatal injuries, there are still risks of lead poisoning, infection, and the fragment moving to cause further damage (fragment migration). In most cases, the victim can be taken to a hospital with large scanners to locate the metal before performing surgery, solving the issue. However, such hospitals are not always accessible for victims.

Our device is inspired by research from the article, "Implementing metal detector technology and a navigation system in the removal of shrapnel," in the Computer Aided Surgery journal. In cases of fragment migration, the detector/navigation system decreased location time by 275%. It is also assumed that the metal detection tool alone would greatly assist surgeons during their operation even if a navigation system was not accessible. Our project plans to encompass this surgical metal detection system in one mobile, cost-efficient unit.

Team Name: Surgical Metal Detector
Team Members: Mason Campbell, John Coughlin, Daniel Goss, Mark Nussbaum
Sponsor: N/A
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

ELECTRICAL ENGINEERING

2:00 IESB 210

Frequency and Location Correlator over Narrow Bands

FALCON-B is a passive radar system that utilizes an array of four antennas to measure the distance and bearing of an incoming signal. FALCON-B finds the relative power of the incoming signal and uses the signal-to-noise ratio (SNR) to determine the distance in feet and direction within 50 feet. FALCON-B can be used for home and business security, or for those interested in the location vector from incoming signals. The data collection is done through RTL Software Defined Radio, and approximately one million samples of IQ data are collected each second. The distance-finding process utilizes an equation that was derived by measuring and recording the collected SNR values at various distances in Microsoft Excel and is calculated using the antenna data with the highest SNR. The direction-finding subcomponent done by FALCON-B utilizes the network of four antennas. By collecting the two highest SNR values, FALCON-B can determine the approximate octant in which the incoming signal is located. Radio shielding is utilized to block each antenna from 180 degrees of its field of view, so the SNR collection process can be more precise. Through SNR collection, FALCON-B determines the distance and approximate bearing of the incoming signal.

Team Name: FALCON-B
Team Members: Ian Carney, Michael Krzystowczyk, William Lee, Frank Polermo
Sponsor: N/A
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattari

2:30 IESB 210

Smart Outlet

The Smart Outlet device is a load consumption monitoring system that measures and displays the voltage, current, real power, apparent power, and power factor based on a load of a 120 Volt RMS system. The smart outlet design project acts as a model for higher voltage industrial plants and is used as an additional solution for smaller-scale predictive maintenance. Through continuous data collection from voltage and current sensors, the smart outlet uses the zero-crossing method to display the power factor the load consumes. The data the smart outlet records is used to troubleshoot abnormal operations and provide feedback for overcurrent. The smart outlet product has a primary focus for industrial use with additional features that can be useful for common household consumers as well. The exterior design of the smart outlet is similar to a common household power strip with the addition of an LCD monitor placed in between two electrical sockets. The LCD displays the electrical values consumed by the various loads plugged into the socket using both voltage and current sensors which are configured between the supply and the load. The smart outlet LCD has the function to display multiple screens of information for each socket by using its touch-screen capability. To increase the safety and reliability of the smart outlets' components and the connected load, the smart outlet incorporates an overcurrent protection relay system that is set to trip at 10 amps. Another feature the smart outlet device implemented is the ability to control the device's ON/OFF setting through a web browser's IP address that is connected to the user's Wi-Fi.

Team Name: Smart Outlet
Team Members: Adrian Eugene, Colton Oberthier, Vu Vu, Mason Youberg
Sponsor: N/A
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

ELECTRICAL ENGINEERING

3:00 IESB 210

Remote Controlled Lawnmower

We converted a normal electric lawnmower into a remote controlled lawnmower that can be operated with the user inside of a house while the mower is in the yard. The mower has a video feed, backup sensor, and numerous safety devices to maximize usability and reliability.

Team Name: Remote Controlled Lawnmower
Team Members: Adam Carlisle, Edward Chappel, Benjamin Finch
Sponsors: Brenden Mertz
Advisors: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

INDUSTRIAL ENGINEERING

1:00 IESB 205

Examining the Use of the DMAIC Process on the Operational Plan Improvement for UPS Personal Vehicle Drivers

UPS has recently incorporated temporary seasonal personnel that deliver packages out of their personal vehicles, or Personal Vehicle Drivers (PVDs). Being able to deliver at a low cost while providing additional capacity makes them an important resource to the company, but without a guideline in place, they are being used inefficiently at some delivery centers. By utilizing the define, measure, analyze, improve, and control (DMAIC) process, the goal of this project was to analyze how PVDs are currently being planned and dispatched in order to create a cost-effective plan and tools to be used for future implementation. With the DMAIC method, interviews with employees directly involved in working with PVDs were first conducted, and key metrics of PVD efficiency were identified using Pareto diagrams. A statistical analysis was then performed to give a predictive equation of PVD performance. These efforts in combination with two other teams' approaches to the problem led to the creation of an operational plan and interactive tool to pinpoint the most productive areas for PVD routes. These solutions, if used, will result in positive financial savings for UPS. The process and findings of this project can be a starting point for others who have an introduced resource in their company that is being used without efficient direction and want to create a methodical guideline.

Team Name: N/A
Team Members: Landry Seimears, Emily Theriot, Courtney Wessels
Sponsor: UPS
Advisor: Dr. Jun-Ing Ker

1:30 IESB 205

TCI Lamination Downtime Analysis

Our team was tasked with investigating machine downtime in the production process bottleneck area named the lamination department at the company T.C.I. (Textiles Coated International) located in New Hampshire. We were given the lamination department data collected over the previous year by our project sponsor (Abhas Joshi), and we utilized multiple statistical analysis techniques in order to determine what factors were contributing to the machines' downtime. We then assembled our teams findings and organized them in an easily digestible report that will be presented to our class and company T.C.I.

Team Name: T.C.I. (Textiles Coated International)
Team Members: Christian Dalby, Conner Hill, Benjamin Steib
Sponsor: Abhas Joshi
Advisor: Dr. Jun-Ing Ker

INDUSTRIAL ENGINEERING

2:00 IESB 205

Benteler Steel Simulation

This senior design project is focused on designing and developing an Arena Simulation model of Benteler Steel's LD81 pipe manufacturing process. The primary goal of this simulation is to identify and insulate bottlenecking issues in the manufacturing process. This model will also be designed to incorporate failure times along with the ability to run different scenarios to measure and compare the severity of different results. In the end, this model will continue to be used by operators and management at Benteler to estimate total processing times.

Team Name: Benteler Steel Simulators
Team Members: Claire Dorsett, Nick Liscomb, Noah Phenice
Sponsor: Xiang Sean Zhou
Advisor: Dr. Jun-Ing Ker

2:30 IESB 205

Alliance Compressors Capstone Project

The purpose of this project was to provide engineers at Alliance with a method for identifying the areas in which bottlenecks occur on their production lines. To accomplish this goal, we separated both lines into zones and placed an andon light in each. We began by choosing data collection points on each line that we planned on using as the locations for our lights. We analyzed historical data as well as the data we collected to determine the options for light functionality. We discussed each solution option as a team and narrowed our selection until we arrived at the best solution. We presented our project sponsor and other engineering managers at Alliance with our findings and recommendation for light functionality. Finally, we developed a plan for collecting data after our solution was implemented to determine if the changes we made had the impact we expected.

Team Name: Alliance Compressors
Team Members: Alexander Brodtman, Alandria Ford, Blake McMillian, Frederick Musa
Sponsor: Logan Hughes
Advisor: Dr. Jun-Ing Ker

INSTRUMENTATION AND CONTROL SYSTEMS ENG. TECH.

1:00 IESB 105

Wind Tunnel Restoration

The laboratory wind tunnel housed in Bogard Hall utilized outdated and dysfunctional sensory equipment in tandem with a limited control system. Our project directive was to address these issues. To do so, we reevaluated the mechanical systems in place, analyzing the load cell configurations that read drag and lift values from within the tunnel. We then re-machined the frame in order to balance out outside forces to zero out load cell readings to allow for more accurate data collection. To address the control system, we chose to replace the Windows application based controller with a custom user interface using a web server running on a Raspberry Pi. This web server was created using Flask, a Python web framework that utilizes HTML and CSS to create customizable and interactable webpages. Last, we upgraded circuitry components such as load cell amplifiers in order to improve data signals and implemented new instrumentation such as temperature sensors to gather additional experimental data.

Team Name: Long Winded
Team Members: Jeremy Dubriske, Johnathan Emerson, Jackson Torrey
Sponsor: N/A
Advisor: Dr. William Long

1:30 IESB 105

Semi-Automatic Acrylic Bender

Over the past year, we have seen an increase of safety measures being issued to provide a safe environment for people to continue their daily routines during COVID-19. At Louisiana Tech, a popular acrylic plastic material has been increasingly implemented for these measures and other uses, but the process used to heat then form the acrylic in a desired angle is an arduous task. We wanted to create a machine that will solve this issue by simplifying and speeding up this process. Introducing the Semi-Automatic Acrylic Bender: a machine used to heat and bend acrylic at an increased speed. A programmable logic controller (PLC) is used to control a stepper motor to make it rotate to the required angle input. The desired angle can be selected on the Human Machine Interface (HMI) touchscreen. A heating element is used to heat the acrylic until it is bendable, then manually clamped on a bending panel to begin the bending process, making the machine semi-automatic. This machine will be used in the COES prototype lab to prep acrylic for uses such as plastic barriers for classrooms, freshmen ENGR122 (Engineering Problem Solving 3) trophies, and other student projects.

Team Name: UnderDawgs
Team Member: Kenan Jackson, LaTwann Jenkins, Jose Portillo
Sponsor: N/A
Advisor: Mr. Ron Gill

INSTRUMENTATION AND CONTROL SYSTEMS ENG. TECH.

2:00 IESB 105

Small Parts Dispensary

The Small Parts Dispensary is a vibratory feeding system designed to dispense a required number of individual hardware items such as nuts and bolts to be packaged for freshman engineering kits. Our design consists of multiple 3D printed spiraled bowls, each having its own stepper motor causing a rotational vibration to produce a speedy flow of each part. The parts are moved up and out of the bowl aligned in a single file line. When they reach the brim of the bowl, the part falls through where an infrared sensor is used to count the desired number of parts to be dispensed. The parts are driven to follow a gravity feed path and fall onto a collecting tray. Our design consists of four individual vibrating bowls. Two of the bowls distribute bolts, and two distribute the corresponding nuts. Our design has an interactive human-machine interface that allows the user to input the desired amount of hardware items to be dispensed.

Team Name: N/A
Team Members: Cole Carroll, Logan McDonough, Jacob Shoesmith
Sponsor: N/A
Advisor: Mr. Michael Theodos, PE

MATHEMATICS & STATISTICS

1:00 IESB 302

Spatial Visualization in the Engineering Fast-Forward Program

This research project discusses the Spatial Visualization Curriculum: Developing Spatial Thinking, endorsed by ENGAGE, and the Purdue test results from students in the Engineering Fast-Forward Program. The summer after acceptance, students in the Engineering Fast-Forward Program take Engineering 220: Statics and Mechanics of Materials, Math 243: Calculus III, and Engineering 198B: Professional Planning with Spatial Visualization. Engineering 198B is a section in which students are taught from the Developing Spatial Thinking Curriculum. The students take the Purdue Rotations test as a pre and post exam in the course. A statistical analysis is completed using the results from these tests.

Team Name: N/A
Team Member: Allissa Gros
Sponsor: N/A
Advisor: Dr. Katie Evans

1:30 IESB 302

Mathematical Modeling of Neurons: Analyzing the Hodgkin-Huxley Model

The Hodgkin-Huxley Model, named after its creators Alan Hodgkin and Andrew Huxley in 1952, showed the initiation and propagation of a neuron's action potential. This model was created using a squid's giant axon to help explain the behavior of nerve cells.

The main focus of this project is to explore MATLAB coding and modeling of the Hodgkin-Huxley Model and incorporate ordinary differential equation solvers to approximate the solutions of the Hodgkin-Huxley model. Euler's Method is used to approximate the Hodgkin-Huxley ordinary differential equation. All constant, channel, current, and voltage functions are created in MATLAB and use Euler's First Order Approximation. Plots of Voltage vs. Time and Potassium and Sodium Ion Conductance vs. Time are also generated using the functions in MATLAB to display graphs in a simulated Neuron.

The most significant result of this research project is being able to generate the MATLAB code to solve the Hodgkin-Huxley ordinary differential equation and to use the solutions to plot Voltage vs Time and Potassium and Sodium Ion Conductance vs Time graphs.

Team Name: N/A
Team Member: Rachel Norton
Sponsor: N/A
Advisor: Dr. Katie Evans

MATHEMATICS & STATISTICS

2:00 IESB 302

Convergence of the Fibonacci Sequence in Polynomials

The purpose of this research is to show progress toward the proof that the Fibonacci Sequence, when applied to polynomials with positive coefficients, converge to the Golden Ratio. A proof of this convergence does not currently exist in the literature. The Golden Ratio is derived from the Fibonacci Sequence. Therefore, in order to reach our goal, we first provide an original proof of convergence of the ratio of consecutive Fibonacci numbers. By using Binet's formula within a ratio test and limit test, it is shown that the Fibonacci sequence does converge to the golden ratio.

Key Terms: convergence, Golden Ratio, Fibonacci sequence, polynomial

Team Name: N/A
Team Member: Kaitlyn Eads
Sponsor: N/A
Advisor: Dr. Stacey McAdams

2:30 IESB 302

The Einstein Field Equations

A tensor is an object used in mathematics to describe physical properties. In this presentation, we will specifically be looking at three important tensors. These are the Ricci curvature tensor, the scalar tensor, and the stress-energy tensor. These tensors come together and are the foundation of what we refer to as the Einstein Field Equations. These equations are a collection of ten different equations that come together to relate the geometry of spacetime and the matter inside of it. Using the Einstein Field Equations and the results from it, we will look at what gravity is and how it affects the space-time around it. In this presentation, we will examine how they came to be what they are today, as well as how the Einstein Field Equations may be used to describe and predict changes in space-time due to gravity using the Schwarzschild metric.

Team Name: N/A
Team Member: Logan Sims
Sponsor: N/A
Advisor: Dr. Jonathan Walters

3:00 IESB 302

Categorical Stock Prices Forecasted by the ARIMA Model

This project is primarily on using the ARIMA (autoregressive integrated moving average) model to predict three quarters of stock prices. Using categories of stock prices: Fast Food, Grocery, Clothing, and Mobile Providers, we can analyze the average stock price quarterly over four years (2014-2017) and forecast the next year (2018) using the ARIMA Model. Once the ARIMA Model has forecasted the quarters, we then check the actual stock price averages of the quarters to see which category or categories work best. We use actual data that has already occurred to check our forecasting. The ARIMA Model shows a confidence interval, and we use this to compare the categories. This research gives a better understanding of what types of stocks are suited best for ARIMA Model forecasting. For this research project, we think it is best to use data that is pre COVID because it has a much more steady data range.

Team Name: N/A
Team Member: Hannah Dickerson
Sponsor: N/A
Advisor: Mr. Stan McCaa

MECHANICAL ENGINEERING

1:00 IESB 112

Visual Tube Detection System

The objective of this project is to design a system to detect incoming tubes on a conveyor before they hit a stopper and are trimmed to their respective lengths. Once the tubes are detected, a signal will be sent to Benteler's PLC through a mosfet transistor circuit to automatically slow the conveyor before impact, mitigating bounce-back from the stopper. This automatic detection and slow-down signal ensures that the tubes stop flush against the stopper, permitting correct length of tube will be cut. An OpenMV Cam H7, utilizing frame differencing technology, was chosen to detect incoming tubes. This sensor is capable of 75-150 frames per second, and contrasts a preliminary background image against the percent change of each new frame captured. The camera is attached to the stopper base via an aluminum extrusion arm set at a 90° angle. The camera housing is 3D-printed using PLA and was designed to slide along the extrusion. An 18-Watt LED light is also attached to the extrusion to provide the camera with adequate lighting. The production budget of the design is just under $150, excluding installation and training costs.

Team Name: N/A
Team Members: Zach Harper, Spencer Hurst, Jacob Leslie, Hyder Spence
Sponsor: Xiang Zhou, Process Engineer, Benteler Steel and Tube, LLC
Advisor: Dr. Krystal Corbett

1:30 IESB 112

Turbine Fluid Damping Model

Bently Nevada uses a rotor training kit to train their technicians and engineers in turbomachinery vibrations. Bently Nevada wants realistic simulation of turbomachinery from their training kit. However, the kit in its current state does not provide vibrational damping effects that realistically simulate turbomachinery. Furthermore, the kit uses a bulky fluid film bearing and a loud pump. To address these issues, the team designed and constructed a modified fluid film bearing with a sleek, minimalistic design that increases damping effects, all while using a quieter pump. The main goal of the design is to decrease the synchronous amplification facto (related simple measure of damping effects) by 50% compared to the existing kit setup. With the team's new bearing design, Bently Nevada will have the realistic results desired using a compact and quiet kit. This provides Bently Nevada's technicians and engineers the benefit of improved training quality due to the realistic simulation of the turbomachinery they will encounter in the field. The training leaders will also benefit from a more portable and less disruptive kit.

Team Name: N/A
Team Members: Lance Allison, Tad Marks, Nabin Shrestha, Paul Vu
Sponsor: Michael Titone, Technical Leader, Bently Nevada, LLC
Advisor: Dr. Kelly Crittenden

MECHANICAL ENGINEERING

2:30 IESB 112

Crack Arrest Treatment Electrode and Testing System

Pressure systems within an American Electric Power plant endure extreme environmental conditions that cause corrosion and fatigue cracks throughout the vessel's prolonged operation. Current repair methods require the removal and replacement of key tubing, pump, or heat exchanger sections within the assembly, causing substantial financial costs in production downtime alone. AEP now seeks to investigate a promising chemical treatment process that may identify and repair fatigue from within. By filling a damaged pressure system with an ionic solution and delivering current through it, metallic ions from the working fluid bond to the internal surface as an electrode device snakes through the tubes. Such plating has been shown to enter cracks, form a particular micro-structure that alleviates adjacent stress concentrations, and arrest further crack growth from propagating. Project members are tasked with configuring the process to treat up to 300 ft., as well as demonstrating a physical electrode device on 50 ft. of the exact carbon-steel tubing used within AEP's boiler-fed steam power plants. Additionally, designs for two separate boiler test apparatuses will be examined: a small boiler to be housed at Louisiana Tech's Trenchless Technology Center and an auxiliary system to run parallel with AEP's primary boiler line.

Team Name: N/A
Team Members: Davin Barron, Liam Flanagan, Isaiah Turner, Sean Woodfork
Sponsor: Brice Daniels, Electrical Engineer, American Electric Power Corporation
Advisor: Dr. Henry Cardenas

3:00 IESB 112

Billet Center Punch System

Benteler makes some of the best steel pipes in the business thanks to their efficient production in terms of quantity and quality. They take advantage of a process called the mannesmann effect during which a large spinning rod is driven through a large red-hot steel cylinder, creating a hole and turning the cylinder into a pipe. Often the head of the cylinder, where the rod starts piercing, is not punched perfectly at center but eventually finds center soon thereafter. This head-end portion of the newly made pipe must be cut off and eventually becomes scrap which costs Benteler money. Benteler wants to cut down on these losses by punching a pilot hole at the center of the cylinder before it moves on to the piercing rod. Team members are tasked with creating a device that will punch a hole into the center of the steel cylinder so that the piecer finds the center faster and more accurately.

Team Name: N/A
Team Members: Grant Anderson, Justin Lewis, Kyle Marcon, Tucker Wann
Sponsor: Justin Dowty, Process Engineer, Benteler Steel and Tube, LLC
Advisor: Dr. Michael Swanbom

MECHANICAL ENGINEERING

3:30 IESB 112

Multi-Terrain Transporter

The Multi-Terrain Transporter is a backpack frame support system which is designed to alleviate the weight of the backpack from the shoulders of the user. The system is compatible with external framed backpacks as it is intended to be an aid for users who are inhibited by their pack weights. The frame of the transporter is designed to attach to the frame of the backpack. The design of the system is set up to be adjustable for people of different heights as well as giving them different adjustments of springs and dampeners to allow for a more personalized and comfortable experience.

Team Name: N/A
Team Members: Hayden Aldridge, Matthew Franklin, Kenneth Green, Louis LaBruyere
Sponsor: David Gremillion, President, Excellence and Innovation LLC
Advisor: Dr. Kelly Crittenden

1:00 IESB 114

Recycle Fractionation Screen Access Platform

WestRock is the second largest American packaging company. Their mill in Hodge, Louisiana, which was built in 1928, is one of the oldest paper mills still in operation. One of their core values is safety. The mill builds temporary scaffolding to access the top of the refractionation screen housing to perform annual maintenance. This scaffolding costs $1500 every time it is put up and must be inspected before use each day. The proposed design is to create a permanent platform which eliminates the need of temporary scaffolding. The design allows for access panels to be removed underneath the structure while retaining access to valves underneath the platform as well as around it. The platform will allow for up to five people to remove 30 bolts located on the top of the screen housing. The platform will have removable handrails to provide the necessary clearance for the removal of the screen housing lid and basket. The platform must meet both WestRock and OSHA standards.

Team Name: N/A
Team Members: Clayton Barrett, Jonny Coe, Jordan Porche, Jordan Sanford
Sponsor: Beth Cole, Project Engineer, WestRock Mill, Hodge, LA
Advisor: Dr. Timothy Reeves

MECHANICAL ENGINEERING

1:30 IESB 114

Thermal Runaway Management System for a Battery Pack

Lithium-ion batteries have enabled many of today's most ubiquitous technologies, including cell phones, laptops, tablets, and, on a larger scale, electric vehicles. However, the same high-energy density storage capabilities that give Lithium-ion batteries the ability to function over long periods can also lead to significant hazards when a battery malfunctions. While these malfunctions can have several root causes, most serious failures fall under "thermal runaway," in which the temperature of the battery rises rapidly. This accelerates a chain of events within the battery, typically resulting in package rupture, toxic gas release, and significant fire potential. The team has designed and constructed an oscillating heat pipe (OHP) thermal management solution that quickly and safely prevents thermal runaway within a model Lithium-ion battery pack. The team constructed a scalable test module to mimic the dimensions and transient thermal response of an actual Lithium-ion battery array comprising seven industry-standard 18650-style cells. A heating condition was identified in which the model array replicates the transient thermal response of an actual thermal runaway event. The successful OHP solution demonstrates the ability to keep module temperatures and temperature ramp rates below those characteristic of thermal runaway in Lithium-ion batteries under the same heating condition.

Team Name: N/A
Team Members: Richard Fontenot, Abigail Morgan, Nicholas Mueller, Carli Raupp
Sponsor: Dr. Arden Moore, Associate Professor, Louisiana Tech University
Advisor: Dr. Arden Moore

2:30 IESB 114

Poppet Valve Control Cylinder Removal System

At the Brame Energy Center in Lena, Louisiana, Cleco Power utilizes poppet valve control cylinders as a component of the coal ash handling process of combustion. These cylinders must be maintained and eventually replaced to ensure proper operation. Cleco currently has no method of removing the cylinders from their pedestals. The proposed solution involves a modified manual straddle stacker. This straddle stacker features a custom grabbing mechanism to safely lift the 450-lb cylinders without damaging them. Stabilizing jacks are also used on the straddle legs of the machine to establish a level lifting surface. The straddle stacker will be used to remove the poppet valve control cylinders from their pedestals on Unit 2 of the Brame Energy Center. A separate, slightly altered version of the design will be used for the same application on Unit 3. After removal, the straddle stacker will allow for the transport of the cylinders to the ground for maintenance purposes.

Team Name: N/A
Team Members: Keil Bauer, Josh Hagberg, Mark Patterson, Jr., Jordan Serna
Sponsor: Jeremy Brimer, Senior Engineer, Cleco Power, LLC
Advisor: Dr. Michael Swanbom

MECHANICAL ENGINEERING

3:00 IESB 114

Recycle Primary Coarse Screen Access Platform

At the WestRock Paper Mill in Hodge, Louisiana, workers are required to build a temporary scaffolding in order to reach the top of the recycle primary coarse screen housing to perform routine maintenance. Building a scaffolding each time maintenance is required is inefficient in terms of both cost and time. The proposed solution was to create a permanent platform in order for workers to access the equipment. This eliminates the use of temporary platforms without a fixed base. The proposed design allows two workers to occupy the platform in order to remove bolts located at the top of the screen housing and to remove the screen basket from the screen housing for maintenance. The platform must also have removable handrails in order to provide the necessary clearance for the removal of the screen basket and must also meet both WestRock and OSHA standards.

Team Name: N/A
Team Members: Jeffery DeRoche, Remington Hayes, Alexandra Perkins, Caleb Villery
Sponsor: Todd Pyles, Engineering Manager, WestRock Mill, Hodge, LA
Advisor: Dr. Amin Azimi

3:30 IESB 114

Potato Trailer Cleanout System

The design team is working with Lamb Weston, a sweet potato processing company located in Delhi, Louisiana. This plant utilizes large 18-wheeled trailers to feed sweet potatoes into the plant to begin the process. The trailers unload the potatoes in a three-stall wide wash bay. The trailers are cleaned after unloading to reduce the risk of spreading contaminants in the soil from farm to farm. The current cleaning process involves a worker climbing a difficult-to-use ladder on the side of the trailer and spraying it with a high-pressure nozzle, similar to a garden hose nozzle. This process is both time-consuming and a high safety risk. Lamb Weston wants to make the ladder easier to use and improve the efficiency of the cleaning process. The first part of this problem will be accomplished by utilizing a fold and latch extension ladder to lower the bottom rung's height. The second part of this process will be conducted by using a sprayer that consists of a long reach handle, an on/off valve, and a roller that will allow the worker to safely roll it around the trailer's top rails.

Team Name: N/A
Team Members: David Horne, Matt Leleux, Grant Mabile
Sponsor: Derick Newman, Project Engineer, Lamb Weston Corp. Delhi, LA
Advisor: Dr. Timothy Reeves

MECHANICAL ENGINEERING

4:00 IESB 114

Screen Servicing Hoist

The Screen Servicing Hoist project seeks to modify an existing lifting system utilized at Westrock's paper plant located in Hodge, Louisiana. The lifting system consists of an overhead-mounted I-beam structure which includes two support beams and a beam/monorail that is bolted underneath the two support beams. A trolley and pulley block traverse along the bottom of the monorail. The pulley block is used to lift, remove, and service components of a fiber fractionation machine. The current lifting system requires suboptimal methods to lift and remove the screen of the fiber fractionation machine due to a lack of vertical clearance between the pulley block and the housing of the fiber fractionation machine. The final design solution increases the resting height of the monorail by cutting the support beams, welding a short and more narrow I-beam to the top of the support-beam halves, and mounting the monorail to the I-beam connecting the support-beam halves. This solution will adequately increase the vertical clearance, maintain safety, and reduce the time and effort required by maintenance personnel to service the fiber fractionation machine.

Team Name: N/A
Team Members: Corey Fyfe, Colby McGuffee, ThankGod Okosodo, John Pickering
Sponsor: Todd Pyles, Engineering Manager, WestRock Mill, Hodge, LA
Advisor: Dr. Arden Moore

1:00 IESB 122

Draw Load Measurement System

Plymouth Tube is a global specialty manufacturer of carbon alloy, nickel alloy, and stainless precision steel tubing. Plymouth uses a tube drawing process that sizes a tube by shrinking a larger diameter tube into a smaller one by drawing the tube through a die. One of the bar drawing processes uses a precision machined mandrel inside the tube while the tube is being pulled through a die. The tubing is pulled through the die, which transfers the load to the die. The die is then pressed up against the back of the housing, which keeps the system stationary. The tubes are drawn numerous times with the feed rates and the number of passes being adjusted to obtain the desired final dimensions. This method leads to many failed dies, wasted materials, increased maintenance, extensive polishing of dies, and many unknown parameters that change with respect to the orders placed. Plymouth Tube believes that if this process can be better understood, production will go up and unexpected failure rates will go down. Our project is to implement a load cell to measure the draw load forces being applied in order to provide greater insight into the tube drawing process.

Team Name: N/A
Team Members: Brett Allen, Lauren Fogg, Cyrus Hinkle, Ethan Parks
Sponsor: Chuck Murphy, Process Engineer, Plymouth Tube LLC, W. Monroe, LA
Advisor: Dr. William Long

MECHANICAL ENGINEERING

1:30 IESB 122

Print Sleeve Storage Lift

Graphic Packaging is one of the leading Fortune 500 companies. The carton converting facility in Monroe, Louisiana, mainly produces beer cartons for the following companies: Anheuser-Busch, Mark Anthony Brands International, and Miller Brewing Company. Each day the 1 million square foot carton covering facility produces and ships nearly 4.2 million cartons. Our project is to develop a print sleeve storage lift to give workers access to the upper position of the storage racks. To this end, we have designed a mobile staircase and lift that will allow workers to lift the printing sleeves to the upper rack with minimal manual effort. Like pulley systems found in elevators, a winch will drive a shaft located underneath the lifting platform. This shaft will collect wires as it rotates, lifting the platform using steel cables. Supports will be engaged underneath the platform after it has been raised to the desired height as a failsafe should the cable break. The lifting mechanism is bolted to the staircase, and the entire assembly is set on casters for mobility purposes. We expect this design to decrease loading and unloading times, as well as greatly mitigate ergonomic safety concerns associated with loading and unloading printing sleeves.

Team Name: N/A
Team Members: Matthew Given, Myles Landry, Vedie Lavan, Seth McCoy
Sponsor: Jonathan Fortenberry, Engineering/Maintenance Manager, Graphic Packaging International, Monroe, LA
Advisor: Dr. Ethan Hilton

2:30 IESB 122

Predictive Maintenance for Conveyor Reliability

Lamb Weston, a sweet potato fry processing facility, currently runs about 7500 ft. in conveyor belts. These conveyors can break down at any moment with the main culprit being the conveyor bearings. One hour of unscheduled downtime can cost the facility up to $10,000. Factory downtime can be mitigated through the implementation of our predictive maintenance software built to predict component failures. By accurately forecasting the life of a part, specifically conveyor belt bearings, optimized maintenance schedules can be developed. This predictive maintenance system minimizes unscheduled facility downtimes due to bearing failures and limits unnecessary or early replacement of bearings. Actively monitoring bearing vibration and temperature provides readings that allows our system to establish failure limits and a confidence interval of when this failure will occur. This system has the potential to increase the Lamb Weston facility's reliability and ultimately increase the production of sweet potato fries.

Team Name: N/A
Team Members: Austin Ballow, Nathanael Cook, Mark Lowe, Logan Thames
Sponsor: Randall Veasey, Senior Mechanical Engineer, Lamb Weston Corp. Delhi, LA
Advisor: Dr. Jinyuan Chen

MECHANICAL ENGINEERING

3:00 IESB 122

Automated Wire Assembly Jig

Dis-Tran Packaged Substations, located in Alexandria, Louisiana, needs a faster method to train their jumper wires. This process includes aligning the ends of the wires to precise points along a large, steel frame and welding these ends to aluminum pads acting as terminals. Rather than measuring and setting up the wires by hand as performed in the current method, which takes about 15 minutes, our team has proposed an alternative design that can align the wires to within 1/16th of an inch all at the push of the button. The Automated Wire Assembly Jig utilizes a stepper motor and rack and pinion combination to deliver a swift, less tedious, and more accurate procedure of wire training. A spur pinion attached to the end of the stepper motor allows for precise steps to be made along racks attached to each dimension of the jig. As the stepper motors are responsible for holding the wires' ends during the welding process, these motors are powerful; they feature a holding force of 125 lbf to prevent the wires from moving out of place and are capable of traveling 12 feet in less than 1 minute!

Team Name: N/A
Team Members: Nick Alphonso, John Barham, Andrew Biggers, Colin Reilly
Sponsor: Ross Babineaux, Engineering Manager, Dis-Tran Packaged Substations, Pineville, LA
Advisor: Dr. Louis Reis

3:30 IESB 122

Active Snack Packaging: A Hands-Free Solution

All across the country, people can be seen fishing every weekend. Fishing can be an all-day event that requires bringing snacks onto the boat. However, fishermen can find their hands covered in dirty water, grime from fish and bait, and other filth. The sponsor of this team has faced this problem often. His only solution has been to wipe his hands off on his pants and hope for the best. He came to the team with the goal of designing a container that would be easy to open, and also keep the dirty hands away from the food and opening. The other goals were to have the package be easily mass produced and have a tight packing factor for easy storage.

Team Name: N/A
Team Members: Kerry Dangerfield, Matthew Marton, David McCauley, Jackson Picard
Sponsor: Wes Higgens, CEO, Roseaux LLC, Alexandria, LA
Advisor: Dr. Andrew Peters

MULTIDISCIPLINARY ENGINEERING

1:00 IESB 126

Ethics Prosthetics

We are Ethics Prosthetics, and we are competing in the growing prosthetic and orthopedic market which, last year was a $5.9 billion value market. Our software and hardware for lower limb prosthetic devices are capable of learning individual walking patterns and grow with their recipient as well as provide sensory feedback to the user upon each step. Through the use of artificial intelligence and statistical analysis, we will be able to teach the prosthetic how mirror their recipients' organic counterpart through gait learning allowing for more natural movements. By also using vibration motors and pressure sensors, our prosthetics can also provide sensory feedback to the wearers as they take each step. Currently, we have a configuration design, and we are looking for potential funders to help us acquire the resources necessary to disrupt the prosthetic and orthotic market with our newly designed prosthetic software and hardware.

Team Name: Ethics Prosthetics
Team Members: Logan McCarthy, Denman McGinnis, Madalynn Warner
Sponsor: N/A
Advisor: Mr. Ryan Botts, Dr. Kelly Crittenden, Mrs. Debbie Inman

1:30 IESB 126

Peryton Drone

This drone is designed for police and military use. It has the ability to both fly and drive on the ground.

Team Name: S & K Innovative Technologies
Team Members: Daniel Kumler, Cade Spikes
Sponsor: N/A
Advisors: Dr. Robert Sweitzer

1:00 IESB 308

In-Situ Laser Annealing of Fused Deposition Modeled Parts

Fused deposition modeling (FDM) is a method of additive manufacturing which is commercialized for fabricating prototypes and parts using plastic filaments. However, a main issue with FDM printed parts is that the parts are unable to effectively replicate the strength of traditionally manufactured materials. The project investigates a system that allows *in-situ* laser annealing of 3D printed parts and whether this system will increase the interlayer bonding of a FDM part. The hypothesis is that heating up the previous printed layer with laser light as the next layer is being extruded, the two layers will anneal more cohesively, and, thus, increase the interlayer bond and strengthen the part. This investigation of the pre-annealing stage is led by design and creation of differing specimen samples with and without the use of a laser annealing attachment on an Ender 5 3D printer, use of tensile mechanical testing method, and optical microscopy of the interlayer bond angles. Mechanical testing methods are used to measure the interlayer bond strength and confirm if the design will be useful for increasing the tensile strength of an FDM part. Samples are also examined with an optical microscope to provide further confirmation of the increased interlayer bonding.

Team Name: NSE Senior Design Team 2021
Team Members: Chandler Goings, Brandon Hubbs, Mariana Neeley, Jazmine Wheat
Sponsor: Louisiana Space Grant Consortium (LaSPACE), NASA Established Program to Stimulate Competitive Research (EPSCoR) (solicitation NNH20ZEA001N-URSC)
Advisor: Dr. Adarsh Radadia

1:30 IESB 308

Investigation of Lanthanide Coordination Complexes as Scintillating Materials in Organic Polymers

Scintillating plastics are an inexpensive means of detecting a variety of ionizing radiation (X-rays, gamma rays, neutrons) from low- to high-flux environments. Most scintillating materials are either classified as inorganic (CsI, NaI) or organic scintillating agents (anthracene, naphthalene). The brightness of these scintillating materials greatly affects the performance and sensitivity of the detector. A series of scintillating plastics were fabricated utilizing lanthanide coordination compounds embedded in matrices of either polystyrene or polymethylmethacrylate. The optical properties of these lanthanide coordination complexes will be presented in various organic solvents. Preparation of the organometallic complex containing scintillating plastics proved difficult on account of the temperatures and oxygen-free environment needed for the optimal thermosetting of these materials. Screening of conditions led to the discovery that many of these organometallic-based scintillating materials degraded in solution and at temperatures exceeding 120 °C. Comparison of conditions including temperature, duration of heating type and concentration of radical initiator for preparing polystyrene and PMMA plastics will be presented as will discussions of quality of polymer formed.

Team Name: Fatila Group
Team Member: Lewis Johnson
Sponsor: LaSpace Grant LEQSF (2015-2018) NNX15AH82H
Advisor: Dr. Elisabeth Fatila

1:45 IESB 308

Benchmarking Elastic Mott and Møller Scattering for P2 Experiment

The goal of our project is to compare theoretical scattering rates and simulated rates from electron-electron (Møller) and electron-proton elastic scattering. The results from the project will be used for benchmark studies of the electron polarimeter that has been proposed for the P2 experiment at the Mainz [Dominik Becker et al. (2018), The P2 experiment, Eur. Phys. J. A (2018) 54: 208, DOI 10.1140/epja/i2018-12611-6]. The P2 experiment's goal is to produce an accurate measurement of weak mixing angle. The weak mixing angle is a parameter used in the standard model parameter. The electron-electron scattering has parity-violating asymmetry. From this, the weak mixing angle can be extracted by measuring the left and right helicity electron-electron scattering. Using an electron polarimeter, the left-right helicity of the electron beam can be determined by the polarization measurements of the beam.

Team Name: N/A
Team Member: Daylen J. Griffin
Sponsor: N/A
Advisor: Dr. Rakitha Beminiwattha

2:00 IESB 308

Data Acquisition System for Particle Physics Experiments

A data acquisition system is a multi-system, modular device that captures data from sensors. As a modular system, a data acquisition system is configurable and expandable to suit experimental design. The group's data acquisition system is designed to capture data from an analog signal generated by a cosmic ray impacting a scintillator. A change of energy state within the scintillator material generates a photon, and a photomultiplier tube connected to the scintillator generates a current. The photomultiplier tube uses this current signal to produce an amplified voltage signal. An analog to digital converter translates the signal to discrete data. The data is recorded in real-time via network connection to a lab computer. The data acquisition system has a single 8-channel analog to digital converter capable of external, internal or software triggering. The system produces high-resolution data with a 12-bit digitizer with a sampling rate of 250 MS/s. The system is highly configurable with programmable event size and pre/post trigger. The system will provide a tool for Louisiana Tech to expand its experimental capabilities in the future by offering accessible, high-quality data that can be customized to the user.

Team Name: DAQula
Team Member: Mitchell Adams, Scott Hotard
Sponsor: Dr. Rakitha Beminiwattha
Advisor: Dr. Matthew Hartmann, Dr. Prashanna Bhattarai

2:15 IESB 308

Peltier Coolers as Thermionic Generators in Regenerative Energy Applications

The use of Peltier coolers (thermoelectric coolers--TECs) are implemented within a computer case (among other experimental setups) in order to generate useable current for charging appliances from existing heat differentials rather than creating heat gradients by dispensing current as is typically seen from these coolers. The optimizing factors and drawbacks are investigated experimentally and mathematically in order to lay groundwork for future personal user applications of Peltier coolers in this generative way.

Team Name: N/A
Team Member: Seth Quigley
Sponsor: N/A
Advisor: Dr. Arden Moore

2:30 IESB 308

Nonlinear and Chaotic Signal Application

The purpose of this project is to use a generated chaotic signal to mask and encrypt a true signal. Thus, the signal appears to be static. Then, by using math techniques, the receiver can be synchronized to the chaotic signal, and, finally, subtracted off leaving the true original signal.

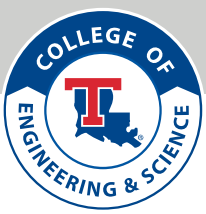
Team Name: Jared Marcantel
Team Member: Jared Marcantel
Sponsor: N/A
Advisor: Dr. Lee Sawyer

2:45 IESB 308

On the Solutions of Nonlinear Schrödinger Equation using Neural Network

The Nonlinear Schrödinger Equation, or NSE, can be used to model the movement of particles, solutions of which can be utilized in numerous fields. By separating the imaginary and real components of the NSE, we can use time- and space-fractional operators to solve the NSE. In this paper, we show a model soliton packet moving through free space and moving through a potential barrier step. By training the solution model on an artificial neural network, we can accurately plot the solutions of the NSE and predict how the soliton packet will travel.

Team Name: N/A
Team Member: Jacob Boyt
Sponsor: N/A
Advisor: Dr. Weizhong Dai



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