Team 1091 – Photopolymer Leads

Sponsor - Abbott

Project Title: Photopolymer Fabrication Methods for Custom Medical Catheters, Shafts and Assemblies

Team Members: Maryam Mohammad (ETL), Ruth Bennett, Gregory Cain, Xenia Knudsen, Michelle Lazaro, Nicholas Redden

<u>Project Abstract</u>

Neuromodulation is a method of reducing chronic pain through electrical stimulation of spinal cord neurons. For stimulation, a lead with electrically-isolated electrodes on each end is used to send electrical pulses from a generator. The section of the lead between the electrodes is a tube called the lead body. Our team was tasked with the design and fabrication of a photopolymer processing system for producing these lead bodies. A machine that implements a dip coating process using the thiol-acrylate photopolymer on a dissolving filament to create a uniform tube of varying controlled lengths and thicknesses was designed. To achieve this, the filament is placed in tension in the photopolymer tank via a linear actuator and run through the tank at a constant rate via a drive pulley. The coated filament is then cured using UV light. The filament is dissolved in water to leave behind the desired tubular lead body.

Team 1092 – Sensorium Link

Sponsor - Abbott

Project Title: Micro Connection Method Between Multi-Channel 1mm Diameter Stimulation Leads

Team Members: Emma Henderson (ETL), Aarti Kapoor, Amit Sahoo, Saigautam Sirivella, Nathaniel Tjahjono, Ashutosh Tripathy

Project Abstract

Deep brain stimulation (DBS), using multi-channel leads to deliver electrical pulses to neurons in the brain, is a form of neuromodulation used for treating a variety of movement disorders such as Parkinson's disease. In some patients, extension leads are used with the therapy leads to enable optimal placement of the pulse generator. The purpose of this project is to create a compact connector for connecting these leads together. During use, one lead is inserted into each end of the connector with the electrodes of each lead being electrically connected through custom, ring-shaped springs that are opened by compressing them (i.e., by compressing the sides of the connector). In this work, a prototype connector was designed, fabricated, and tested. A finite element analysis model was created based on the test results and showed the connector to be scalable, up to 99.2% overall smaller volume.

Team 1093 – FootPrint

Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of a 3D Printed Midsole

Team Members: Austin Williams (ETL), Mustafa Eyad, Sarah Heady, Victor Herrera, Allison Ramsey, Minh-Phong Tran

Project Abstract

Additive manufacturing can dramatically reduce the time-to-market and simplify the manufacturing process for new shoe designs. Our team seeks to use Adaptive3D Technologies' Elastic Tough-Rubber 90 (ETR-90) and design-driven lattice structures to replace the traditional EVA foam midsole in a Salomon 4D 3 GTX hiking boot. This printed midsole improves upon the EVA original by reducing its weight and using a human foot pressure map to drive the lattice structures throughout. Furthermore, the designed midsole workflow allows for high customizability depending on the wearer's orthotic needs. The new midsole was printed using Digital Light Processing (DLP) 3D printing, verified through simulation for comfort and strength, and tested for impact attenuation and fatigue resilience.

Team 1094 – 3D Swabs

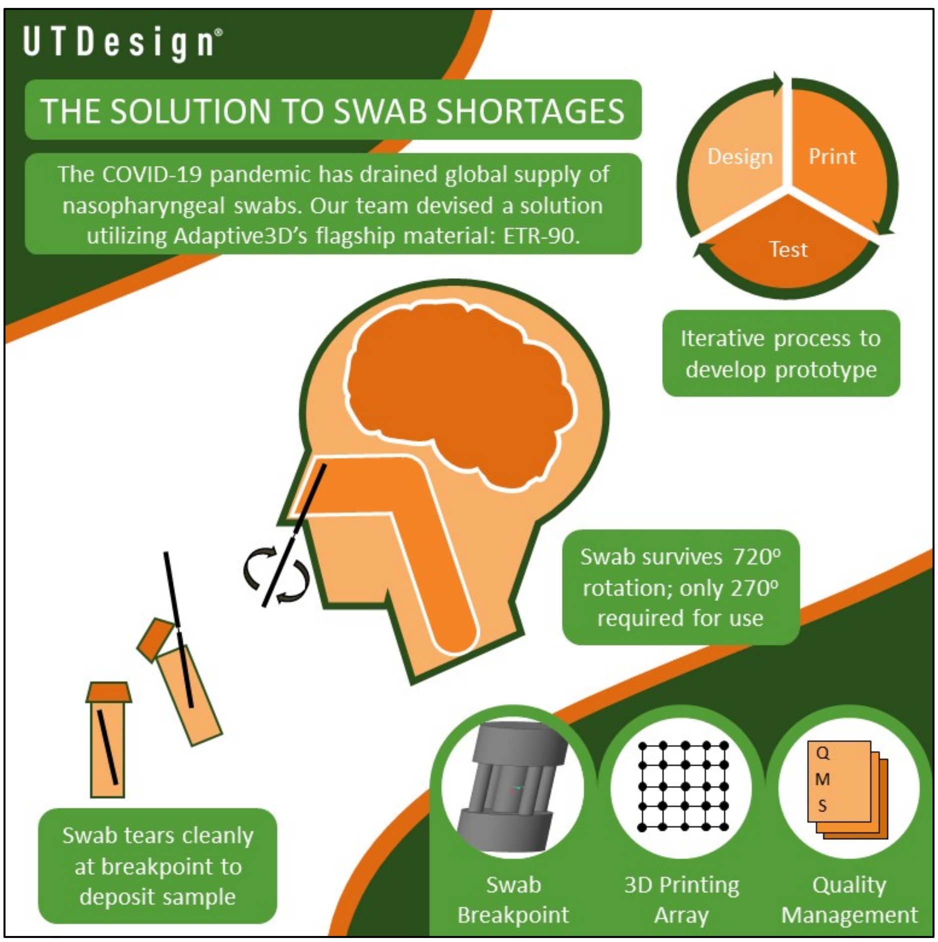
Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of 3D Printed Nasopharyngeal Swabs

Team Members: Trevor Schmaeling (ETL), Jacob Feret, Rohclem Lim, Darrah Merillat, Ethan Nichols, Andrew Riding

Project Abstract

During the COVID-19 pandemic, global supplies of nasopharyngeal swabs were drained due to massive testing efforts. Additive-manufacturing can address these shortages through mass production; however, currently marketed stiff plastics have caused extreme discomfort for patients. Adaptive 3D has emerged with a solution: utilizing their ETR-90's extreme flexibility to design a swab that makes the testing experience more patient friendly. Although, the strength of ETR-90 poses a unique challenge at an integral step in testing: depositing collected samples in vials. Without an integrated weak point, the combination of extremely high material strength and elevated elasticity prevents easy deposition of the swab head. Our team has developed a breakpoint to address this challenge. Our device's breakpoint offers self-restriction during rotation, while being susceptible to tearing that depositing the sample head requires. This device can address shortages through mass production and maintain functionality of industry standards, all while increasing the comfort of patients.



Team 1095 – UT3D Solutions

Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of 3D Printed Vacuum Machine Parts

Team Members: Greyson Long (ETL), Merek Byckovski, Jackson Huckaby, Thang Mang, Nga Mar, Donnovan Smith

Project Abstract

When using a shop-vac, a user often needs to switch between different sized nozzles. Additionally, there may be times when a user does not wish to intake certain items, such as nuts and bolts. We have developed a prototype of a multi-functional vacuum hose attachment. By using a flexible material, our attachment can change between two nozzle sizes, allowing for use in a variety of situations. The variable nozzle size reduces the need to switch between multiple nozzle attachments. Our hose attachment also includes a removable filtration screen that prevents larger objects from passing into the vacuum bucket. Made of a durable and flexible material, our attachment can withstand rigorous use on a construction site, in a machine shop, or anywhere else you might be using a shop-vac. Our innovative vacuum hose attachment aims to improve efficiency in workshop and industrial environments.

Team 1096 – TopZ

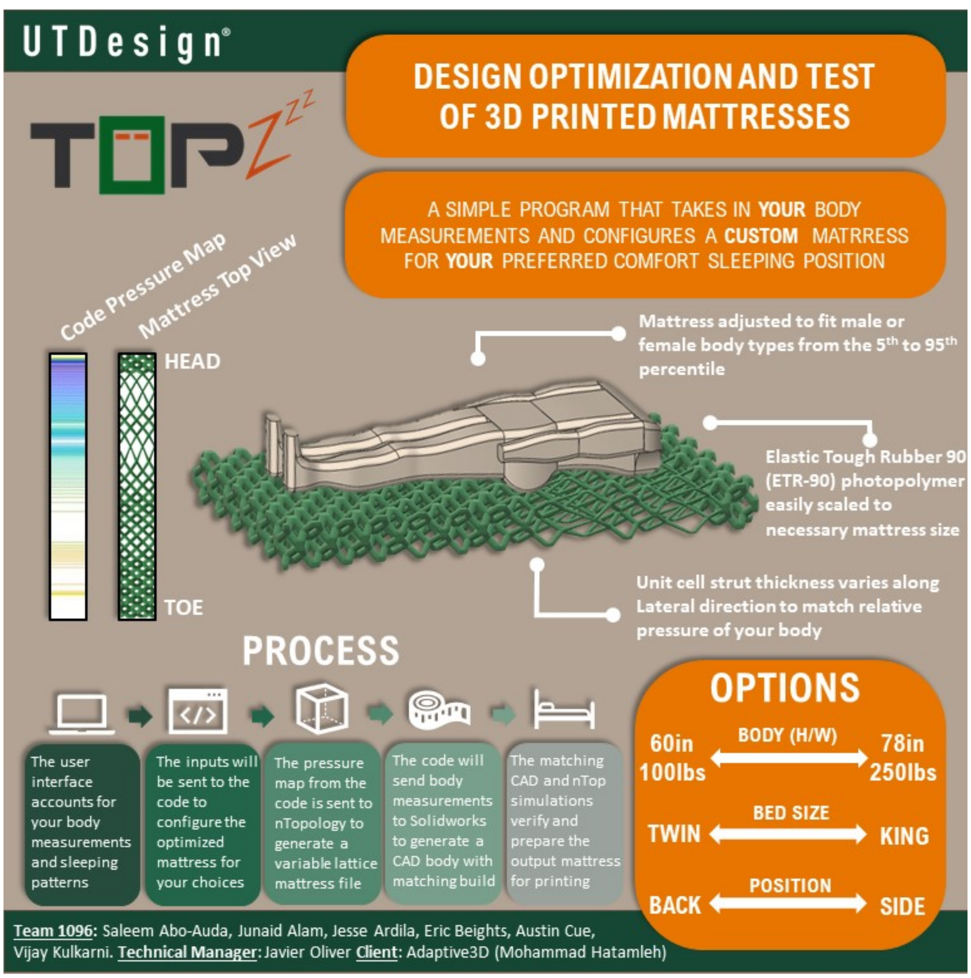
Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of 3D Printed Mattresses

Team Members: Vijay Kulkarni (ETL), Junaid Alam, Jesse Ardila, Saleem Abo-Auda, Eric Beights, Austin Cue

<u>Project Abstract</u>

The purpose of our project is to provide comfort and improve posture for higher quality sleep and long-term health benefits. We are capitalizing on the revolution of programmable materials by creating a variable stiffness mattress to conform to the customer's body dimensions and optimal spinal alignment. By using lattice structures with a 3D printable elastic rubber developed by Adaptive 3D Technologies, Elastic Tough Rubber 90, we will be able to deliver a customized experience for each customer. We can vary pressure response with the lattice type, unit cell size, and strut or wall thickness. We have created a program that, from experimental data collected, will generate the optimal lattice structure for each individual customer. Users simply put in their height, weight, and preferred sleeping position and a custom mattress is ready for print.



Team 1097 – Vulcan

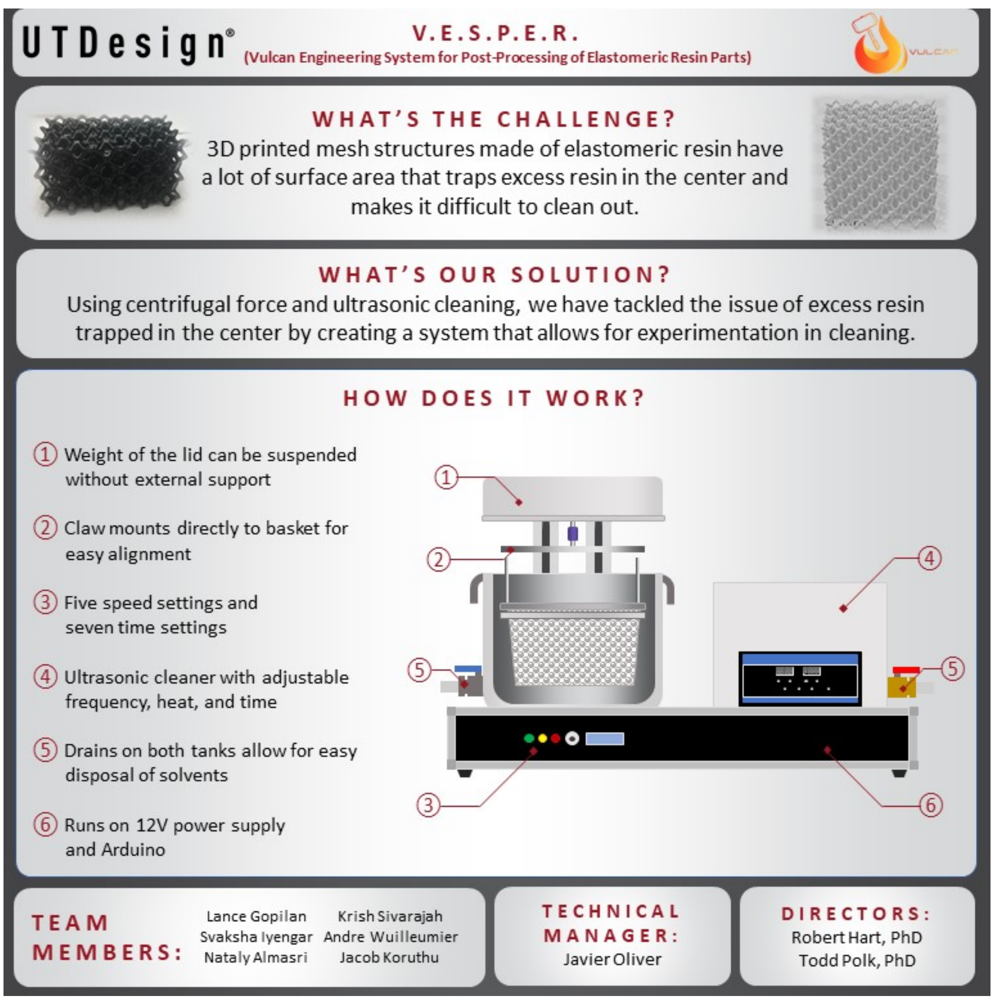
Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of Post Processing Unit for 3D Printed Elastomeric Lattice Structures

Team Members: Lance Gopilan (ETL), Nataly Almasri, Svaksha Iyengar, Benjamin Koruthu, Sivakrish Sivarajah, Michel-Andre Wuilleumier

Project Abstract

Adaptive3D Technologies prints 3D mesh structures for various applications. One of their biggest challenges is the extraction of residual liquid resin with larger print volumes and more intricate structures. The purpose of this project is to create a machine for Adaptive engineers to experiment with different agitation conditions and optimize the process of extracting residual resin from their prints. Our post processing unit offers users a wide selection of settings to experiment with. The spin cycle can be run at 5 different speeds and 7 different time settings. Users can run the spin cycle with or without a solvent, and a drain allows for easy disposal or reuse of solvent. Users can also customize an ultrasonic cleaning process with a choice of 2 different frequencies, various time settings, and whether to incorporate heat.



Team 1098 – O-Tester Innovation

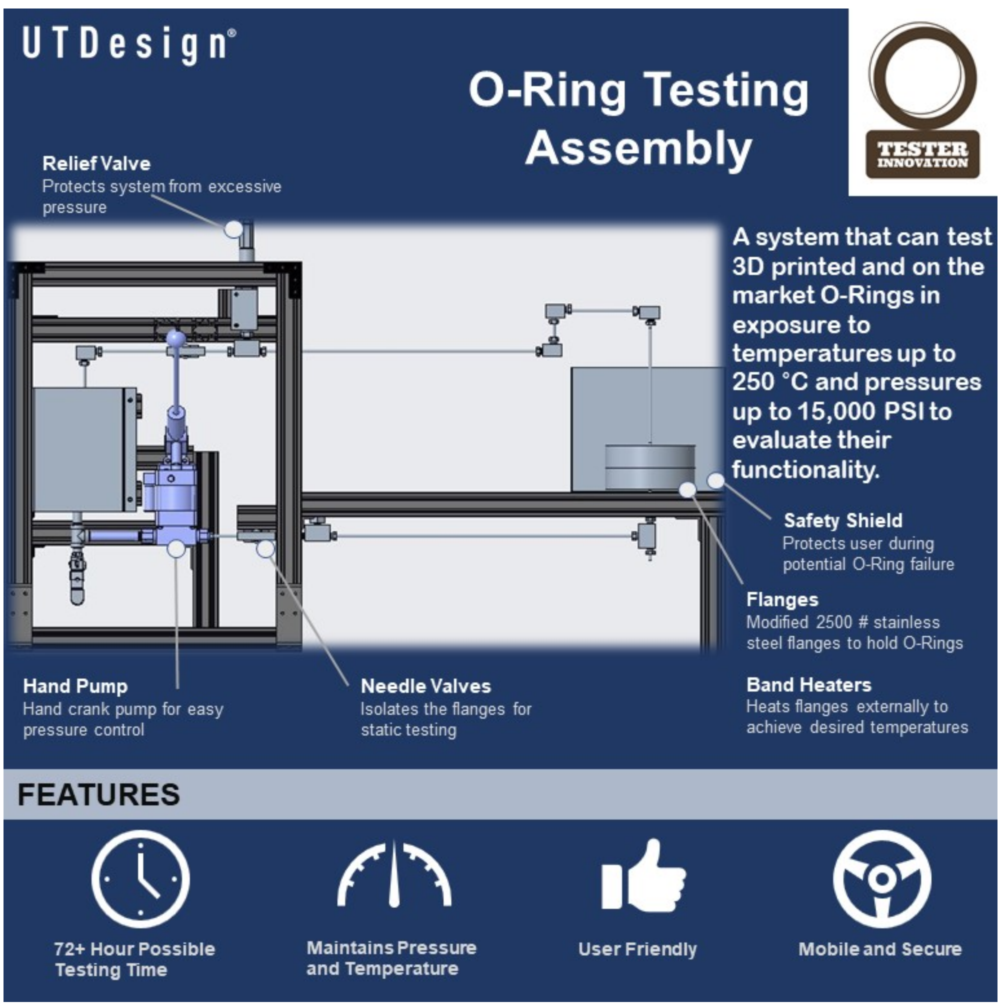
Sponsor: Adaptive3D Technologies

Project Title: Design Optimization and Test of 3D Printed Parts for Oil and Gas Applications

Team Members: Ian Hung (ETL), Sida Chen, Peter Chin, Adam Cook, Austin Mendoza, Alexander Ruehlen

<u>Project Abstract</u>

Adaptive3D has developed new 3D printable resins used in the oil and gas industries. The products created from these new resins need to be tested before they can be implemented in the field. O-Tester Innovation was tasked with creating a system that could test O-Rings with inner diameter ranges from 1” - 5.5” with 0.125” – 0.25” thickness at up to 15,000 PSI (1034.2136 Bar) at 250 °C printed by Adaptive3D. Our solution was to design a testing system that can handle the pressure and temperature and test for any leakage around the O-ring. To hold the O-Rings, we modified standard class 2500 stainless steel flanges with concentric O-Ring grooves to test two different O-Rings. The system meets the requirements of Adaptive3D but is limited by the flanges. With this limitation, the current configuration can test a 1” and 2” O-Ring at 3250 PSI (224.0796 Bar) and 250 °C.



Team 1099 – Swab Squad Automation

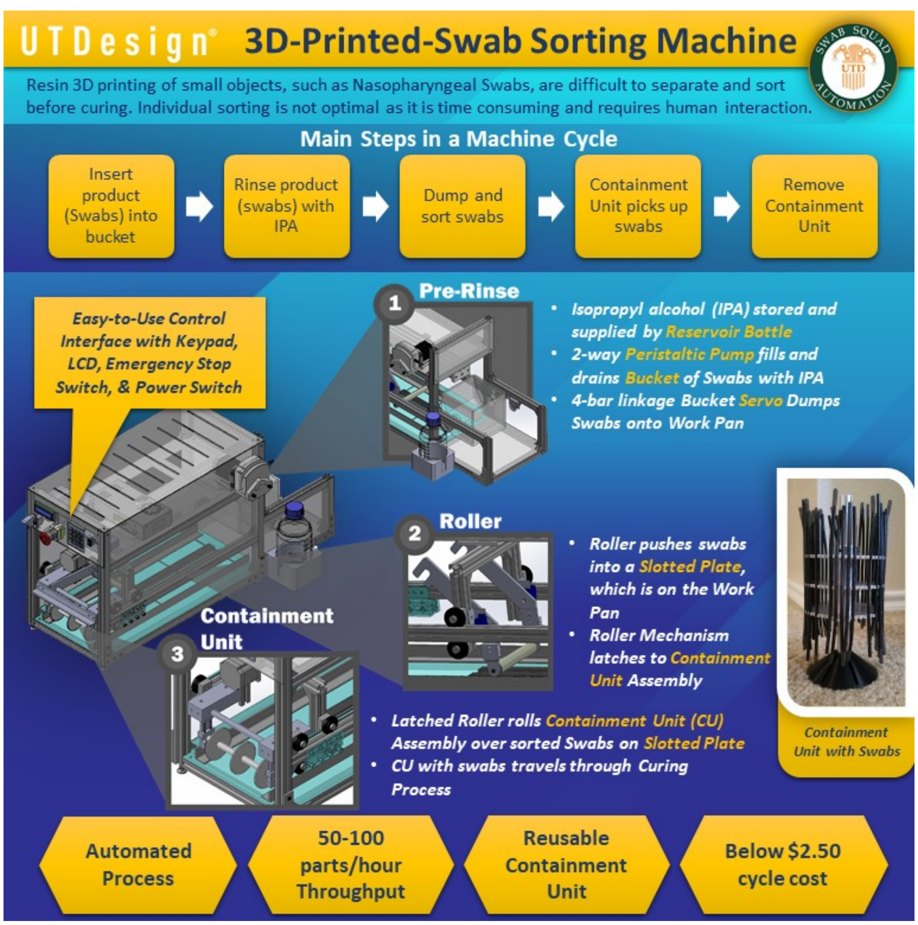
Sponsor: Adaptive3D Technologies

Project Title: Development of Manufacturing Automation for the Sorting and Assembly of Nasopharyngeal Swabs

Team Members: Trent Sakakini (ETL), Josiah Go, Tobias Hynes, Petro John, Thien Nguyen, Jayaram Rajagopalan

Project Abstract

Adaptive3D aims to develop additive manufacturing into a scalable industrial process utilizing 3D printing technologies. Additive manufacturing has revolutionized how engineers design functional parts – bringing new geometries previously not possible using traditional manufacturing processes. However, this new method of manufacturing parts requires us to reexamine how to process, package, and deliver said manufactured parts. Our team is tasked to automate a novel packaging problem for polymer additive-manufactured nasal swabs. Swabs manufactured using resin-based photolithography are covered in viscous polymer resins which presents a challenge when trying to automatically manipulate the swabs. The swabs also experience chemical and UV-post curing processes. To solve this packaging problem, this automated machine prerinses the swabs in Isopropyl Alcohol to remove the viscous resin, and then sorts and packages the swabs into a Containment Unit to go through the curing process afterwards.



Team 1100 – Team Flex

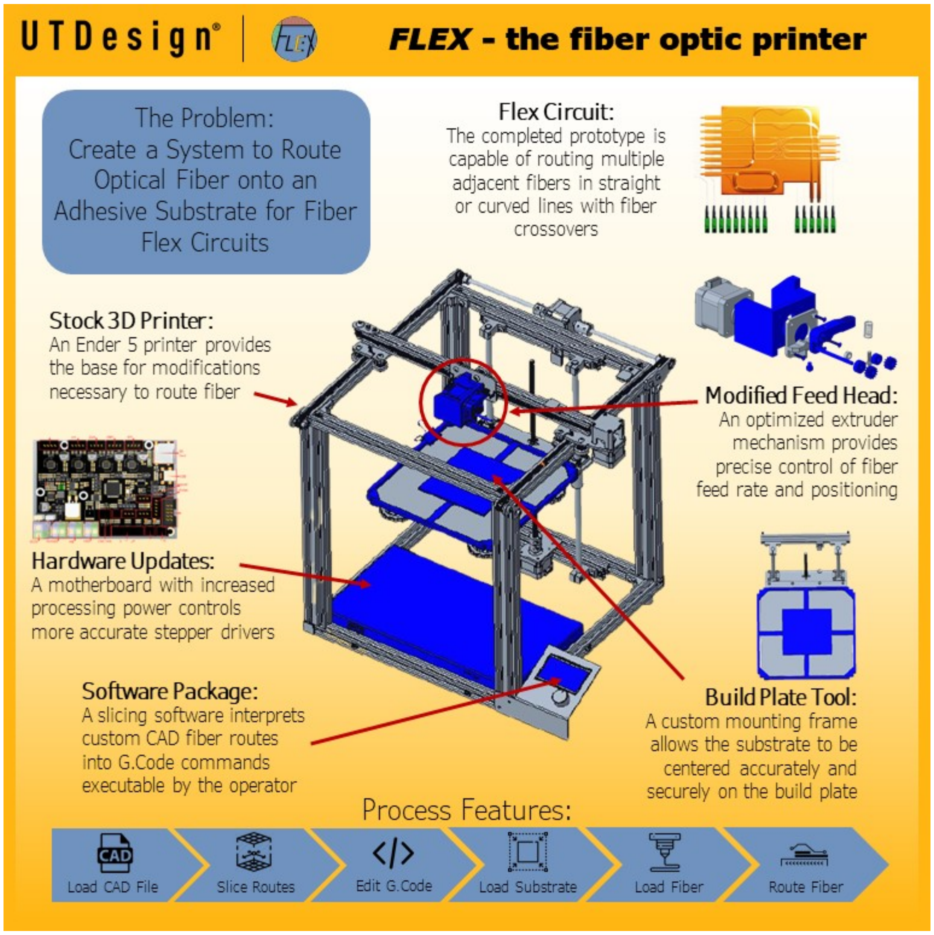
Sponsor: Amphenol Fiber Systems International

Project Title: Fiber Optic Flex Circuit

Team Members: Andon Rosato (ETL), Sara Beitelspacher, Sara Kimmich, Jarod Klavon, Gary Turner, Ateh Wangia

Project Abstract

Amphenol FSI manufactures fiber optic flex circuits for use in optical systems. Currently, the client hand lays optical fiber onto an adhesive substrate, a time-consuming and labor-intensive process. Our team was tasked with creating a semi-automated system to lay fiber onto the adhesive substrate. The team modified an existing FDM 3D printer to lay optical fiber. Key changes included increasing the movement resolution, installing a custom feed system, and integrating centering fixtures to the build plate. Altogether, the completed system came in under $700. Fiber routes are generated in a CAD software allowing any number of circuit designs. The system is capable of laying straights, curves, and cross-overs within ± 0.05mm without damaging the fiber. The solution decreases labor costs, produces repeatable and accurate lays, and is scalable, allowing the client to streamline their manufacturing process.



Team 1101 – JAADOM Engineering

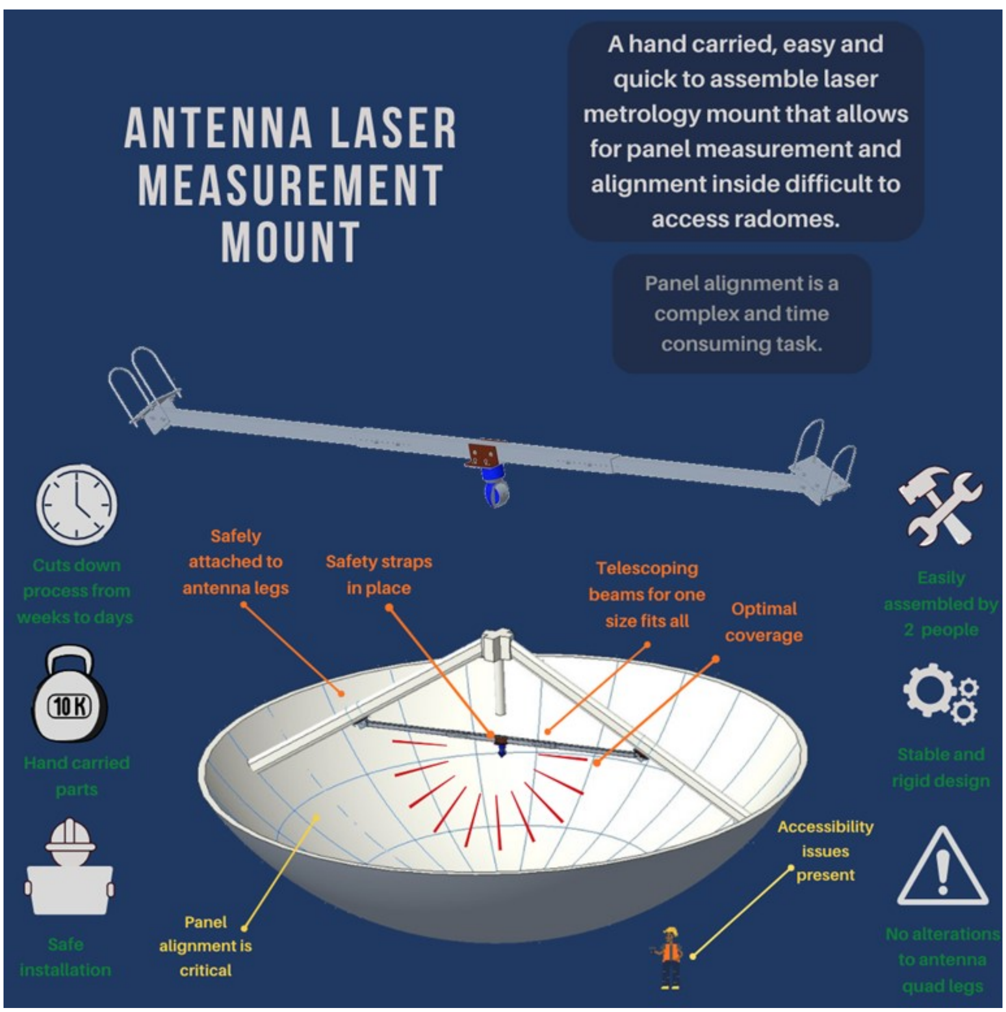
Sponsor: General Dynamics Mission Systems

Project Title: Modular Laser Tracker Mount for Antenna Subreflector

Team Members: Omar Elnomrosy (ETL), Andom Habtemariam, Amer Hamdan, Devin Harris, Mario Lopez, John Nicknish

Project Abstract

This project focuses on creating a laser metrology mount attachable to both the 16M and 22M antenna systems made by CPI to reduce the time it takes to measure the antennas reflector panels. CPI's requirements state the assembly must weigh under 300 pounds, be hand carried, assembled in under 4 hours, and will not damage the antenna system. The design uses square aluminum telescoping beams for strength, stiffness, and weight reduction. The uniquely designed custom U-bolts mount to the proprietary dimensions of CPI's 16M and 22M antenna leg profiles without damage to the antenna. Users assemble the structure in under 55 minutes. JAADOM used traditional design and analysis methods and FEA to verify the design.



Team 1102 – Galaxy Brain

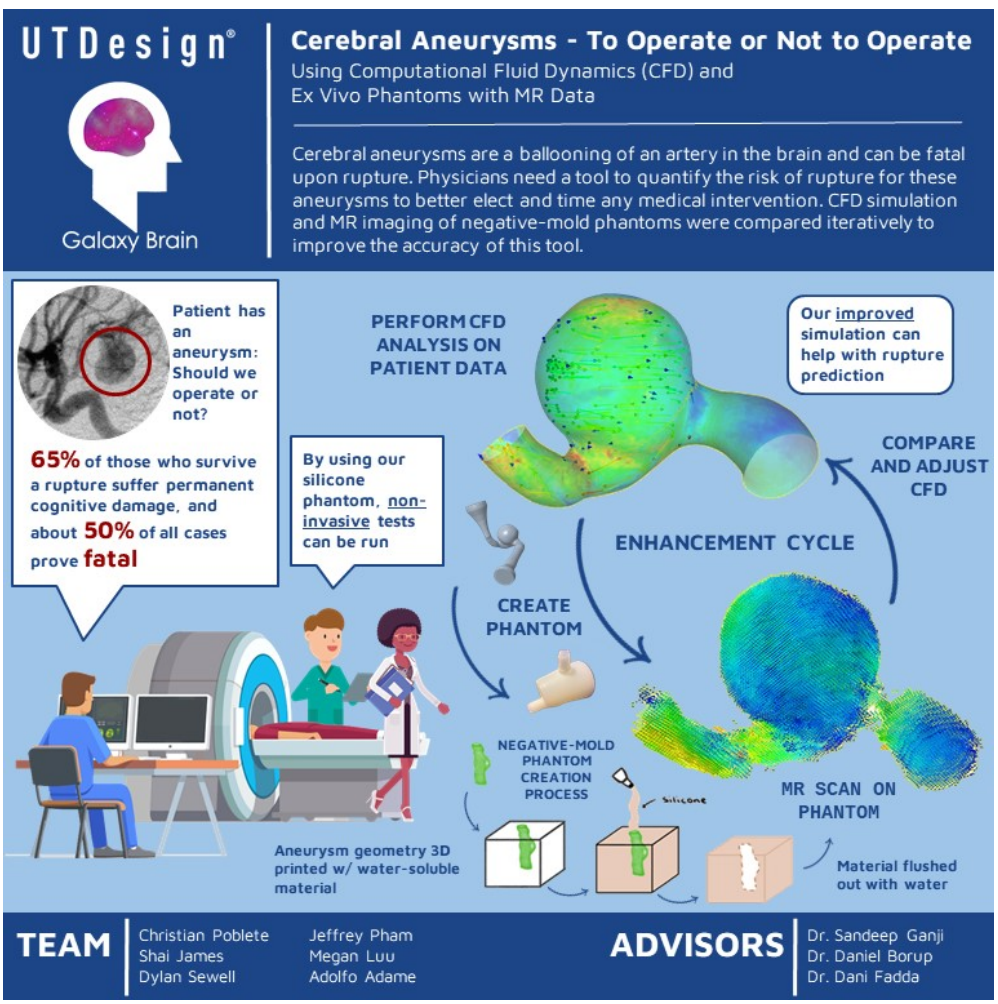
Sponsor: Global Diagnostic Imaging Solutions, LLC.

Project Title: Enhancement of Computational Fluid Dynamics (CFD) of Cerebral Aneurysms and Other Complications Using 3D Modeled Phantoms with MR Data

Team Members: Christian Poblete (ETL), Adolfo Adame, Shai James, Megan Luu, Jeffrey Pham, Dylan Sewell

Project Abstract

Cerebral aneurysms are a ballooning of an artery in the brain and can be fatal upon rupture. Physicians need a tool to quantify the risk of rupture for these aneurysms to better elect and time any medical intervention. This project provides a method that consists of performing simulated computational fluid dynamics (CFD) analysis on an aneurysm geometry, creating negative-mold phantoms using the geometry, performing MR tests with said phantoms, and comparing the results to that of the CFD. The simulated analysis model is then adjusted to better reflect the test and thus improved. This improved analysis can provide more accurate data for doctors to use without needing to test on the patient. They can then decide whether to operate on the patient or not, which can save the person's life or avoid an intrusive procedure.



Team 1104 – RVRS

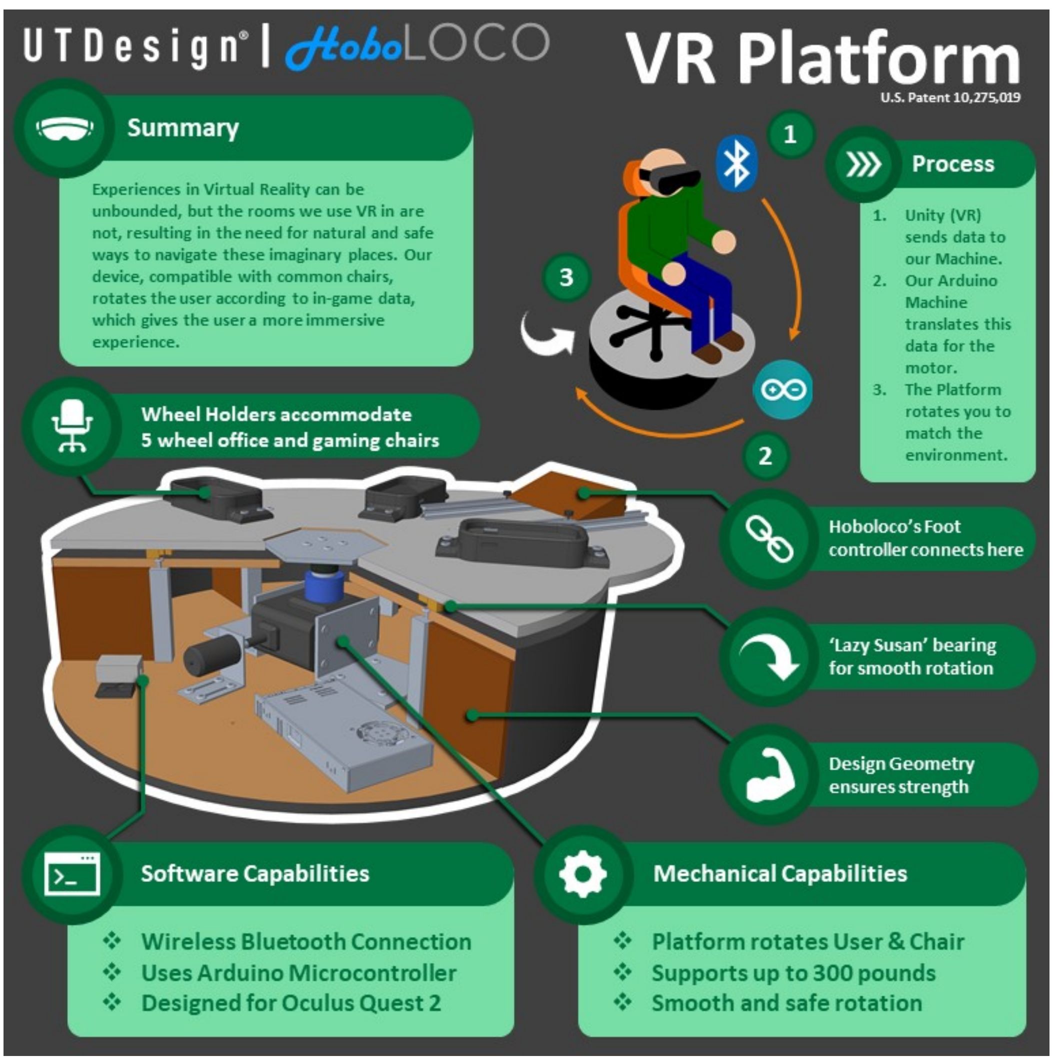
Sponsor: HoboLoco Inc

Project Title: Rotating Virtual Reality Controller Chair

Team Members: Martin-Frederic David (ETL), Jeremiah De Luna, Chanhee Jeong, Anastasia Mayangsari, Himanshu Patil, Duong Phan

<u>Project Abstract</u>

When experiencing virtual reality (VR), the user's immersion is often interrupted. This occurs when a change of location is desired, as VR devices only showcase a change in point of view (POV) from the headset. Additionally, immersion is important when considering VR sickness – the user's visual and vestibular sense should ideally match. In order to increase the immersion of VR, our team has designed a rotating platform which enables the user to be seated and rotated with user input. This rotating platform is capable of continuous motion in either direction and supports a user weight of up to 300 pounds. Additionally, this motion is decoupled from the user's POV, which is more realistic and immersive. This platform also utilizes Bluetooth connection between Unity and Arduino, which removes any extra wires that may pose a safety risk.



Team 1105 – LocoMotion

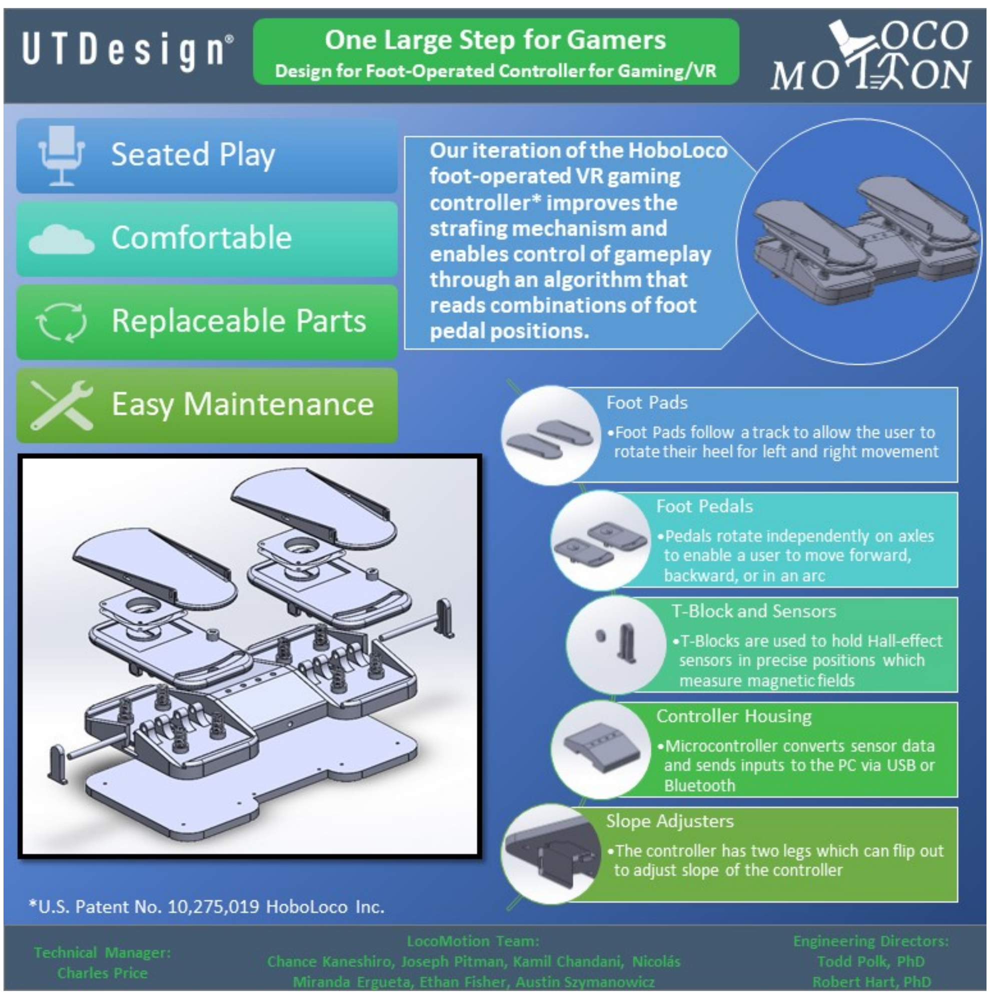
Sponsor: HoboLoco Inc

Project Title: Optimize Design of Foot-Operated Controller for Gamers

Team Members: Ethan Fisher (ETL), Kamil Chandani, Chance Kaneshiro, Nicolas Miranda Ergueta, Joseph Pitman, Austin Szymanowicz

<u>Project Abstract</u>

With the rapid growth of online gaming, users are constantly searching for equipment that will help them improve accessibility while playing. The purpose of this project, sponsored by HoboLoco, Inc., is to iterate on an existing foot-operated gaming controller by improving the strafing mechanism as well as reducing its fabrication footprint. The HoboLoco Foot-Operated Controller (US Patent No. 10,275,019) utilizes the mechanics of the feet to perform in-game commands, using the heel and toes for forward and backward movement, as well as the rotation of the heel for side-to-side movement. With the use of Linear Hall-Effect sensors, Neodymium magnets, and Lazy Susan turntables, users can confidently use the controller to augment their gaming experience.



Team 1106 – reFLOWT

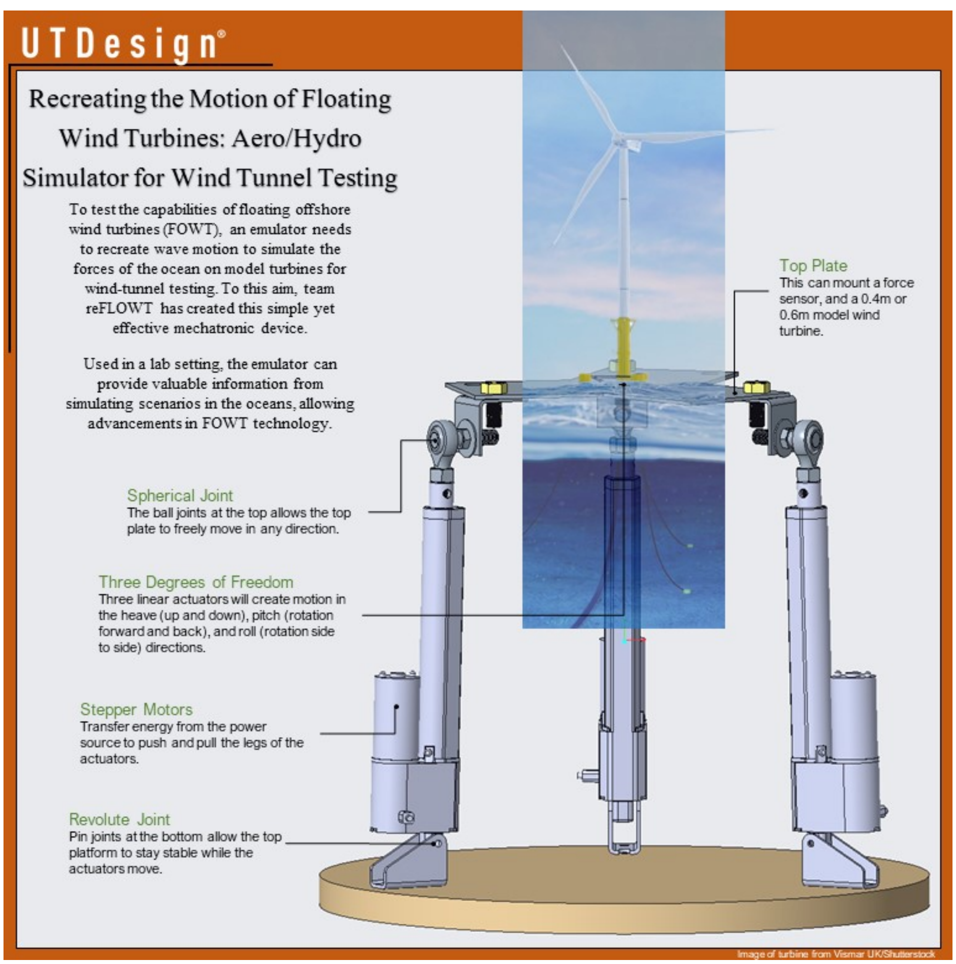
Sponsor: The University of Texas at Dallas

Project Title: FOWT Emulator for Wind Tunnel Testing

Team Members: Coleman Moss (ETL), Aakaar Jaiswal, Aadi Kothari, Duon Nguyen, Yash Rupawat, Reina Woolridge

Project Abstract

Transition to renewable energy is vital for a sustainable energy future. Wind energy remains an essential component of this pursuit. Wind speeds over oceans are generally faster and steadier than those over land, making them ideal for sustained high-power generation. Floating Offshore Wind Turbines (FOWTs) are used to harness this power. To better understand the effects aerodynamic and hydrodynamic forces on these floating machines, the reFLOWT team developed a robotic emulator platform that can simulate ocean conditions in a laboratory setting. The emulator reproduces wave loading on a scaled-down, model DTU 10MW FOWT. The platform is a three revolute-prismatic-spherical parallel manipulator capable of producing motion in three degrees of freedom, roll, pitch, and heave, while following the motion of a computer simulated FOWT. Intended to be used in the UTD BLAST wind tunnel, the machine is compact and mobile and will enable research into wake development and power generation.



Team 1107 – Icarus Solutions

Sponsor: Lockheed Martin Missiles and Fire Control

Project Title: Low Cost and Portable Anti-Drone System

Team Members: Caleb Ho (ETL), Alvin Chew, Eric Deng, Harrison Phillips, Christopher Simpson, Sookit Srivathanakul

Project Abstract

The Low-Cost and Portable Anti-Drone System's purpose is to disable commercially available quadcopter drones for military or security uses. Our solution is a 3D-printed compressed air launcher designed to fire custom projectiles meant to entangle drones. The launcher consists of commercial off-the-shelf components as well as custom components that are entirely 3D-printed. The projectile is 3D-printed as well, and is comprised of a central body and four detaching pieces connected via high strength fishing line. Upon firing the projectile, the detaching pieces deploy outwards, and the connecting string is able to foul any drone propellers it comes in contact with. As a result, the end product is a low cost and easily manufacturable launcher capable of rapidly deploying against targets at ranges of 100 feet by 100 feet. With multiple five-shot detachable box magazines and quick reloading, the system is able to repeatedly engage and disable enemy drones.

Team 1108 – UTDefense

Sponsor: Lockheed Martin Missiles and Fire Control

Project Title: Low Cost and Portable Anti-Drone System

Team Members: Clayton Shelton (ETL), Albert Li, Ian Milne, Sung Jun Moon, Ashley Perumbilly, Derek Purcella

Project Abstract

Drone technology is quickly advancing, and quadcopter-type drones are more widely available to consumers, this has led to an increase in harassment and unsafe drone practices. Meanwhile, current anti-drone solutions suffer from practicality and affordability issues. The purpose of this project is to develop an anti-drone device that can efficiently remove drones from a protected airspace, while being both highly portable and maintaining a low cost. The UTDefense system is a carbon fiber cage that surrounds a user-controlled drone. The system can be modified to attach to a variety of drones by swapping the 3D printed connecting interface and scaling the cage dimensions. The fully encompassed and protected user drone flies into the air and engages the "hostile" drone, removing it from the sky through impact force. This system is significantly more economical than existing solutions and is extremely portable weighing less than 1lb and taking up 6 ft3 of space.

Team 1109 – Takedown

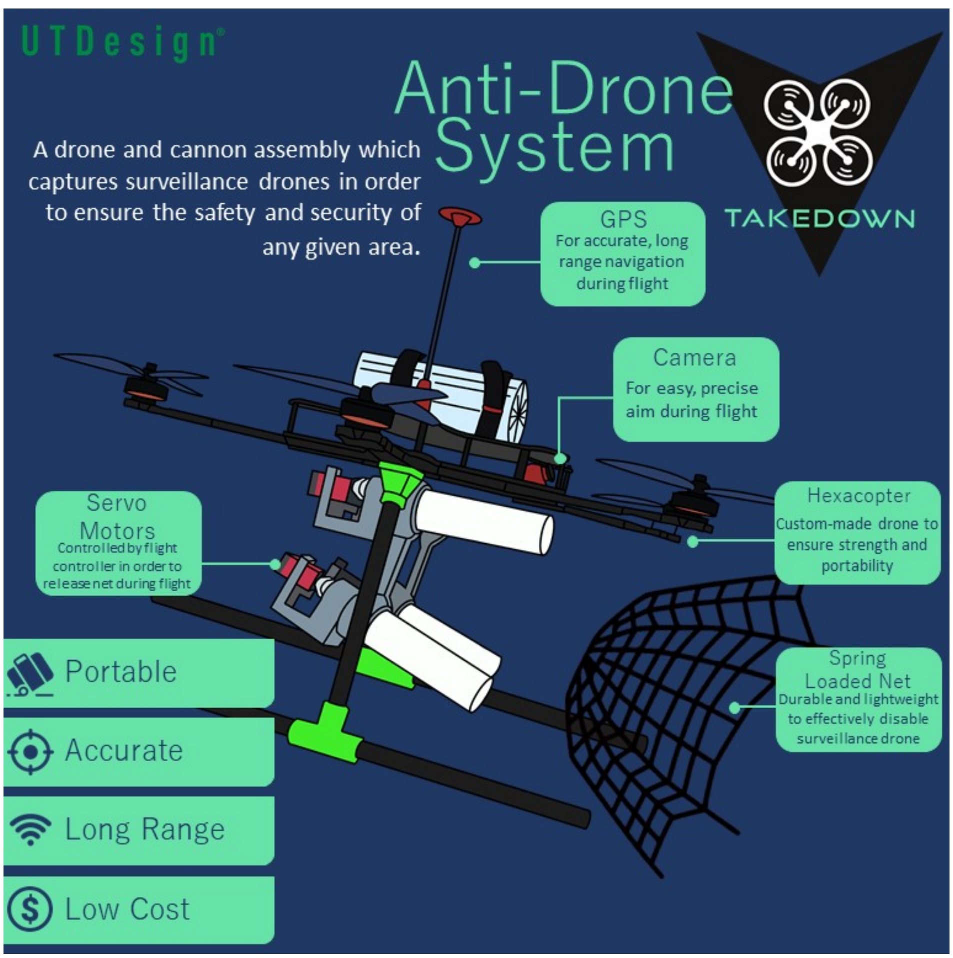
Sponsor: Lockheed Martin Missiles and Fire Control

Project Title: Low Cost and Portable Anti-Drone System

Team Members: Elizabeth Pham (ETL), Daniel Cepeda, Kristen Fitzgerald, Justin Pool, Sarah Tempelmeyer, Lillian Turner

Project Abstract

Partnering with Lockheed Martin, Team Takedown's objective is to design, fabricate and test a low-cost, portable anti-drone system to protect important areas by disabling unauthorized quadcopters. Concluding with a final system demonstration competition against other UTDesign teams, Team Takedown utilized spring-loaded net cannons which can be aimed and launched at drone threats. The team integrated the cannon onto a customized drone which includes a carbon fiber frame, remote controlled navigation, net cannon launcher, and six motors producing a combined 31.2 lbs of thrust. The system meets all compliance requirements at 68% of the budget provided to the team by effectively disabling a maneuvering target drone within four minutes of initial detection, at a horizontal and vertical range of 100 feet from ground station, operated by two persons, and at a lower cost than existing systems. The system includes a carrying case with a battery recharger and custom projectile reloading equipment.



Team 1110 – SpectraFlow

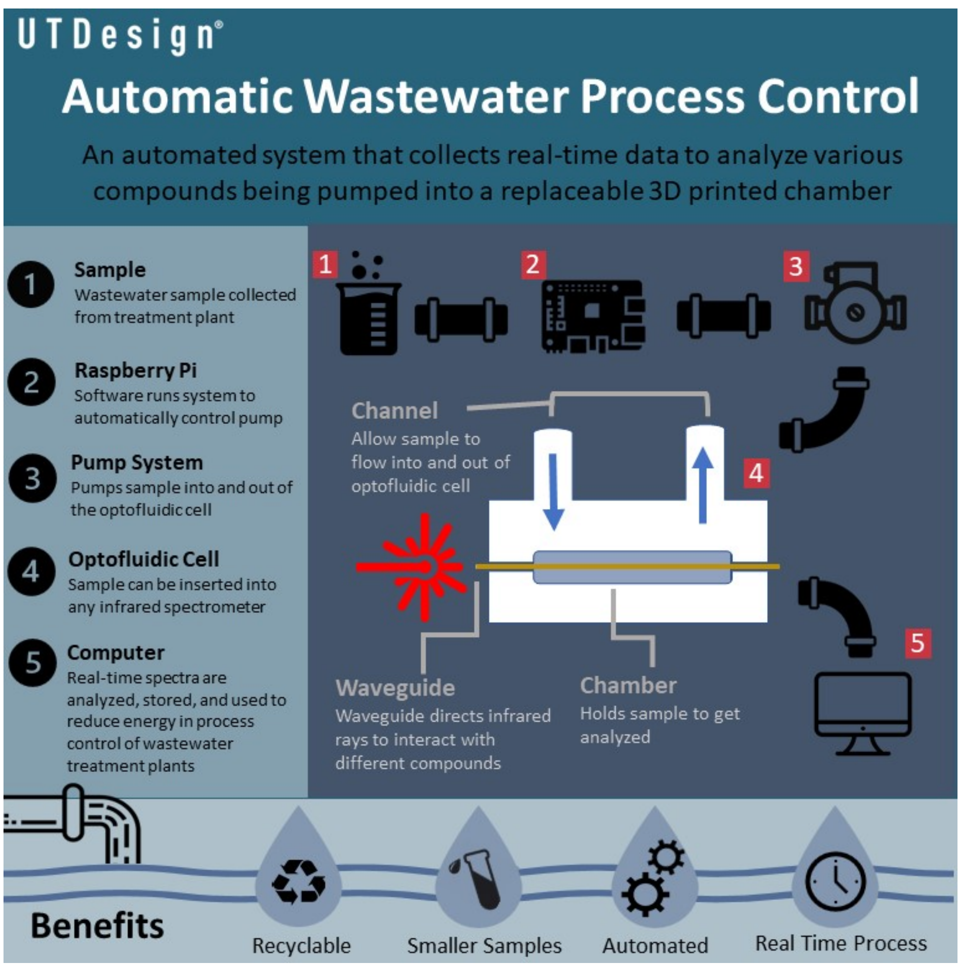
Sponsor: Max-IR Labs

Project Title: Optofluidic Device for Evaluation of Nitrate and Ammonia in Water

Team Members: Abbas Zaki (ETL), Laith Altarabulsi, Justin Chau, Bach Le, Rhianna McFarlen, Yvonne Pham

Project Abstract

One of the major hurdles with testing and quantifying dynamic processes in a fluid environment is the stepwise manual sampling and subsequent adjustment of parameters until a desired result is achieved. Max-IR Labs is a startup focused on using inline infrared sensors to optimize process control in wastewater treatment facilities. Our team has therefore developed an automated system to pump various analytes into a replaceable 3D printed chamber compatible with a commercial FT-IR spectrometer and gather infrared spectra for quick and efficient analysis of various compounds. We have demonstrated our system's use in automated sensing of nitrate and ammonia in water; however, our system can be generalized for other time-dependent applications such as bioreactors, food processing, fermentation, etc. Therefore, this system will be the basis of future prototype development for Max-IR by reducing manual labor, time, and reaction chamber replacement costs as well as automating process control in industrial applications.



Team 1111 – MedFlux

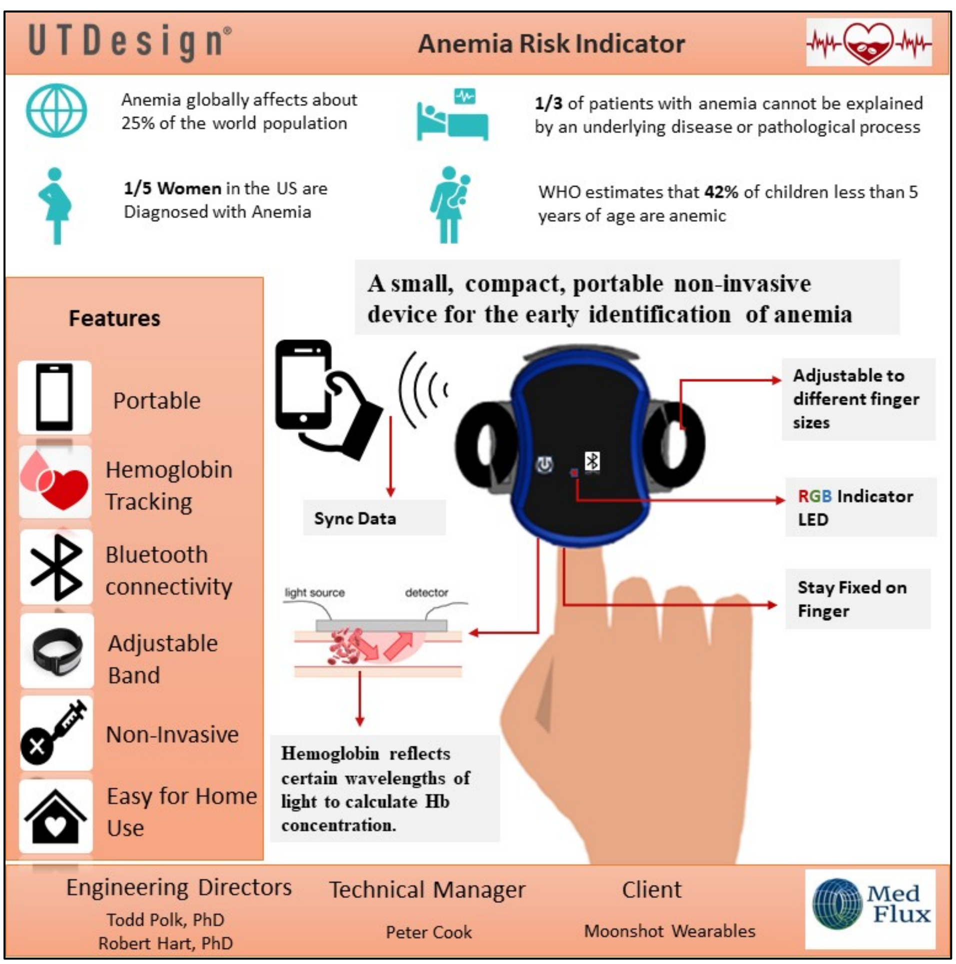
Sponsor: Moonshot Wearables, Inc.

Project Title: Non-Invasive Co-Oximeter mHealth Sensor

Team Members: Alberto Nunez (ETL), Matthew Adams, Divya Chidambaram, Anumta Fatima, Eniola Oyebade, Rodrigo Rocha Uribe

Project Abstract

Anemia is defined as hemoglobin concentration below normal limits for a given group of individuals of the same age, sex, and environmental conditions. According to the World Health Organization (WHO), anemia is a serious public health problem where it is estimated that 25% of the world's population suffer from some type of anemia. There are five different types of anemia: aplastic anemia, iron deficiency anemia, sickle cell anemia, thalassemia, and vitamin deficiency anemia. Our project focuses on creating an accessible and affordable healthcare device targeting at- risk populations in the world. Our objective is to create a wearable non-invasive detection device that will determine the hemoglobin concentration levels in a person's blood. Our device will provide information to our client's mobile application that will be part of their digital healthcare platform for the detection, diagnostic health information, and clinical decision support of anemia.



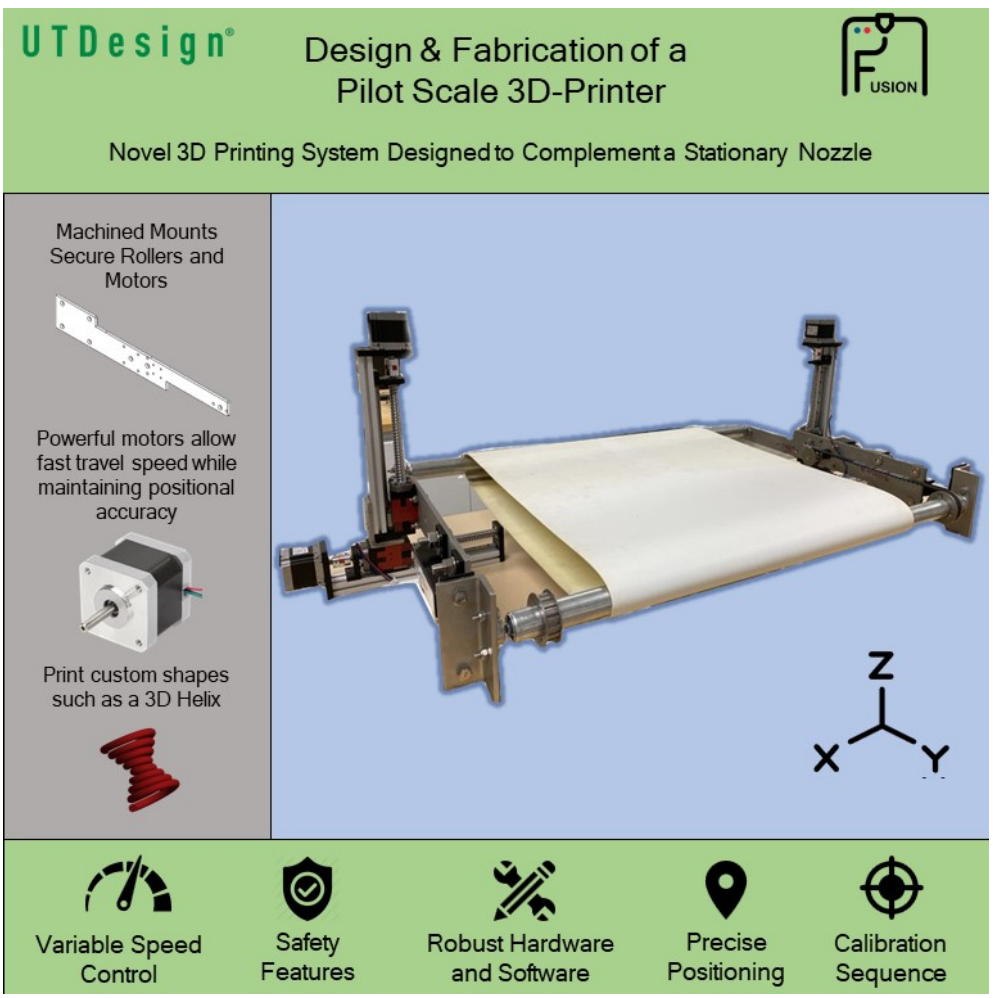
Team 1112 – Fusion

Project Title: Design & Fabrication of Pilot Scale 3D Printer

Team Members: Shankar Lal (ETL), Kevindat Dinh, Sameer Hasnani, Na Hun Kim, William Novalany, Landon Shea

<u>Project Abstract</u>

The objective of this project was to create a novel 3D printing system in a production line setting by integrating multi-axes motion with an industrial stationary nozzle. A 3D printing system built around a stationary nozzle requires moving the print surface along the X, Y, and Z axes. Team Fusion's prototype consists of a large conveyor belt, which also functions as a print bed, coupled with linear actuators that provide translational motion along the X and Z (Vertical) axes. To further emulate the adaptability and precision of current 3D printing systems, Team Fusion incorporated a custom calibration sequence and variable speed control of all axes. These features, together with the parameters built-in the Arduino control programs, provide users with the flexibility to print a wide variety of extruded materials for the creation of 3D complex geometries such as Square Pyramid, 3D Helix, etc.



Team 1113 – Team Unphased

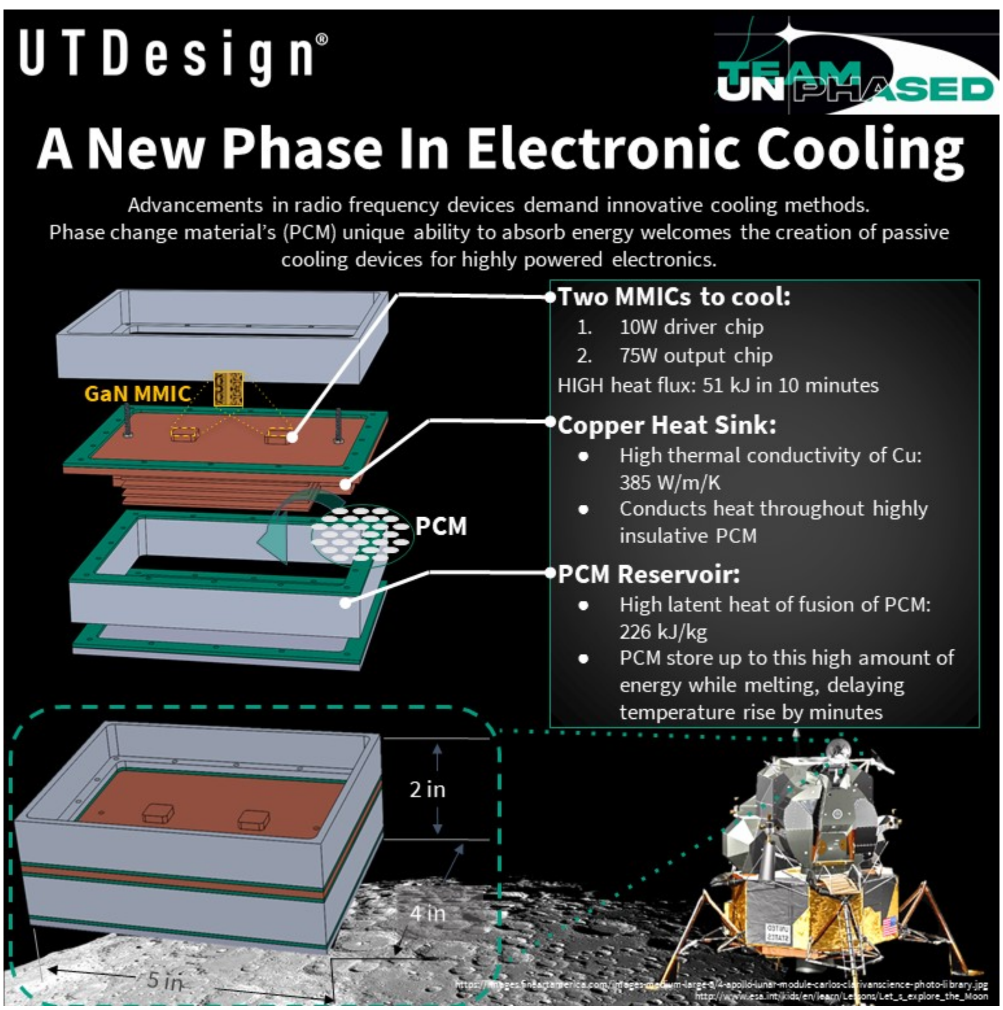
Sponsor: Qorvo

Project Title: Design and Test of Phase Change Materials for Thermal Control of High Power Electronics

Team Members: Alejandro Pasillas (ETL), Sadiq Afzal Godil, Abdul Samad Kholia, Derek Kunish, Bernadette Magalindan, Christian Ploubis

Project Abstract

Radio frequency (RF) devices in the Aerospace and Defense fields utilize high-powered circuitry for broadband communications and radar sensing. Qorvo specializes in these devices, but seeks a method of cooling the electronics without dissipating heat to the environment. Qorvo tasks Team Unphased to create a thermal management solution for a circuit of two monolithic microwave integrated circuits (MMICs) that dissipate 75 W and 10 W in ten minutes. The team utilizes phase change material (PCM) to absorb the bulk of the heat from the high-flux MMICs. PCMs can absorb high amounts of energy during their phase change process. PCMs have the adverse property of low conductivity; a suitable heat sink is designed to conduct heat from two small square MMIC surface areas of 0.19 in2 into the PCM.



Team 1114 – Cells To-Go

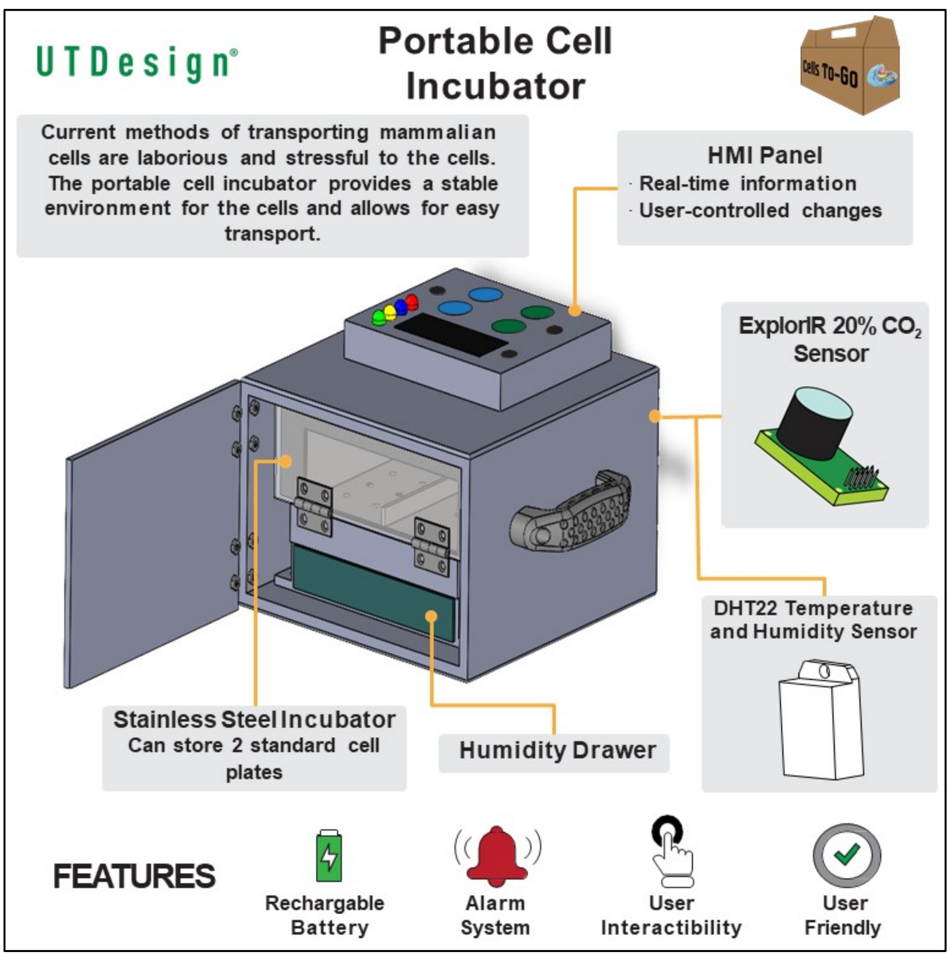
Sponsor: The University of Texas at Dallas

Project Title: Autonomous and Portable Cell Culture System

Team Members: Casey Koger (ETL), Tracy Bui, Kaci Le, Barrett Miller, Khai Nguyen, John Nguyen

Project Abstract

To provide optimal conditions for cell culturing on the go, the UTDesign Cells-To-Go team has developed an autonomous and portable cell culture system. This device allows for the transportation of incubated cultured cells that bypasses the laborious and time-consuming procedures of freezing and thawing. Using sensors to monitor the incubation chamber's CO2, temperature, and humidity, the device will maintain the aforementioned conditions with an embedded CO2 delivery system, heating element, and a moist sponge to provide CO2, heat, and humidity, respectively. In addition, the system incorporates a user interface that allows for manual input and real-time user oversight of incubation parameters. Our task was to develop a portable incubator that can maintain cells that are cultured in cell plates and media. Our device will serve as an alternative method for cell transportation that is time-efficient, user-friendly, and beneficial to cell research labs.



Team 1115 – CADalyst

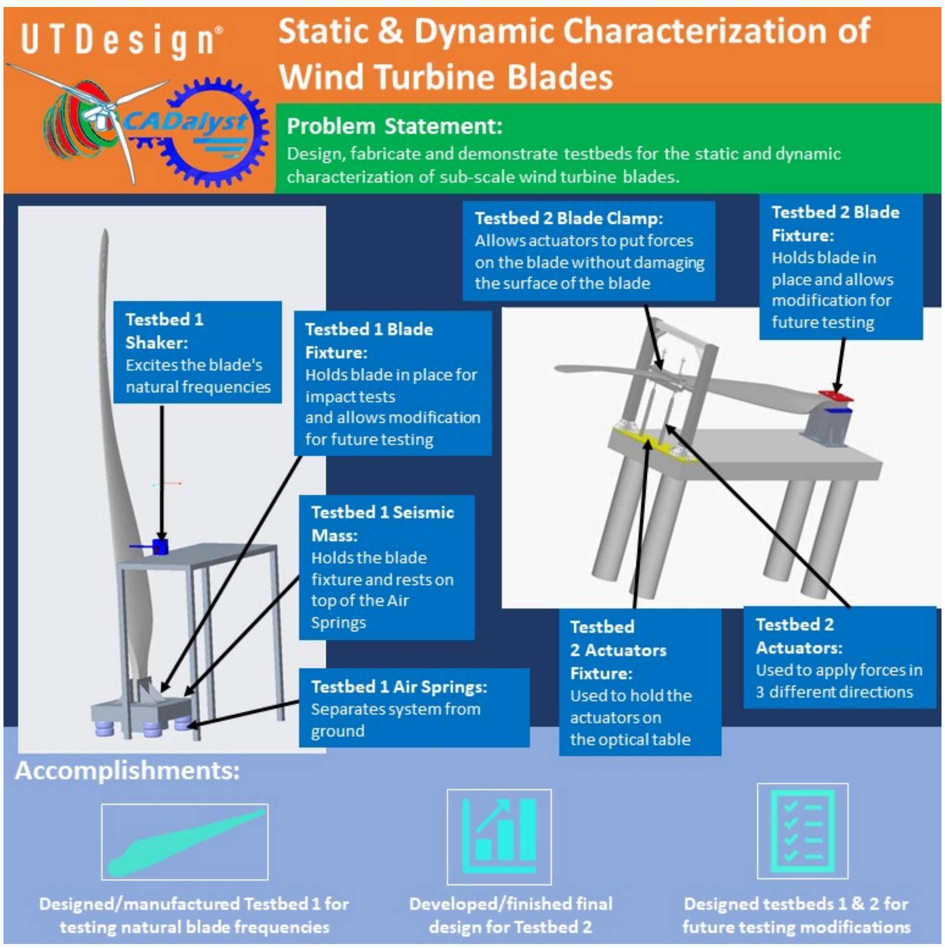
Sponsor: The University of Texas at Dallas

Project Title: Design of Testbed for Novel Static and Dynamic Characterization of Wind Turbine Blades

Team Members: Trevor Ellis (ETL), Sean Bertram, Scott Burlison, John Hernandez, Michelle Hogan-Poole, Khang Pham

<u>Project Abstract</u>

Two testbeds were designed for mechanical and dynamic testing of sub-scale wind turbine blades. Testbed 1 was made to test the blade's dynamic response, and specifically its natural frequencies. To meet the scope of the project the team came up with a solution that uses a model wind turbine blade that attaches to a large steel seismic mass, which rests upon a series of soft foam pads. The foam pads allow the mass-blade system to freely move when a force is applied. A forced vibration is applied to the blade and its dynamic response is then recorded. Testbed 2 permits mechanical testing with tests that measure the static characteristics by applying a force on the flap-wise, edgewise and torsional directions of the blade and then measuring the deflection and strain. The team came up with a final paper design for the client to allow them to build Testbed 2 in the future.



Team 1116 – Phantom Protocol

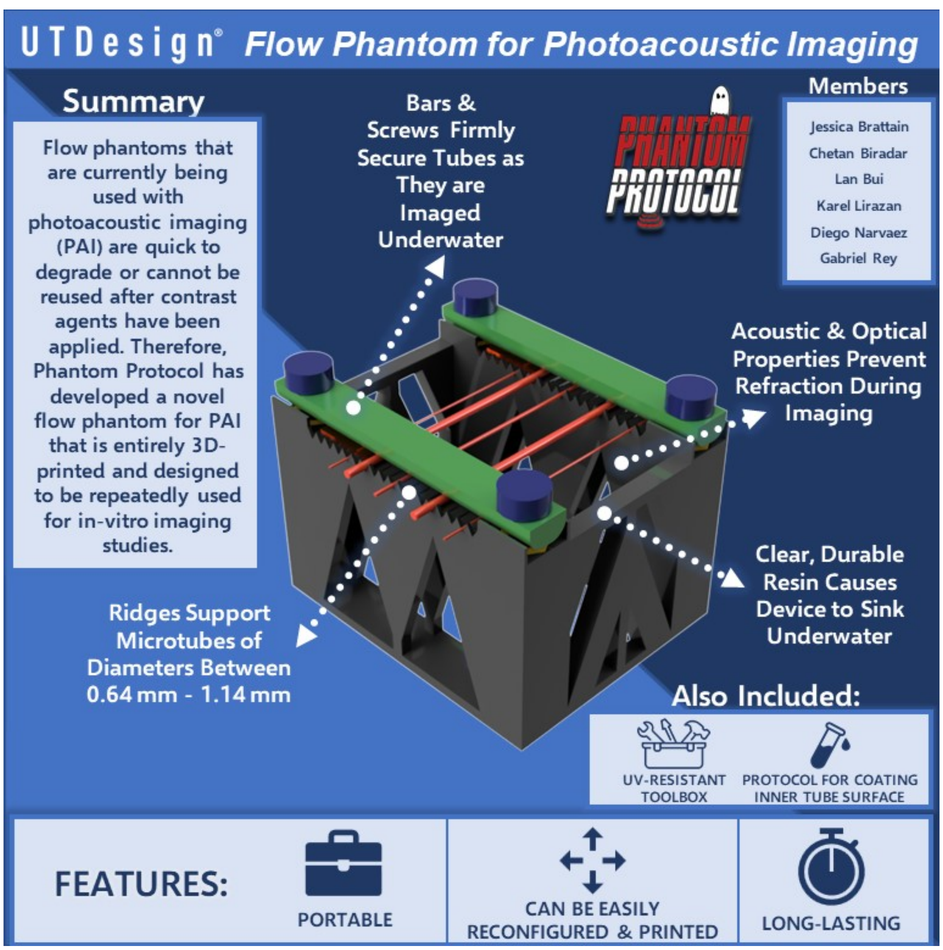
Sponsor: The University of Texas at Dallas

Project Title: Design and Development of a Flow Phantom for Photoacoustic Imaging

Team Members: Jessica Brattain (ETL), Chetan Biradar, Lan Bui, Karel Lirazan, Diego Narvaez, Gabriel Rey

Project Abstract

Flow phantoms that are currently being used with photoacoustic imaging (PAI) are quick to degrade or cannot be reused after contrast agents have been applied. Therefore, Phantom Protocol has developed a novel flow phantom for PAI that is entirely 3D-printed and designed to be repeatedly used for in-vitro imaging studies. The phantom is made of a clear, durable resin that prevents reflection and refraction of the laser during imaging, contains ridges that support microtubes of diameters between 0.64 mm and 1.14 mm, and bars that firmly secure the tubes as they are imaged underwater. The device is portable, can be easily reconfigured and reprinted, and is estimated to last through thousands of imaging experiments without degradation. The team also developed a procedure for coating the inner tube surfaces with a chemical compound that prevents artificial and real blood from coagulating and enhances the flow of blood within the tubes.



Team 1117 – VascuWorks

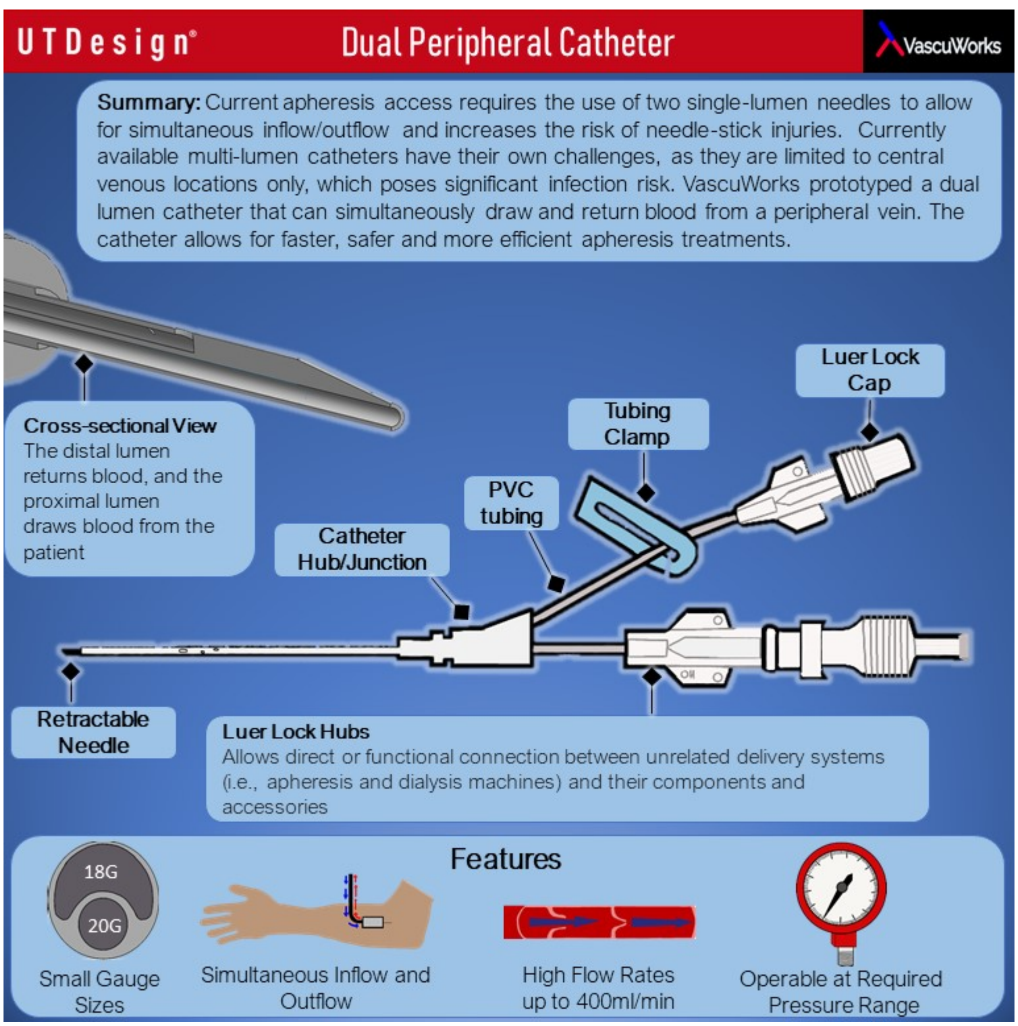
Sponsor: University of Texas Southwestern Medical Center

Project Title: Double Lumen Peripheral Catheter

Team Members: Amulya Srivatsa (ETL), Emily Baumbach, David Cho, Meghana Ponakala, Joel Varghese, Lizbeth Zamora

<u>Project Abstract</u>

Multi-lumen catheters are often limited to central locations as they need a larger diameter to contain the multiple lumens. In contrast, a traditional peripheral catheter has one lumen, so multiple are placed for simultaneous flow, and this increases risk for catheter-associated infections. The team has created a double lumen peripheral catheter which can simultaneously draw and return blood from a peripheral vein for the purpose of improving apheresis treatments. Apheresis involves collecting, removing, or replacing blood components per specific procedure. The device consists of a 3D printed catheter shaft with a cross section that reflects the appropriate lumen sizes for draw and return. The catheter is designed to insert into the arm's basilic vein and simultaneously draw and return blood under the appropriate flow rates and pressures.



Team 1118 – BronchUS

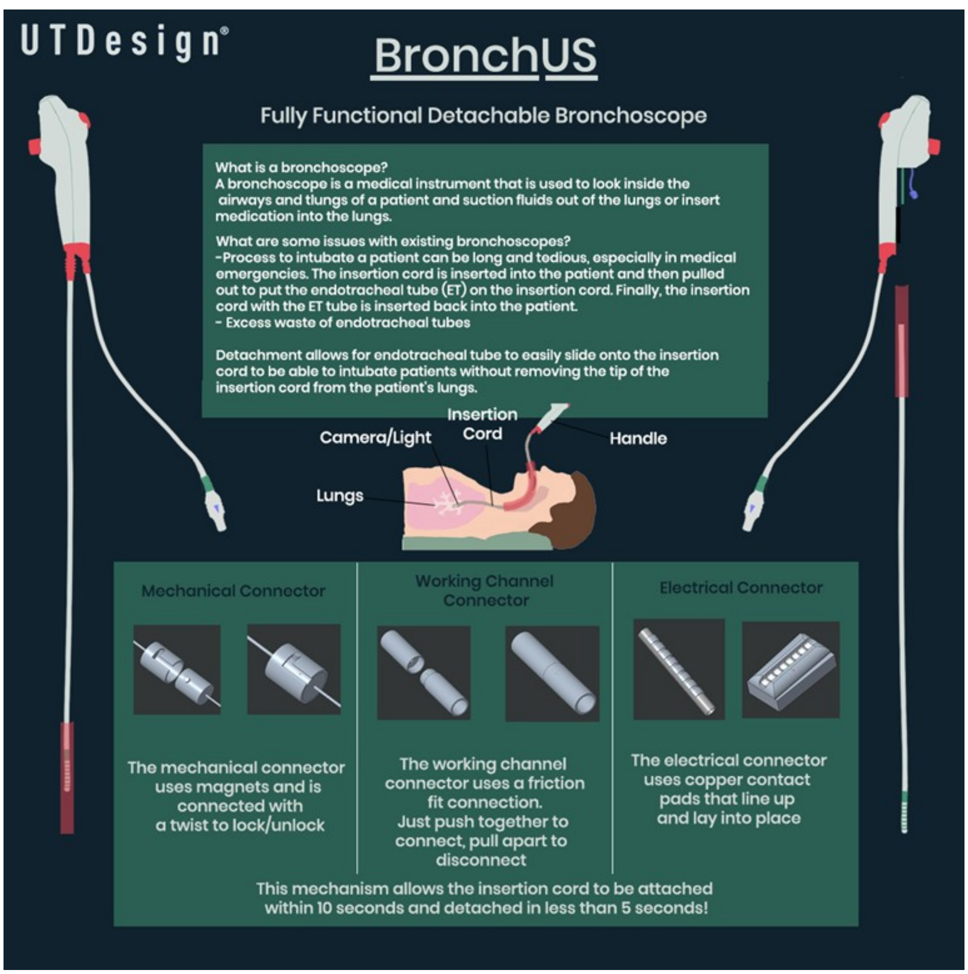
Sponsor: University of Texas Southwestern Medical Center

Project Title: A Fully Functional Detachable Bronchoscope

Team Members: Manogna Reddy Yanamala (ETL), Micah Cox, Kaylen Morrison, Ricardo Peralta, Mia Spennato, Abhishek Srinivas

<u>Project Abstract</u>

Current bronchoscopes are not detachable, which causes operators to have to reinsert the insertion cord into patients or have excessive wastage of endotracheal tubes. To combat these issues, we have designed a bronchoscope with which operators can detach the insertion cord from the handle, feed the endotracheal tube over the insertion cord, and reattach the insertion cord to the handle. A bronchoscope has three internal parts allowing it to perform its functions of flexing the tip, providing light and video, and transferring fluids. All connections happen inside the handle which has a hinge allowing it to open/ close. The mechanical connectors use magnetic twist clasps, and the working channel is a friction fit plug. The electrical connections are along an extension of the insertion cord and must be laid into/ pulled off a bed with conductive plates. This mechanism can be connected and disconnect in less than 20 seconds.



Team 1119 – Helios

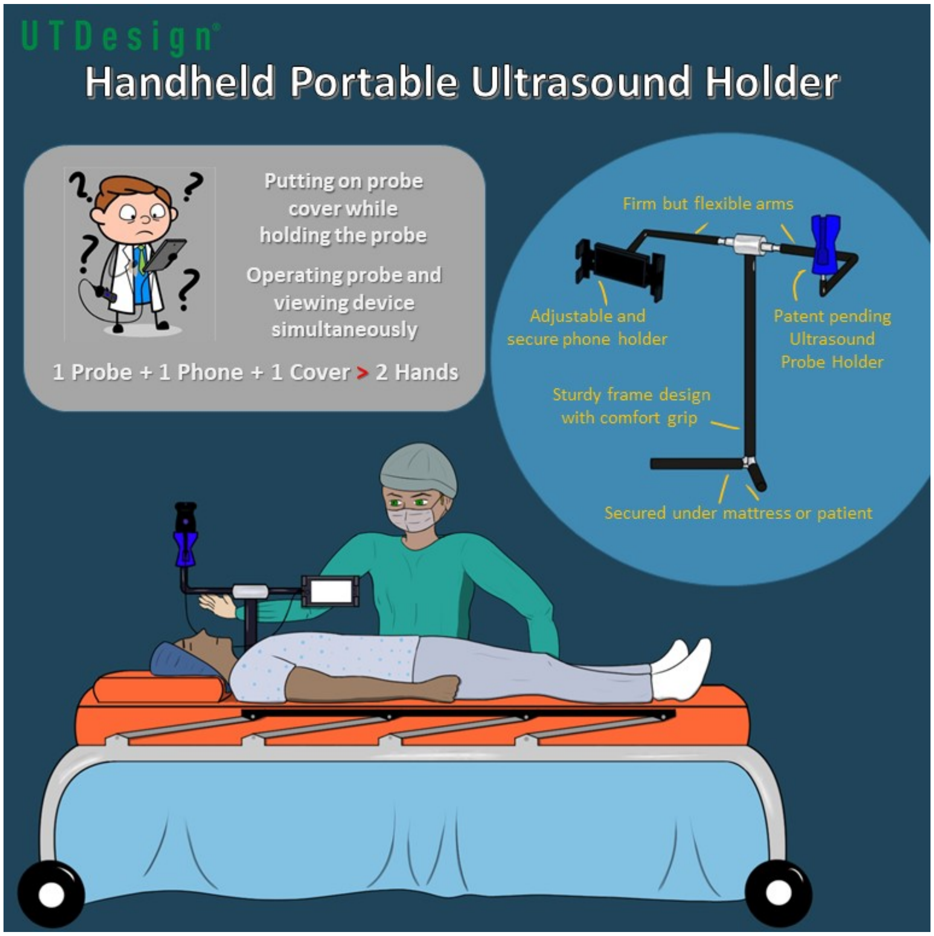
Sponsor: University of Texas Southwestern Medical Center

Project Title: Hand Held Portable Ultrasound Holder

Team Members: Ishan Navendra (ETL), Betsiti Araya, Blessy Kuriakose, Seyun Park, Christian Soeder

Project Abstract

Technological advancements have allowed for the innovation of handheld portable ultrasound machines that use smartphone devices for image display. However, it is difficult to obtain certain images when both hands are occupied, one holding the ultrasound probe and the other holding the monitor. Another problem arises when performing ultrasound guided procedures, and a single operator is not able to install the sterile probe cover without assistance from a second operator to maintain sterile technique. We have solved both problems by creating a stand that attaches the probe and monitor onto gooseneck arms that adapt to user ergonomics. The probe is held in a prompt up position which allows an operator to install the sterile probe cover independently. The stand is placed underneath the patient's body or mattress. This device will allow physicians performing point of care ultrasound and ultrasound guided procedures with handheld ultrasound devices be more independent and efficient.



Team 1120 – HVM Simulation

Sponsor: University of Texas Southwestern Medical Center

Project Title: Healthcare Workplace Violence Mitigation

Team Members: Brian Torres (ETL), Andrew Koudelka, Manuel Lamuno Noriega, Sagar Patel, Amster Salas

<u>Project Abstract</u>

Current training methods against health care workplace violence involve the use of online modules that are deemed noninteractive and ineffective. New technological advancements in virtual reality allow for creating a more hands-on and immersive method of education. In this project, a training tool was created for both virtual reality and PC platforms with the purpose of giving healthcare providers a realistic training experience in mitigating workplace violence. This training tool will place learners in a simulated environment in which they will be tested in both the identification of potentially dangerous items and engagement in interactions with patients.

Team 1121 – Gundamatics

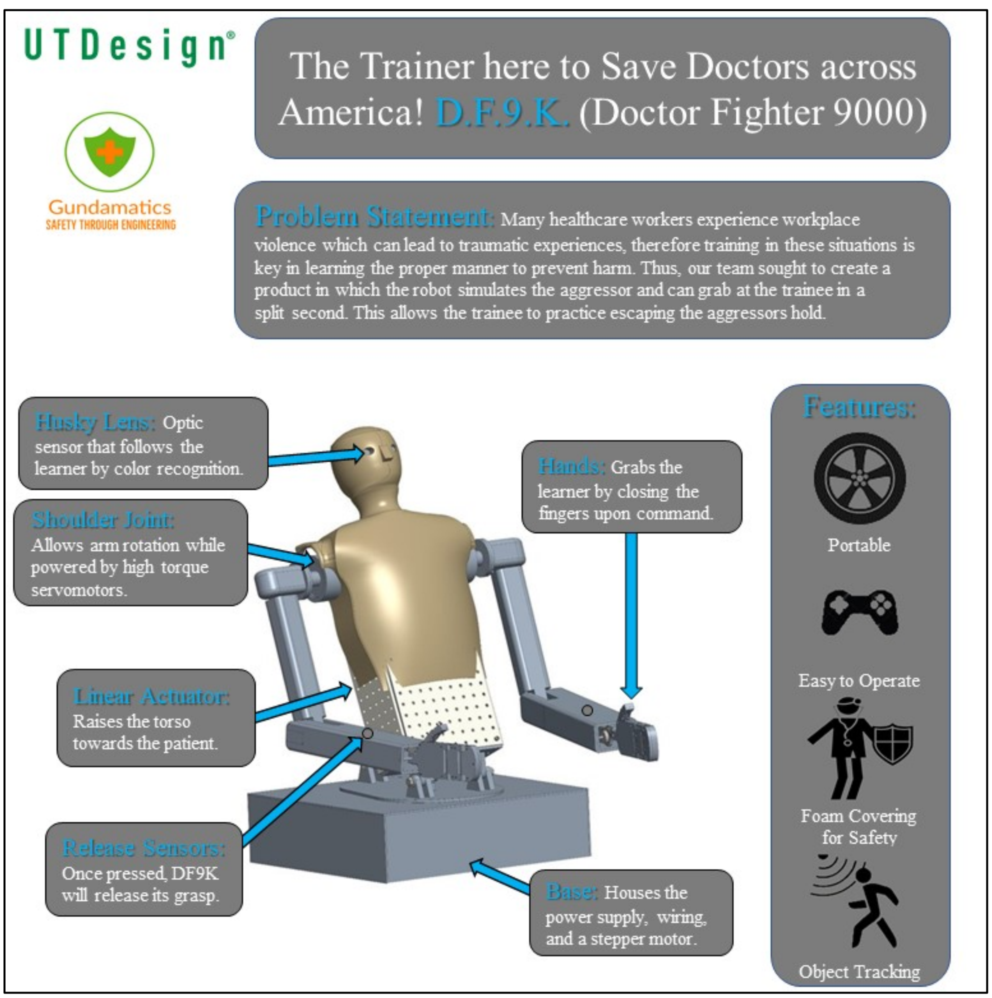
Sponsor: University of Texas Southwestern Medical Center

Project Title: Workplace Violence Fight Simulator

Team Members: Marlon Pena (ETL), Anwer Abdurahman, Hamza Ahmad, Jorge Arteaga, Tyler Johnson, Ayush Shah

<u>Project Abstract</u>

Within the healthcare profession, doctors/nurses often must deal with violent patients. Thus, the purpose of this project which our group undertook was to come up with a resolution which would be capable of providing these healthcare workers with hands-on training in escaping from grappling attempts to help these professionals stay safe while working. The solution to this issue was to design a robot with arms designed to simultaneously grab at a learner, then clench its hands on said learner's vest. The patient would then be tasked with triggering the release mechanism located on either hand or the forearm to release the robot's grip. Upon completion of the robot, and after successfully testing its requisite motions with various individuals simulating the learner, the robot certainly assisted these individuals in improving their ability to disengage from grappling attempts by swiftly locating the necessary release points.



Team 1122 – Ultra Hydrophonics

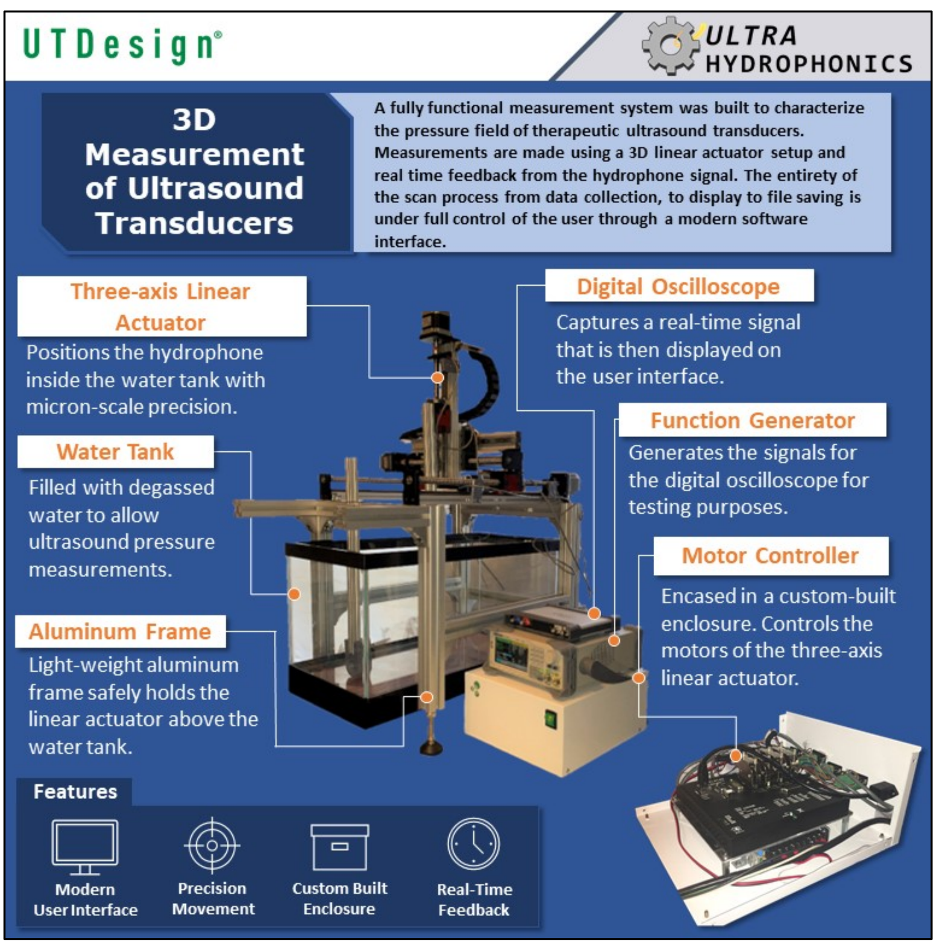
Sponsor: University of Texas Southwestern Medical Center

Project Title: Automatic 3D Measurement of Ultrasound Transducers

Team Members: Dayton Abbey (ETL), Adam Carrera, Kirubel Fanta, Jordan Gallegos, Isaiah Moorehead, Aman Nurani

Project Abstract

Therapeutic ultrasound transducers must be calibrated before use. Proper calibration involves measuring the transducer's spatial pressure distribution in water, using an ultrasonic pressure sensor known as a hydrophone. At UTSW, Dr. Chopra uses a hydrophone scan tank that relies on antiquated hardware and software, nearing obsoletion, to calibrate his transducers. The goal of this project is to build a new three-axis actuator system using a sophisticated Galil motor controller to position the hydrophone; this allows consistent and repeatable transducer calibration measurements. Provided the specifications of the water tank by Dr. Chopra, a motorized actuator was custom-built and is driven by the Galil motor controller to achieve micron-scale positional accuracy. Using custom-coded Python software, a modern user interface was designed to automate and control the entire scan process including data acquisition, visualization and file saving. With this new laboratory equipment, Dr. Chopra can reliably characterize transducers for years to come.



Team 1123 – neoFusion

Sponsor: University of Texas Southwestern Medical Center

Project Title: Brain-Blood Flow Waveform Simulator

Team Members: Gabriel Reyes (ETL), Obada Albaghdadi, Jacob Awkal, Hadi Moussa, Muhammed Aaqil Shariff, Mansur Syed

Project Abstract

Isolated organ perfusion is of high importance to researchers due to its ability to control confounding factors that complicate results as a result of networking with other organ systems. To mimic varying physiological states, it is essential that organs be perfused in a pulsatile manner to mimic heart function as represented in-vivo. The NeoFusion Blood-Brain Waveform system provides the capability of mimicking physiological heart function by allowing user input of physiological waveforms acquired as Excel files. The system is capable of dynamically controlling a shear resistant centrifugal pump to modulate frequency, systolic, and diastolic pressures all controlled via a LabVIEW feedback system. In addition, the system is capable of vital readout (pO_2, temperature, pressure, etc.) and stores data for clients to evaluate readings following surgery. Currently, the system has succeeded in resuscitating a dead porcine heart at various frequencies and pressures and has succeeded in perfusing an isolated brain system.

Team 1124 – CryoCreate

Project Title: Cooling Prosthetic Socket

Team Members: Alyssa Rossen (ETL), Kiran Kudumula, Deion Nguyen, Kendall Noto, Richard Osay, Alhan Saadiq

Project Abstract

A common problem experienced by individuals who use prosthetics is a buildup of heat within the prosthetic socket, which not only causes discomfort but can also damage tissue. This project addresses this problem through the development of a cooling system for lower limb prosthetics. The prototype device that was developed utilizes a closed-loop liquid cooling system consisting of a pump and thermoelectric cooler (TEC) which cools water that is circulated through the socket. A novel socket was created for this project to allow for cooling of the entire area that is in contact with the wearer's residual limb. By utilizing a thermistor placed on the socket's interior wall to trigger the TEC when the measured temperature is outside of the desired range of 25°C to 30°C, this system is able to react in real time to keep the temperature within the socket from rising beyond comfortable and safe levels.

Team 1125 – Plantar AI

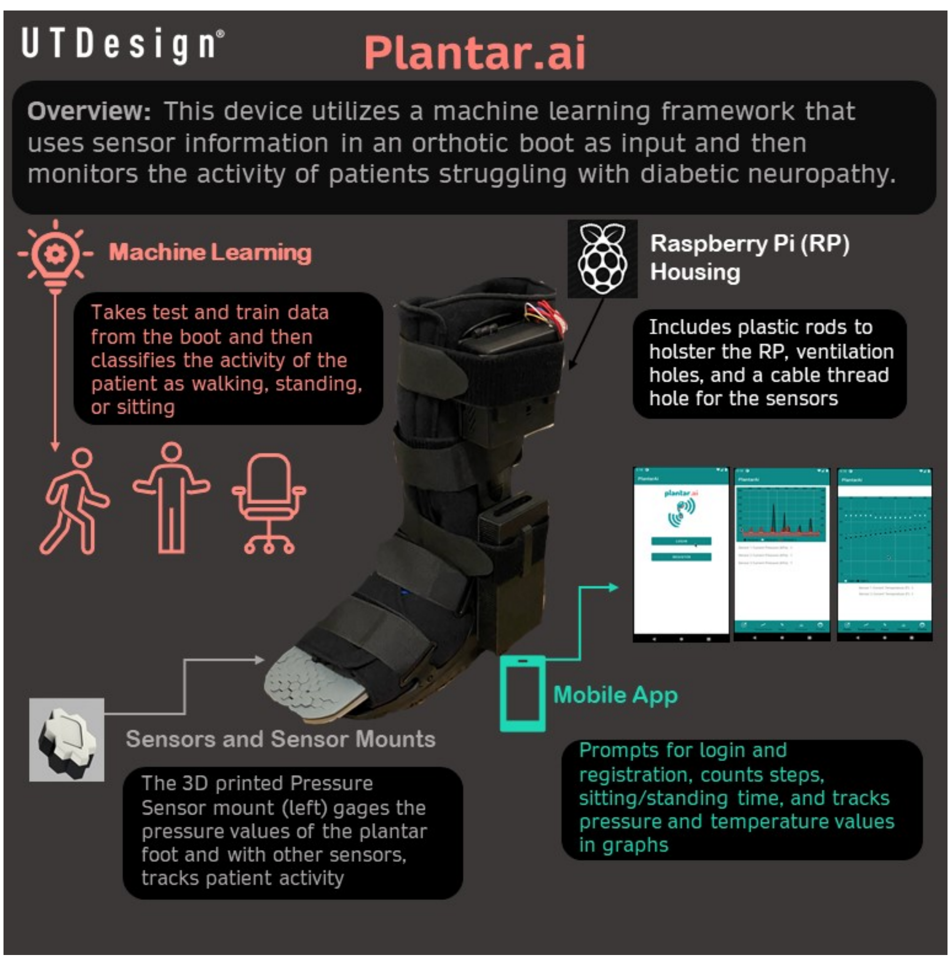
Sponsor: University of Texas Southwestern Medical Center

Project Title: Activity Observer Insole

Team Members: Blake Heckart (ETL), Laura Eads, Jared Harvey, Lindy Patterson, Kelden Pruitt, Matthew Punnoose

<u>Project Abstract</u>

Current orthotic solutions for patients diagnosed with diabetic neuropathy that have developed persisting plantar ulcers have drawbacks regarding wound treatment and prescribed behavior compliance. Plantar.ai provides an alternative for physicians and patients alike that offers data-driven insight, not only in how physicians may configure the Össur DH Offloading Walker orthotic boot to best suite a patient's wound site, but also in the daily usage habits of the device. In using a combination of pressure, temperature, and acceleration data along with machine learning classifications on movement patterns, the Plantar.ai system is a step towards improved patient-physician awareness in treating persisting plantar ulcers that can be easily integrated into orthotic boots. Plantar.ai is capable of alerting patients and physicians to important sensory changes within the orthotic boot, as well as ensuring that patients adhere to prescribed behaviors in order to speed up treatment time.



Team 1126 – Diabetic Foot Works

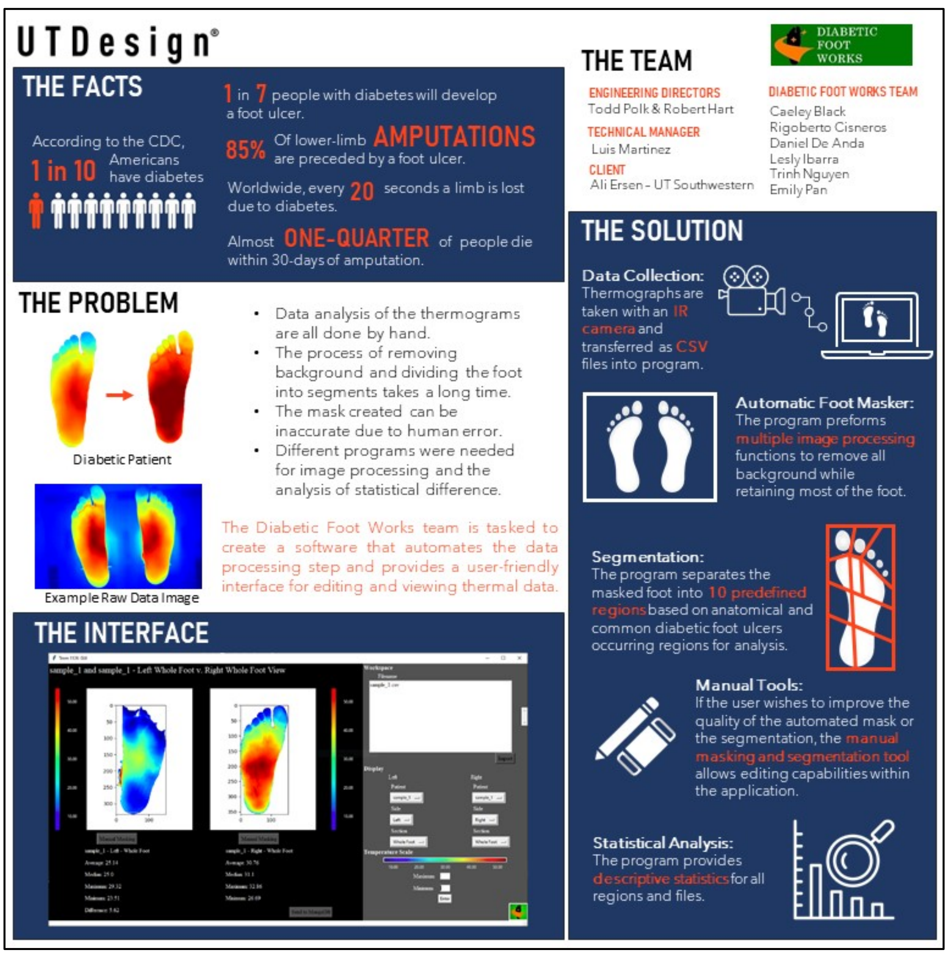
Sponsor: University of Texas Southwestern Medical Center

Project Title: Foot Masker for Monitoring Diabetic Foot Condition

Team Members: Daniel De Anda (ETL), Caeley Black, Rigoberto Cisneros, Lesly Ibarra, Trinh Nguyen, Emily Pan

<u>Project Abstract</u>

Diabetic patients are at high-risk of developing foot ulcers that become difficult to treat and may result in lower-limb amputation. Early detection and routine monitoring can prevent the development of foot ulcers. The team has developed a Python based software that aids in prevention by accelerating data processing. The program intakes infrared images in comma separated variable (CSV) format, automatically masks out the background, segments the feet into regions, and performs statistical analysis that is used to predict which regions of the foot are at risk of developing ulcers. The program uses a custom-built graphical user interface that has automated and manual analysis options for the users. The manual process allows the user to correct any of the data sets that are not properly processed by the automated portion of the software. The results of the program demonstrate the power of automated analysis in the prevention of diabetic foot ulcers.



Team 1127 – Next Step Engineering

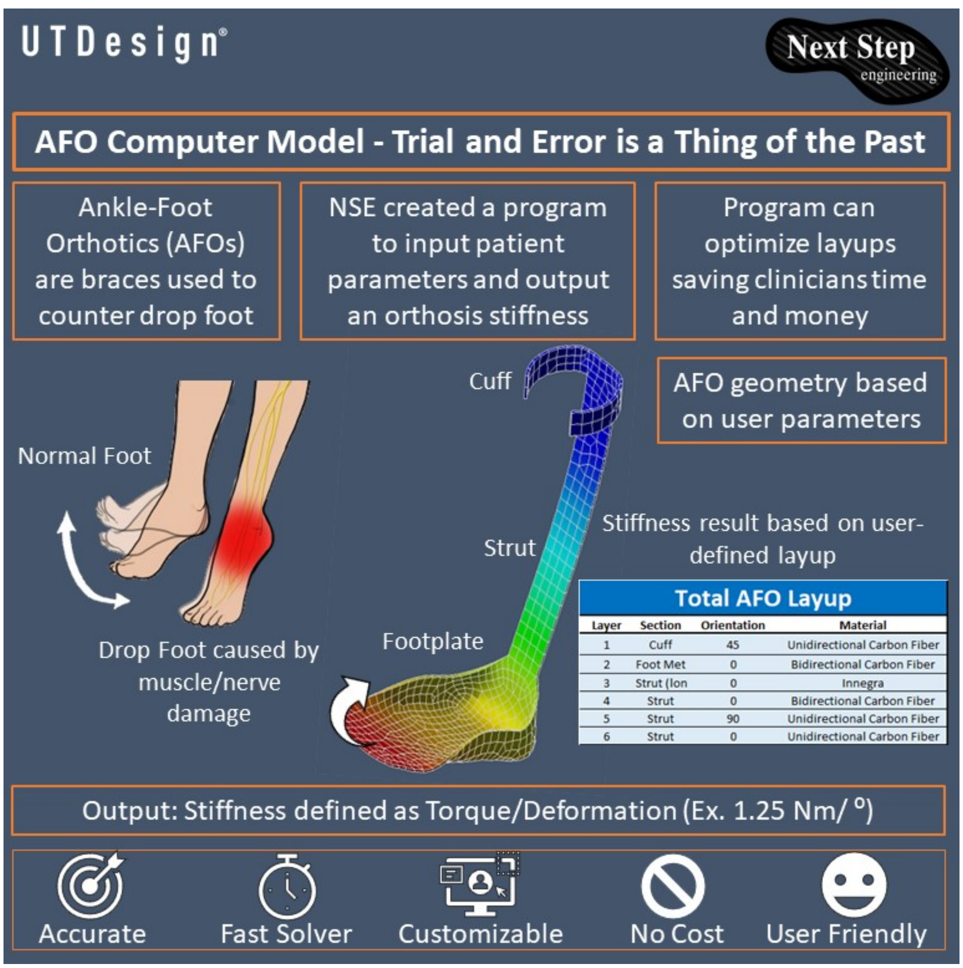
Sponsor: University of Texas Southwestern Medical Center

Project Title: Carbon AFO Computer Model

Team Members: Justin Williams (ETL), Jaclyn Bergman, Jacob Kubicki, Grant Lindsay, Haben Mikaele, Motasim Mohammad

Project Abstract

An Ankle Foot Orthosis (or AFO) is an ankle brace that supports the walking motion of patients with weak ankle and foot muscles. AFOs are made in layups, or groups of thin composite material layers. The strength of an AFO is dependent on the layup. UT Southwestern treats various foot and ankle conditions using AFOs. The required patient layups levels vary based on their condition, with some requiring a stiff layup and others needing something more flexible with less layers. Next Step Engineering's AFO Computer Model is solves the problem of not knowing the stiffness of an AFO prior to construction. NSE has developed a computer program that determines the stiffness of a user-defined AFO and optimizes a section of the layup to produce a set of total AFO layups within a desired stiffness range. This approach saves UT Southwestern time and money by minimizing trial and error.



Team 1128 – Pressure Point

Sponsor: University of Texas Southwestern Medical Center

Project Title: Chest Tube Trainer with Feedback

Team Members: Sruthi Dubagunta (ETL), Daniel Awad, Kraigen Eisaman, Emily Hofman, Ifti Hossain, Omar Khan

Project Abstract

Medical residents use simple manikins with replaceable rubber chest walls to perform chest-tube insertions. These models do not provide feedback to the user based on how much force the user exerts during the insertion and when the user punctures the inner chest cavity. The purpose of this design project is to create a device with a system, which if connected to the chest-tube trainer manikin, will give the user either visual or auditory feedback based on how hard or soft the user is pushing the Kelly Clamp tool into the chest-tube trainer model. The final design of the device includes a case that easily snaps onto the Kelly Clamp being used, which senses the force being exerted on the clamp and is connected to an external system with visual and audio components that provide effective feedback to the user based on how much force is being exerted by the user.