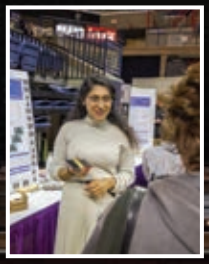
ANNUAL SENIOR DESIGN DEMONSTRATION DAY

UCONN | SCHOOL OF ENGINEERING

INNOVATION DESIGN INSPIRATION CREATIVITY

HARRY A. GAMPEL PAVILION, STORRS, CT
MAY 1, 2020 12:30PM - 4:30PM

SHARING IDEAS



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COMPUTER SCIENCE AND ENGINEERING

TEAM 1

Jordan Beecher
Mason DiCicco
Kristian Huber
Lauren Moore
Alex O'Neill

ADVISOR

Seung-Hyun Hong

SPONSOR

Every Child Every Day
East Hartford Public Schools

Scholarship Matcher

The testing and application process for colleges is expensive and lengthy by itself, but it is not the end of the journey. Once accepted, students, especially those from low income families, must struggle to acquire the funds be able to pay for college. Our goal to solve this problem is to create a website that is simple and intuitive and gives students accurate and applicable scholarships. Once they have a narrowed down list, our website will help create an essay to apply for each scholarship by asking questions that guide the student in the direction of a compelling story. At the end of this project, any high school student should be able to use this website and find more scholarships to apply to and submit better applications that will increase their chances of winning more awards. The front-end sections are user interface and design, scholarship display, and account information. The back-end sections are server code/information flow, database management/web scraping tool. The front-end is written JavaScript, HTML, and CSS. Those files are handled by the server code. The server uses the NodeJS framework and the website itself is hosted on Amazon's Web Services. The database that stores all of our scholarship information is MongoDB. All of these components come together to set up our website to simplify scholarship searching.

COMPUTER SCIENCE AND ENGINEERING

TEAM 2

Mitchell Chan
Adam Fan
Cameron Slater

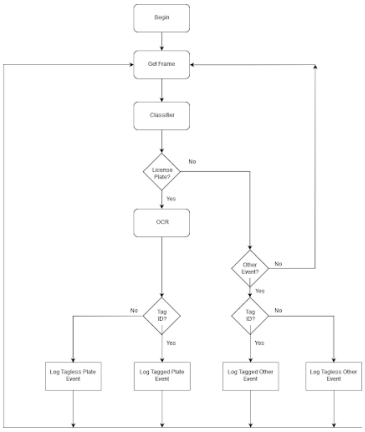
ADVISOR

Joseph Johnson

SPONSOR

CONTROL MODULE INC

License Plate Recognition



Our sponsor, Control Module Inc. (CMI), is a global provider of innovative systems and solutions for workforce data collection, EV charging, and fleet management.

We were tasked with designing a DVR-type device with event logging that classifies license plates and uses OCR machine learning to read the plate and log the event depending on whether a tagged ID was presented.

The license plate recognizer has two main components. It takes as input a video feed utilizing an IP based camera that the ECE team designed. First it finds a license plate (if one is present). Then, it reads the plate number and logs the event. We used Keras with TensorFlow core to build our neural network.

COMPUTER SCIENCE AND ENGINEERING

TEAM 3

Anthony D'Andrea
Ethan Hanna
Xiangyu He
Michael Lu
Katherine Riedling

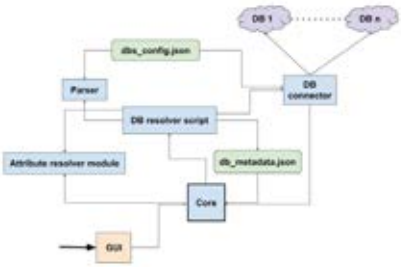
ADVISOR

Jinbo Bi

SPONSOR

CGI

Entity Resolution Tool for Record Retention



CGI is an IT and business consulting company that provides an array of infrastructure, analytics, and data management services for a variety of companies. The purpose of this project is to address entity resolution in the healthcare domain with respect to record retention. This has become an increasingly relevant topic with the rising usage of digital documentation services and concerns about data privacy. The motivation behind this solution is to understand how logical entities can be identified in a heterogeneous collection of databases with sufficient reliability. We seek to ensure that the correct records are expunged safely and accurately from any system.

This software tool searches through available databases that contain some unknown collection of attributes and attribute values, and determines the relationships between different fields by applying a combination of deterministic and probabilistic methods on data containing errors, inconsistencies, or missing values. The user interface will then display these results. However, we are operating on the assumption that there will be a key-identifying attribute that will always remain correct, such as social security numbers.

COMPUTER SCIENCE AND ENGINEERING

TEAM 4

Reed Kroll
Noah Pacik-Nelson
Keshav Patel
Niels Peschel
Jeremy Reiser

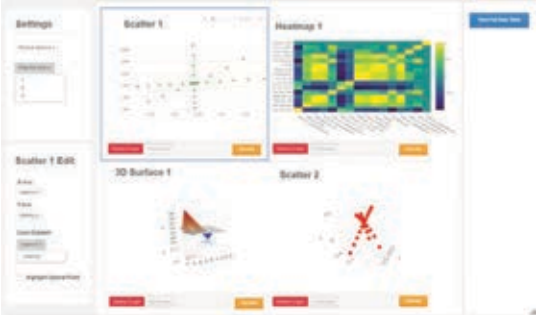
ADVISOR

Dong-Guk Shin

SPONSOR

Carrier
United Technologies

Kalydoscope



The Carrier Corporation uses model based design (MBD) for their product development applications. One of the MBD tool sets, Sandia Dakota, outputs data into HDF5 file format. HDF5 files uses a versatile data model that can represent very complex data objects and a wide variety of metadata.

The Carrier team would like a data visualization application capable of reading/processing the HDF5 format and producing versatile visualizations to interpret the MBD results. There are currently a very limited number of tools available for visualizing HDF5 files and their capabilities are inflexible and limited. The envisioned data visualization application should allow the Carrier team to easily visualize the results of methods, compare and contrast variables, find optimal values, etc. The planned data visualization application should allow the user to create a variety of custom visualizations from the datasets contained within a wide-array of user provided HDF5 files. We are developing this HDF5 data visualization application using the Electron software framework, React and Bootstrap front-end components, and the h5py and plotly libraries for data processing/visualization generation.

COMPUTER SCIENCE AND ENGINEERING

TEAM 5

Tyler Cromwell
Cristian Gutu
Nick Huynh
Michael Welch

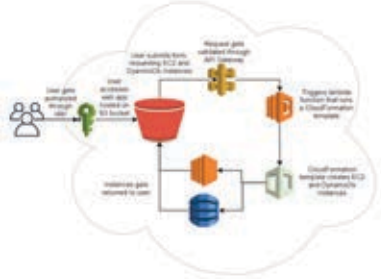
ADVISOR

Joseph Johnson

SPONSOR

LOCKHEED MARTIN

Cloud Developer Management Dashboard

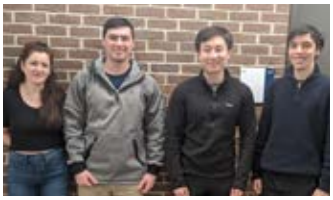


Lockheed Martin is a global high tech, security and aerospace company principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

Lockheed Martin is in the midst of a digital transformation in the Rotary and Mission Systems (RMS) business area, including Sikorsky military and commercial helicopters, integrated air and missile defense, littoral warfare, undersea warfare, etc.

This Senior Design project involves the design, build, and deployment of a web-app that provides users with the ability to easily create and manage AWS resources and associate them with various development efforts. This enterprise-scale, cloud-based application automates repetitive project management tasks that serves as the first iteration of a tool Lockheed Martin that can be deployed for their software development teams. The scope of this project encompasses a wide range of subproblems, specifically: UI/UX design, frontend development, backend development, database design, and cloud architecture design. The UI/UX design and frontend development portions are covered by the user-facing web-app that implements the interaction functionality. The remaining backend development, database design, and cloud architecture design subproblems implement the logic to handle the actions made available through the web-app.

COMPUTER SCIENCE AND ENGINEERING



TEAM 6

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Samantha Hunsley
Daniel Scalzi
Johnny Sit

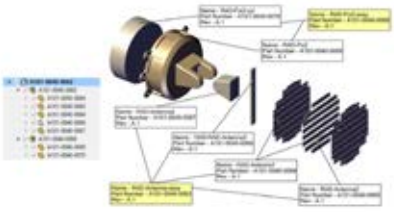
ADVISOR

Joseph Johnson

SPONSOR

LOCKHEED MARTIN

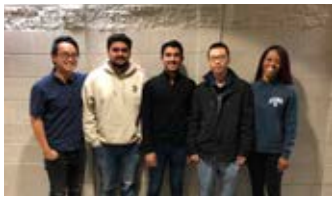
3D System Navigation



Lockheed Martin is a global high tech, security and aerospace company principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. Lockheed Martin's mission is to solve complex challenges, advance scientific discovery and deliver innovative solutions that help our customers keep safe.

This project involves the design, development and deployment of a proof of concept for a personnel productivity tool featuring an updated file navigation system. Currently, tree-based file navigation requires users to learn the file system's structure as well as memorize part numbers prior to utilizing the system. Under the new approach in this proof-of-concept, called 3D navigation, personnel are able to open up the web application and easily access the information they need from a 3D model. The web application is hosted on AWS (Amazon Web Services) and allows users to view a 3D model of an object and its parts using standard tree controls. The goal is to leverage this proof-of-concept to ultimately deploy an enterprise system that reduces training time and provides an intuitive, interactive environment for working with model data.

COMPUTER SCIENCE AND ENGINEERING



TEAM 7

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Alan Liu
Mohit Mali
Tyler Nguyen
Amar Sinha

ADVISOR

Hanna Aknouche-Martinsson

SPONSOR

synchrony

Secure Scrum Design

Being able to create a robust, secure application is a crucial task for any software engineer. With Agile as its adopted methodology, Synchrony proposes to adopt the idea of 'C. Pohl and H.-J. Hof, Secure Scrum and OpenSAMM for Secure Software Developmentin International Journal On Advances in Security, volume 9, numbers 1 and 2, 2016, 1942-2636, Jan. 2016, vol. 9.' to enable discovery, systematic tagging and traceability for software components related to secure practices. Using controlled repositories, this project, Secure Scrum Design, leverages Synchrony's existing CI/CD pipeline to allow security metadata to pass consistently through the pipeline. The project enables this capability by developing OpenAPI specifications across the pipeline elements, starting from the metadata repository and flowing through to executables. In other words, the project enables developers to find tested secure code, include it in their builds, and to trace those security features through the CI/CD pipeline. This capability impacts the following pipeline components such as Eclipse, Jenkins, Jira, BitBucket, Confluence, Pytest, and CEDAR.

Optionally, the project will utilize the specs created for OpenAPI to create test scripts. If successful, the project will enable Synchrony developers to create RESTful interfaces that implement the desired security metadata automation.

COMPUTER SCIENCE AND ENGINEERING

TEAM 8

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Danny Fryer
Haseeb Khan
Aakib Shaikh
Richard Zheng

ADVISOR

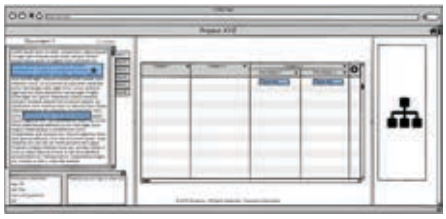
Steven Demurjian

SPONSOR

SONALYSTS

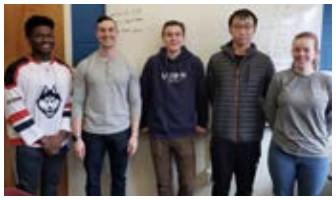
SIFT - Automated Document Analysis

Sonalysts, the US Government, and academia/research institutions conduct qualitative or observational research to gain key insights into the design of systems, using methods such as Cognitive Walkthrough (CWT), Knowledge Elicitation (KE) interviews, and/or focus groups. Currently, data collected via these methods are transcribed, iteratively coded based on thematic analysis; then insights or results are manually generated by tabulating data, custom visualizations are manually developed, and analytical products are generated to disseminate these findings to decision makers (via PowerPoint, Word, Excel, etc.).



SIFT will be a web-based platform to consolidate and automate this process, enabling simultaneous processing/analysis of data and configuration management across a diverse group of users, including human factors engineers, data scientists, UX designers, graphic artists, and software engineers. SIFT will be a web-based technology, enabling collaboration across LANs, WANs, or the open internet depending on use case. The goal is to create a means to more rapidly process text-based qualitative data, glean insights from the data (via analytics or visualizations), develop analytic products, and provide traceability from resultant designs (predominantly visual media), through analysis, and all the way back to raw data.

COMPUTER SCIENCE AND ENGINEERING



TEAM 9

Benjamin Buchanan
Aaron Hill
Daniel Toby
Elizabeth Turano
Dingchen Yan

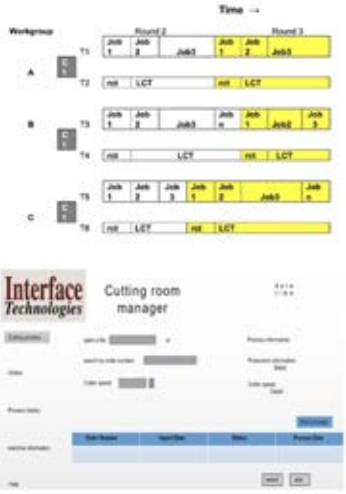
ADVISOR

Jacob Scoggin

SPONSOR

Interface Technologies

Cut Room Scheduling Software



The global textile industry is one of the largest consumer goods industries in the world. As the global population continues to grow, the company Interface Technologies (IT) realized a glaring problem in global clothing manufacturing industry. There exists a lack of technological innovation. This has resulted in manufacturers going outside of the United States rather than utilizing automation to lower manufacturing costs. IT has developed software to automate much of the garment production process and is currently working on developing an algorithm to optimize the scheduling of the process.

Currently, a cutting room manager decides how to prioritize what order raw material is cut. The prioritization can be based on the size of the order, the order deadline, the space available in the cutting room and many other factors. Much of this process is passed down from one manager to the next.

IT estimates that an algorithmic scheduler could increase efficiency up to 30%. The algorithm works to optimize the due date of a garment order, amount of material needed to prioritize the orders in a manner more efficient than the way it is typically done. This algorithm has been created by IT and implemented by a senior design team at The University of Connecticut.

COMPUTER SCIENCE AND ENGINEERING

TEAM 10

Andrew Collins
Eric Flower
Sam Markelon

ADVISOR

Wei Wei

SPONSOR

ISO new england

Generator Model Verification Result Analysis System

Power system dynamic models need to accurately represent the actual behavior of the systems. These models are used in planning to identify and mitigate potential criteria violations, determine transfer capability, and develop transmission system reinforcement plans. They are also used in operations for outage coordination studies, establishment of system operating limits, and real-time assessment tools.

ISO New England has developed an online tool - Automatic Power Plant Model Verification (APPMV), that automatically performs the task of power plant model verification using real-time power system disturbances.

This project will develop a database, an application server, and a web-based user-facing front end, which can help the ISO effectively perform the model verification task. This entails implementing a generic event database that stores rich information about each event, and making it easily accessible to data mining tools. This will feed a web-based GUI designed for analyzing and managing APPMV results.

Since the current method of accessing and analyzing this data is manual, a web-GUI will quantitatively and qualitatively enhance the analysis of power grid events for ISO New England engineers. It will provide the engineers with a streamlined process and real-time visibility into grid events, helping keep the lights on in New England.

COMPUTER SCIENCE AND ENGINEERING

TEAM 11

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Klauss Preising
Joseph Warmus
Daniel Zhang

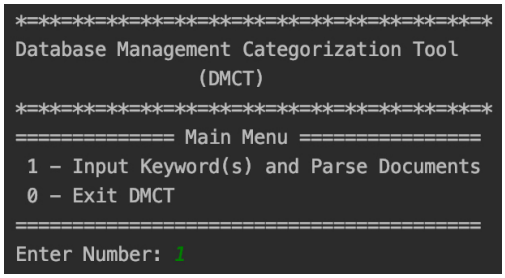
ADVISOR

Steven Demurjian

SPONSOR

LOCKHEED MARTIN

Data Categorization Management Tool



Lockheed Martin Rotary and Mission Systems (RMS) labs are moving from traditional on-premise servers located in computer rooms across the infrastructure to Amazon Web Services (AWS). The goal is to reduce costs while also creating new data management, access and sharing capability across the RMS portfolio. Data that resides in the labs is stored in a variety of application formats. Moving the data to AWS requires that the data type is properly identified prior to transfer. Data stored within the lab environments can be categorized as export control, third party proprietary, Lockheed Martin Proprietary, or Covered Defense Information (DFARS 254.204-7012). Prior to moving the data to AWS, the current procedure is to manually review the information to ensure that it is labeled or tagged with the correct data category. The process of manually opening every file and applying a label or meta tag is extremely time consuming and inefficient. We here at Lockheed Martin RMS would like the UConn Senior Design Team to create a machine learning solution that can analyze and categorize the data. The solution should allow the data owner the ability to provide input into the recommended categorization and key terms for their program prior to moving the data into AWS.

COMPUTER SCIENCE AND ENGINEERING

TEAM 12

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Thomas Fauci
Araceliz Mare Gomes
David Motta
Charles Sampson

ADVISOR

Seung-Hyun Hong

SPONSOR

logicbroker

Logicbroker Repricing Engine

Our project is to create a repricing engine for Logicbroker. Logicbroker is a company that connects brands and retailers through their cloud based platform by using Dropship Technology to help manufacturers manage and advertise their inventories. The first part of our project is to create a program that interacts with Logicbroker's API to fill in the missing product information in 3 steps: 1) find items with missing information in their system, 2) automatically searches the web for missing data, and 3) updates the missing information in Logicbroker's system. The second part and main focus of our project is a product repricing engine. For a given product, the program presents the user with repricing options, such as price x% below average. Users select an option and provide information through our GUI, so that prices can be found online using the methods we developed in part one. The program calculates the recommended price based on the pricing rules and displays it to the user. A user interface was developed so that a user can interactively run the program.

COMPUTER SCIENCE AND ENGINEERING

TEAM 13

Joel Johnson
Sruthi Kalidindi
Caroline Sekel
Julian Shin

ADVISOR

Wei Wei

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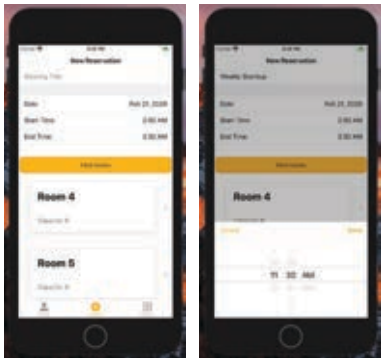
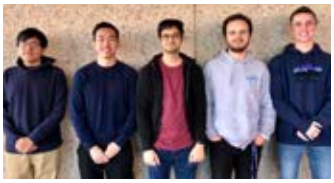
synchrony™

Synchrony Room Reservation System



The Innovation Station at Synchrony's Stamford office is in need of an efficient room reservation system for its conference rooms. Our team worked with Synchrony to create a new room reservation system, built from the ground up, that integrates with Synchrony's Office 365 accounts to deliver an easy-to-use, streamlined experience for all employees. Employees at Synchrony can make reservations and check room availability with specified criteria using our mobile and web applications. Room reservations will be automatically integrated into employees' Office 365 accounts and will be visible on their Outlook calendar. Our team utilized the Ionic framework, an open-source UI toolkit for building mobile and desktop apps, along with Angular and SQLite to develop the application.

COMPUTER SCIENCE AND ENGINEERING



TEAM 14

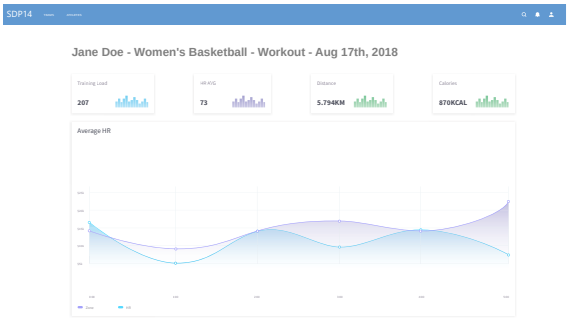
Renzo Corihuaman
Rome McColl
Matthew Rumbel
Renukanandan Tumu
Lawrence Wu

ADVISOR

Suining He

SPONSOR

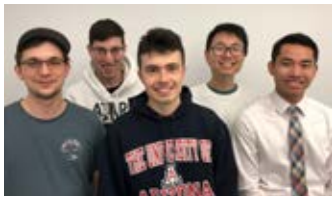
Web-Based Athletic Data Visualization



As college athletics has become increasingly competitive, the use of specialized coaching, monitoring staff, and equipment has become necessary to ensure competitiveness. The UConn Athletics strives to push the performance of its coaching staff and athletes, while ensuring safety. UConn Athletics trainers utilize Polar wearables to monitor the activity of athletes during practice sessions.

UConn Athletics seeks to visualize highly nuanced performance data for their student athletes. Trainers initially leveraged Microsoft Power BI to create visualizations of performance data obtained manually from Polar Team Pro's online portal (exported to CSV). However, the export did not expose the full raw data. The current export only includes data taken at 1 Hz frequency. The use of Polar Team Pro's API will allow access to data taken at 10 Hz frequency, which is needed to accurately calculate nuances in athlete movement and biometrics.

COMPUTER SCIENCE AND ENGINEERING



TEAM 15

Jonathan Ardolino
Mike Huynh
Jeff Shi
Zachary Wahrman
Jack Wohl

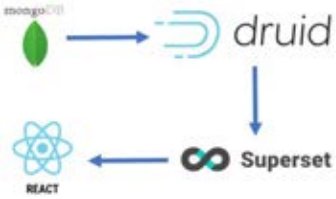
ADVISOR

Dong-Guk Shin

SPONSOR

Diameter Health

Fusion Application

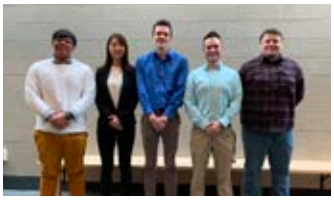


The objective of this project is to help Diameter Health customers to better understand and visualize the benefits and improvements that their enriched and normalized data has.

Currently, Fusion's visualizations are taken directly from a document-oriented NoSQL database, which doesn't perform well for aggregate reporting. The goal is to create a data pipeline from the current MongoDB database to a new analytical reporting source, and further improve the user experience by adapting the current visualizations and redesigning the UI to help customers appreciate the value of their patient data.

Various tools were used in redesigning the application: ReactJS, MongoDB, Python, Apache Superset, Apache Druid. React JS is used for the redesigned front end that includes the embedded analytic visualizations from Apache Superset. The data pipeline takes data from MongoDB and transforms and moves it using Python into Apache Druid, the data source that Apache Superset reads from.

COMPUTER SCIENCE AND ENGINEERING



TEAM 16

Agean Binan
Benjamin Buchmeier
Taeyoung Park
Ethan Pernal
Patrick Thompson

ADVISORS

Jerry Shi
Bing Wang

SPONSOR

PRATT & WHITNEY DEPENDABLE ENGINES
GO BEYOND

Secure Embedded Architecture

The team researched possible avenues of attack and determined what types of attacks are most likely or most crippling to the provided development board. Based on the vulnerability analysis, the team identified viable mitigation strategies for the most relevant attacks. The team designed a secure boot process that makes sure the development board boots into the correct program. The process verifies the boot image with various encryption and authentication methods, and detects attacks with built-in hardware mechanisms. The team has created and tested a prototype secure boot image. The team also evaluated the performance of crypto operations, with and without hardware acceleration, in terms of the execution time, and memory footprint.

COMPUTER SCIENCE AND ENGINEERING

TEAM 17

Xuan Chau
Chris Lo
Martin Place
Yijiang Yu

ADVISOR

Dong-Guk Shin

SPONSOR

Unilever

Process Visualization

Unilever is a global consumer goods company with over 300 factories worldwide, and produces a variety of personal care products. The company oversees ingredient-mixing operations in large-scale production tanks of varying sizes and configurations.

Unilever's Research and Design teams are constantly creating and testing new products, whose production must be scaled to fit a production-sized environment. This is a complicated and risky process due to several risk factors associated with large-batch mixing. Namely, the vertical height of the liquid must not fall in any "critical points" found within the tank, which would ruin, aerate, or otherwise reduce the quality of the product.

The goal of this project is to create a web-based, Unity 3D process visualization tool that allows Unilever's researchers to accurately observe and predict mixing conditions in a virtual environment. The tool automates critical point checks and volume calculations, while offering a transparent view of the tank. By connecting to Unilever's SQL tank database, the app is capable of accurately modeling any tank that is tracked. Through a simple UI, users can add, remove, and change steps in their theoretical mixing process, while receiving crucial feedback on the state of the mixture.

COMPUTER SCIENCE AND ENGINEERING

TEAM 18

Benjamin Catarevas
Kaixiang Lin
Xinyu Lu
Isabelle Wright

ADVISOR

Jacob Scoggin

SPONSOR

TRUMPF

TRUMPF OPC-UA Dashboard

We design and implement a dashboard that extracts, displays, and visualizes information pertaining to the performance of industrial machines. The dashboard communicates with these machines via the OPC Unified Architecture (OPC-UA) protocol, a machine communication protocol that is used for industrial automation. The information that engineers are interested in is Overall Equipment Effectiveness (OEE), a metric used to measure the overall performance of a machine, and can be calculated from records found on each machine. The dashboard has an overview page to show the OEE of all the machines that are running. It also features the option to view a detailed page of each machine. The detailed page has a table showing all the information used to calculate the OEE for a machine, visualizations for errors within the machines, as well as a detailed summary of different areas that the machine is performing well or poor in. The uses of this dashboard are broad, ranging from determining flaws or weak points in the machines, to calibrating the machines to perform better. This dashboard is designed for TRUMPF, a company that specializes in manufacturing solutions in the fields of machine tools and laser technologies, utilizing machines for laser cutting, punching, punch and laser processing, bending, and laser tube processing.

COMPUTER SCIENCE AND ENGINEERING

TEAM 19

Donna Agogliati
Alexander Barone
Adrian Cruz
Daniel Ruskin

ADVISOR

Jacob Scoggin

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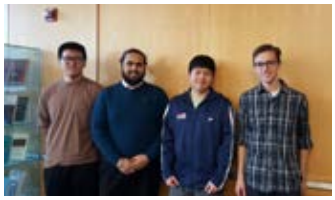
GMIS INTERNATIONAL

Mobile Incident Log Application

The Town of Manchester commissioned our team to create a mobile app for reporting cybersecurity incidents. Historically, state and local government officials have failed to efficiently report active cybersecurity incidents to relevant stakeholders in a timely manner. It is illustrative that, when an incident is noticed, officials must manually notify a wide variety of incident response managers. It takes a large amount of time to gather the stakeholders' contact information and send custom messages to each one. This time could be better spent on addressing the incident. Accordingly, our team has been instructed to automate this task with a mobile app.

Our mobile app will be used by stakeholders across the state of Connecticut. All IT system users and managers will be provided with an account. These individuals will then use our app to report cybersecurity incidents as they occur. When an incident is created or updated, automated e-mail and SMS notifications will be sent to all relevant stakeholders. Our app will serve as an authoritative source of information for all stakeholders. Stakeholders will refer to our app at all stages of the incident response process. Specifically, with our app, stakeholders will learn about new cybersecurity incidents, monitor the progress of mitigative measures, and identify/contact incident owners.

COMPUTER SCIENCE AND ENGINEERING



TEAM 20

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Brodin Raymond
Samrath Singh
Neal Xiao

ADVISOR

Suining He

SPONSOR

GENERAL DIGITAL

S.U.D.S (Secure Upload and Download System) Biometric Security

This project focuses on the implementation of a biometric credential validation system in an existing Secure Upload and Download System (S.U.D.S.) device. This device, manufactured by the sponsoring company General Digital, is utilized by mechanics and maintenance operators working on commercial aircraft engines, and is adopted to facilitate the transfer of data in a secure way. Leveraging various forms of biometric authentication, such as facial recognition and fingerprint scanning, this project seeks to improve the current security of the device to a standard which would allow it to be marketed towards military applications. This advance would permit the application of the S.U.D.S. devices upon military aircraft, tanks, and weapons systems, increasing the consumer base for the product greatly. Throughout this project we have devised a system to convert a single stage, simple password authentication into a two-stage, multi-factor, biometrics-based state machine.

COMPUTER SCIENCE AND ENGINEERING

TEAM 21

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ADVISOR

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UCONN INFORMATION TECHNOLOGY SERVICES

ITS Analytics Dashboard

UConn Information Technology Services (ITS), responsible for IT services, supports about 15,000 machines in total, across the different branches of UConn. With such an extensive user base and network system and few analysis tools, it is difficult to detect most of the underlying issues and potential environmental changes without a central data visualization and management software. Therefore, the goal of this project is to develop a web-based system which pulls data directly from different backend data feeds and creates a dashboard so that ITS and potential users, where appropriate, can visualize statistics at a glance on any device. This will greatly alleviate/reduce the complexity of analyzing multiple REST APIs and databases in the system, and allow for potential issues to be detected and addressed before they become larger problems. To address this, we propose an interactive dashboard design, which mainly consists of four different widgets: a graph showing login statistics, pie charts displaying the percentage of computers compliant with a security standard, a table of machines that had last been used, and a table showing machines deemed idle.

COMPUTER SCIENCE AND ENGINEERING

TEAM 22

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Frances Yu

ADVISOR

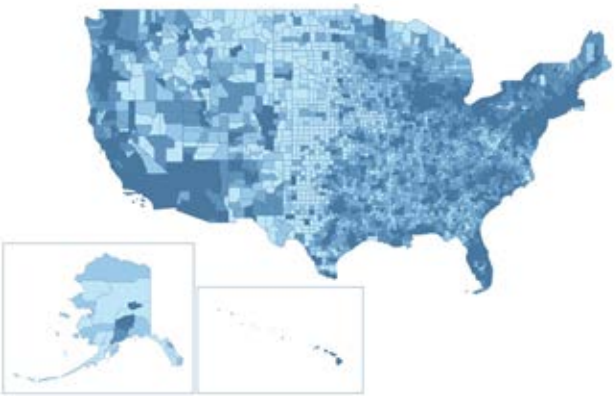
Joseph Johnson

SPONSOR

Cigna.

Opioid Epidemic Predictive Modeling

Cigna is a global health service company headquartered in Bloomfield, Connecticut that has been leading the national effort to promote safe pain management and curb opioid addiction and misuse. This project involves developing a machine learning model for understanding trends across geographic areas, the utilization of this research to identify risks, and the attainment of actionable insights on how to address this on both a local and national level. This model is made available to professionals by way of an interactive website for the purposes of information sharing, decision making, and further research.



COMPUTER SCIENCE AND ENGINEERING

TEAM 23

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Greg Foss
Matt Scalzo
Nate Shaw

ADVISOR

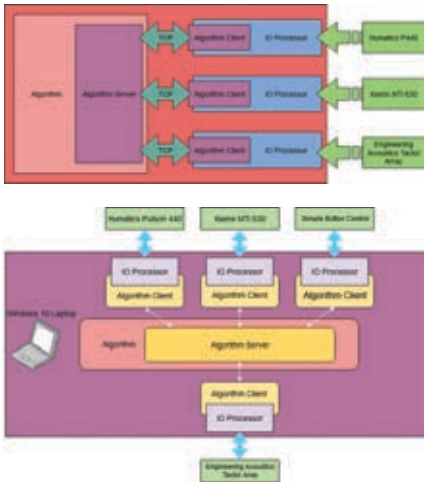
Steven Demurjian

SPONSOR

UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES
KINESIOLOGY

Breadcrumbs: Sensory Biofeedback System

The Sensory Biofeedback System is a wearable set of hardware that collects 3D environmental data and processes it to help a user navigate their environment with impaired vision. The intended use is for firefighters navigating through a burning building performing search and rescue and helping them with disorientation. The Sensory Biofeedback System gives tactile feedback through a belt embedded with several tactor motors that can relay valuable information such as where the firefighter is in the building and their orientation. The firefighter can provide input to the system through a button box that creates a path of virtual breadcrumbs which can be deleted, allowing the system to direct them to the previous one to retrace their steps. The firefighter will wear a backpack with a computer inside connected to all the different components and a belt wrapped around his/her waist with 16 vibration motors (tactors), that communicate the feedback essentially creating a 'vibration compass' like mechanism.



COMPUTER SCIENCE AND ENGINEERING

TEAM 24

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ADVISOR

Wei Wei

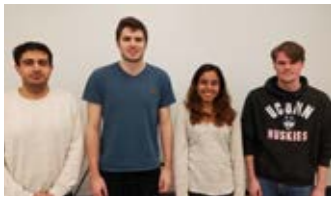
SPONSOR

JONAL LABORATORIES

Visual Inspection Automation

Jonal Laboratories Inc. is a custom manufacturing company that primarily produces elastomeric components for the aerospace industry. Currently, Jonal uses a team of quality inspectors to manually examine each part for defects including chips, contaminations, flashes, and more. However, this is a tedious, non-value-added process subject to human error. Introducing automation would remove pressure from the inspectors, provide them more time to focus on value-added tasks, and increase the speed and efficiency of the defect detection process. Thus, this project entails creating such an automated system to classify a part image as either defective or not defective. To achieve this goal, a convolutional neural network was trained using images of both defective and non-defective parts collected onsite at Jonal in order to perform the necessary binary classification. Once an acceptable accuracy is achieved, a method to integrate the trained model into the currently inspection process, thus creating the desired automated system, is generated.

COMPUTER SCIENCE AND ENGINEERING



TEAM 25

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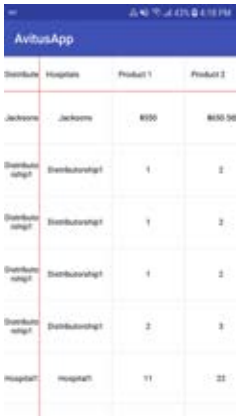
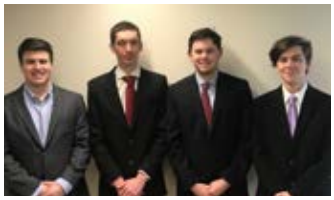
SPONSOR

Avitus Marketing App

Avitus Orthopaedics requires a mobile phone app to create a seamless transmission of data between the company and its sales representatives. This app will contain promotional material for the company's representatives to utilize when pitching the company's products to potential customers. The app will also allow its representatives to email promotional material to potential customers so that customers can access this material on their own time. Another feature of the app is enabling sales representatives to access the current inventory management system, take a picture of any documents and upload the image to the application. However, this app is not only targeted towards the employees of Avitus but also customers or potential future customers of the company by offering other useful features. One such feature is providing the company's scheduling information such as the date, time, and location, of future, current or past medical conferences that Avitus will be attending. Another feature is providing forms that can be filled out in the application, similar to how online forms are filled out in web applications. Finally, the application will also be able to schedule an upcoming surgery that utilizes Avitus Orthopaedics products and allow customers to contact an Avitus representative for real-time assistance using an instant messaging feature, similar to slack.



COMPUTER SCIENCE AND ENGINEERING



TEAM 26

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Anthony Masullo

ADVISOR

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SPONSOR

Optical Camera System

The Movia Optical Camera System was designed to be a self-contained product that is used as a component of larger systems. The system requires it to be used in a robot with a camera, with either the robot or the camera itself having the ability to move. The base component of the system takes input from the camera and outputs an immediate environment map based on the observed optic flow and built-in heuristics. This map can then be used by other subsystems in the robot and enable them to act appropriately within the robot's requirements.

COMPUTER SCIENCE AND ENGINEERING

TEAM 27

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Michelle Tsun

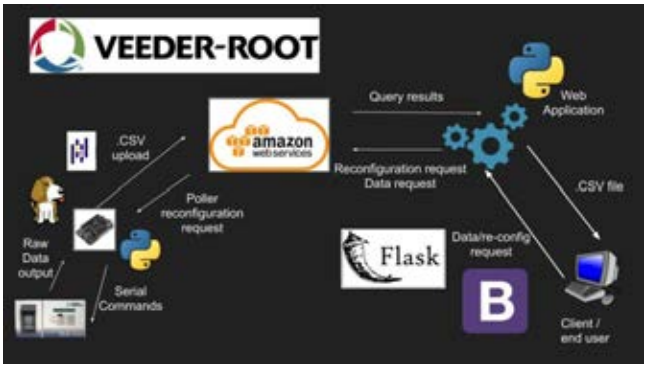
ADVISOR

Seung-Hyun Hong

SPONSOR

VEEDER-ROOT

Veeder-Root Cloud-Based Fuel Management System



Veeder-Root is a fuel management technology company, specializing in automatic fuel tank gauges. Team 27's task is to create a software solution that manages a group of automatic fuel tank gauges over the internet. The software both collects data and issues polling commands to the gauges remotely. This project leverages Python's Flask web framework to implement a web application, with which Veeder-Root's engineers can retrieve and analyze gas tank data. A gauge controller program, loaded onto a single-board computer located on-site, is utilized to record gas tank data incrementally and store it to the cloud via Amazon Web Services. The web application then fetches data from the cloud database storage and presents it to the end user in .CSV format. Engineers can also manage the gauge devices remotely using the web application's graphical user interface. Team 27 succeeded in creating a system that improves workflow efficiency through remote management of the gauges, obviating the need for engineers to travel to customers and physically interact with the gauge units on-site.

COMPUTER SCIENCE AND ENGINEERING

TEAM 28

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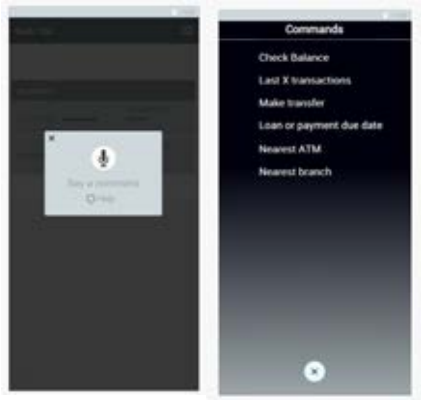
ADVISOR

Hanna Aknouche-Martinsson

SPONSOR

COCC
collaborative to the core

Voice Interface for Mobile Banking App



This project's aim is to add voice command functionality to COCC's existing banking mobile applications. COCC offers android and iOS mobile applications to banks, as a service. This voice assistant will be able to perform several commands such as: transferring funds between accounts, checking balance, and more. In order to achieve this, our team will integrate a scalable and modular system that leverages cutting edge NLP (natural language processing) algorithms to transcribe speech into actionable commands. On top of the functionality that this addition will provide, our team will complete this project in a way that emphasizes modularity to promote additional future commands.

COMPUTER SCIENCE AND ENGINEERING

TEAM 29

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Devan Yeo

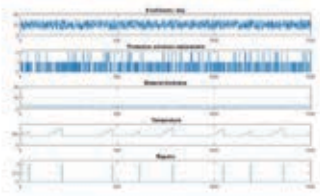
ADVISOR

Suining He

SPONSOR

TRUMPF

Preventative Maintenance of Laser Cutting Machines using Machine Learning Models



TRUMPF Inc. manufactures industrial laser-cutting machines designed to cut sheet metal. These machines are an essential part of their customers' manufacturing processes and even a few hours of unscheduled down-time can be very costly. To minimize the chances of this, we were tasked with researching and implementing machine learning models that would be able to predict when a machine would fail or need maintenance based on its usage and sensor data. Currently, the data collected from the laser-cutting machines is limited, so to simulate the future state of TRUMPF's data collection system, we generated synthetic datasets representing the data from 1,000 customers, consisting of a time-series log of various sensors on the machine. We used these datasets as training data for machine learning models by injecting patterns and correlations into it, and using repairs as a failure indicator. In addition to models such as a Bayesian model, we utilized clustering algorithms to identify the trends, patterns, and anomalies in the data.

Our research and demonstrations will allow TRUMPF to develop their data analysis process to incorporate machine learning by replacing the synthetic datasets with real sensor data. This will assist both TRUMPF and their customers to save money by minimizing the downtime of their laser-cutting machines.

COMPUTER SCIENCE AND ENGINEERING

TEAM 30

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Ryan Marsh
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ADVISOR

Wei Wei

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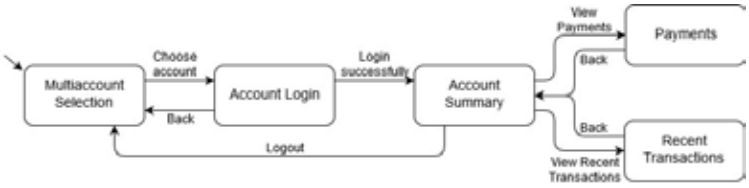
synchrony™

Interactive Canvas Personal Banking Application

Synchrony is working to continue leading the competitive financial industry by delivering innovative and intuitive banking experiences for their customers. Based on the convenience and growing popularity of voice enabled devices, Synchrony partnered with our team to develop a personal banking application for the Google Nest Hub, a smart speaker with a display. Our application allows customers to view their financial data by simply asking their Google Assistant.

Our application includes features such as viewing account details, recent payments, transactions, and PIN based authentication. We developed the application using Synchrony's existing voice API, HTML, CSS, Javascript, React, Google Actions, Dialogflow, and Firebase.

This application provides the consumer with a hassle-free, and hands-free, way to manage their financial accounts. It represents a continuation of Synchrony's strategy to innovate by leveraging cutting-edge hardware and software tools.



COMPUTER SCIENCE AND ENGINEERING

TEAM 31

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Zhuoqun Zhan
Sherry Zhang

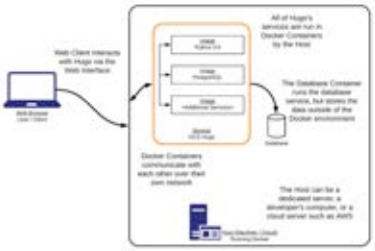
ADVISOR

Steven Demurjian

SPONSOR

UCONN SCHOOL OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING

OCS Hugo: Continuous Delivery



Student Affairs Information Technology (SAIT) provides primary IT support for all staff and departments within the Division of Student Affairs at UConn. For this project, SAIT is seeking to continue development of their project, OCS Hugo, as it moves from its current environment to a new continuous delivery system.

The purpose of Hugo is to assist the Off-Campus and Commuter Student Services department in documenting incidents and planning outreach activities. Hugo helps the office send move-in goodie bags and keep tabs on tenant / landlord issues and legal infractions that might be university-related even when they occur off campus. Hugo stores data which can be reported and represented through analytics and maps to highlight activity hotspots. The end goal is to make Hugo open source so other universities or organizations can use the service. The conversion will consist of creating a standardized environment using Docker, adding support for additional database systems, and removing branding among other tasks. Notable aspects of the project are adding database support for PostgreSQL and using Docker to simplify cloud deployment to services such as AWS and Google Cloud while also creating a stable environment for all users. Secondary goals include migrating from Python 2 to Python 3 and introducing OpenStreetMap in addition to the current support for Google Maps.

COMPUTER SCIENCE AND ENGINEERING

TEAM 32

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Ryan King
Daniel Janikowski
Mitko Alexander Mateev

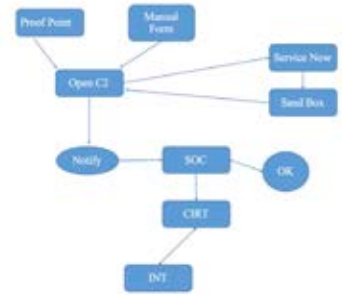
ADVISOR

Jacob Scoggin

SPONSOR

synchrony™

Phishing Orchestration

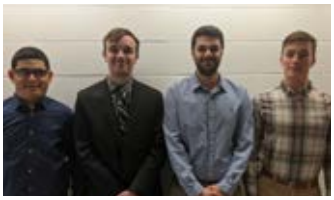


Phishing attacks are a combination of social engineering and technical methods that are used to obtain sensitive information from a user's data, such as login credentials or credit card numbers. Phishing occurs when an attacker disguises themself as a trusted entity in electronic communication. These attacks are aimed at exploiting weaknesses found in end users, such as humans not being properly trained to detect an attack. Phishing is a frequent problem for organizations.

Synchrony is a Fortune 500 company that wants to develop better, faster, and more granular actions for when phishing attacks happen. This is because their current workflow orchestration is not efficient. Attacks that are spread across multiple messages and platforms are challenging for humans to rapidly manage across specialized tools and teams. We were given the challenge to construct an adaptive, self-improving model to orchestrate phishing countermeasures using a cloud service mesh model framework that is a suite of OpenAPI specifications to orchestrate a diversity of phishing actions and associated telemetry.

Our goal for this project is to improve the efficiency of phishing detection at Synchrony. We research more efficient ways to communicate across phishing detection, mitigation and forensics teams in order to reduce the adverse effects of phishing on the company.

COMPUTER SCIENCE AND ENGINEERING



TEAM 33

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Kerwin Mercado
Stephen Moores

ADVISOR

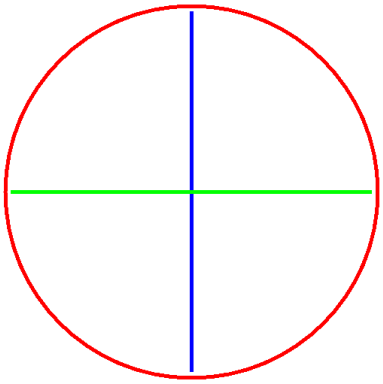
Hanna Aknouche-Martinsson

SPONSOR

GENERAL DYNAMICS
Electric Boat

Artificial Intelligence for Augmented Reality

The goal of this project was to utilize Artificial Intelligence, specifically a Convolutional Neural Network (CNN), to identify a specific symbol that Electric Boat utilizes during the building process. Ultimately, the final program would be able to locate and return the center pixel of the symbol in a given image. The CNN was designed utilizing both Python and Keras. Supervised training of the CNN was conducted using digital recreations of the symbol that were produced by a program that was able to manipulate the homography of a given image. The layers of the CNN were augmented throughout the design process to achieve greater accuracy and reduce over fitting. Once the CNN was trained, further work was done to allow the CNN to identify specific features of symbol, which in turn allowed the image to identify and return the center pixel.



COMPUTER SCIENCE AND ENGINEERING

TEAM 34

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ADVISOR

Seung-Hyun Hong

SPONSOR

Walter Nelson, Sr.
WNS Enterprises, LLC

Courtesy Messaging Signaling Device

Automobile accidents have been one of the leading causes of injury and/or death around the world. Through miscues, senseless driving, drunk driving, inattention, etc. people are paying the price with their livelihood or lives themselves. With the Courtesy Messaging Signaling Device (CMSD) we will attempt to decrease adverse impacts on property and lives by making roads safer. We envision that the CMSD will allow driver-to-driver and/or driver-to-pedestrian communication. Specifically, the technology will provide drivers with the ability to send messages to other drivers and/or pedestrians from their cars using an app that is accessible on a user's smartphone. In our demonstration of the technology, a driver would be equipped with an LED board that will allow message to be seen from other drivers or pedestrians in their vicinity. We believe that the addition of such technology will make a substantial difference in creating safer roadways for all users.

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