Olin College of Engineering

The Senior Capstone Program in Engineering Presents

SCOPE Summit

Tuesday, May 15, 2018
SCOPE Summit 2018

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Welcome from the SCOPE Leadership Team

Welcome to SCOPE Summit!

Today we join in celebration of the 72 Olin seniors who are presenting their Senior Capstone Program in Engineering (SCOPE) projects. These teams have worked long hours, grappled with challenging problems, and ultimately accomplished great things over the 2017-2018 academic year. SCOPE is the culmination of the students’ Olin experience. They have spent four years learning how to do engineering through engaging with successively larger and more complex projects, with increasing ambiguity and decreased scaffolding. While they have worked on numerous teams throughout their time at Olin, SCOPE is the place they put into practice everything they have learned about collaboration and maintaining healthy team dynamics. And now they have reached the end of the year having achieved both personal learning goals and significant problem solutions.

We wish to thank the sponsors for bringing us 14 amazing projects that varied widely in topic, development stage, and desired outcome. What these projects have in common is that they each address a problem of substantial interest to the sponsor, they are significantly challenging, and they are in technical areas and fields that match the skills and interests of our students. As you will see today, projects range from proof-of-concept prototypes of new medical technology to building equipment intended for near-term use on the manufacturing floor; from wide-open design of autonomous vehicles that meet the needs of an aging population to implementation of a new method to make commercial vehicles safer. Regardless of the area, grappling with important real-world projects in the context of a sponsor’s culture, provides our students with a unique educational experience and an opportunity to apply the skills they have been building during their four years at Olin.

Finally, we want to offer a special thank you to the individuals who made this work possible -- the liaisons from each sponsor who supported and mentored the teams throughout the year and the Olin faculty advising team that mentored and coached teams.

We hope you enjoy this year’s SCOPE Summit!

SCOPE Leadership Team:

Alisha Sarang-Sieminski  
Director of SCOPE  
Associate Professor of Bioengineering

Ruth Levine  
Director of Business Development

Jessica McCarthy  
SCOPE Program Manager
Amazon Robotics

Robotic Pick and Place

Amazon Robotics is a subsidiary company of Amazon that specializes in manufacturing leading technology for future fulfillment centers. When Amazon orders are placed, minimizing delivery time to customers is critical. Due to rapid growth, Amazon is planning to expand by creating new fulfillment centers all across the US and is also seeking to find more efficient ways to deliver products to customers. Amazon Robotics is looking to increase the throughput of fulfillment centers by augmenting their existing capabilities with robotic assistive systems. Our SCOPE team carried forward the progress made by the previous Amazon Robotics SCOPE team to design, build, and demonstrate advanced robotic capabilities.

Faculty Advisor: Samantha Michalka

Team Members: Anna Buchele
Rocco DiVerdi
Yuzhong Huang
Hunter Normandeau
Ziyu Wang
Juan Carlos del Rio
Boeing

Improving the Wire Harness Manufacturing Process

As airplanes modernize, traditional mechanical systems have given way to increasingly complex electrical systems. This has been accompanied by a commensurate increase in the number and complexity of wire bundles used to assemble these systems. Boeing has identified increasing the efficiency of producing these wire bundles as a key area of interest, and our SCOPE team was tasked with improving a subset of these manufacturing processes. The team designed and built a prototype production module to improve the processing of wire bundles.

Faculty Advisor: Alisha Sarang-Sieminski

Team Members: Kevin Crispie
               Aubrey Dority
               Trent Dye
               Marie-Caroline Finke
               Isaac Getto
               William Lu
Boston Scientific

Improved ERCP Cannulation

Boston Scientific's (BSC's) mission is to transform lives through innovative medical solutions that improve the health of patients around the world. BSC continues to develop endoscopic devices used by physicians worldwide to treat patients with a variety of conditions. For example, Endoscopic Retrograde Cholangio-Pancreatography (ERCP) is a complicated gastrointestinal procedure used to diagnose and treat the conditions of the pancreatic and bile ducts. Accessing these ducts through cannulation is a time-consuming, difficult, and skill intensive process. Innovations in the cannulation process can significantly improve procedure time, user experience, and patient outcomes. The 2017-2018 Boston Scientific SCOPE team explored, tested, and designed a potentially revolutionary cannulation process to make recommendations to BSC on the feasibility and design of the new cannulation design.

Faculty Advisor: Alisha Sarang-Sieminski

Team Members: Daniel Bishop
Frances Devanbu
Rebecca Gettys
Wilson Tang
Effective research in water science requires combining information from multiple sources, which requires collaboration and hydrologic information systems to support sharing, discovery, analysis, management, and publication of data and computer models. Collaborative platforms and data tools are being developed to aid researchers, students, citizen scientists, and educators in accomplishing these tasks so that they can better focus their efforts on addressing the scientific issues. The Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) SCOPE team evaluated one such collaborative platform, HydroShare, which was funded by the National Science Foundation and is now maintained by CUAHSI, that enables sharing and publishing of hydrologic data and models. The CUAHSI SCOPE team conducted user-based research, in the form of interviews, codesign, UX tests, and prototyping, among other methods, to evaluate and design an improved user experience for HydroShare. The user-oriented project focused on identifying key users and workflows, defining current limitations of the system, and developing a comprehensive document of design recommendations. The SCOPE team also documented their design process in order to inform future improvements to HydroShare.

Faculty Advisor: Jason Woodard

Team Members: Celina Bekins
Andrew Deaver
Mackenzie Frackleton
Patrick Huston
Keenan Zucker
Dassault Systemes SolidWorks

SOLIDWORKS Apps for Kids: Slice It!

The Slice It app is part of the SOLIDWORKS Apps for Kids suite. It allows users to explore the geometrical potential of planar forms coming together to form a shape. Using Shape It (an Apps for Kids app), users will be able to virtually create their model before Slice It takes the model and "slices" it into planar pieces that fit together. Drawing from topics familiar to children such as origami, model making, and sewing patterns, the language and examples are accessible to young minds and hands. Like the other Apps for Kids apps, the goal is to engage young minds in the field of engineering and design and to physically create a 3D object using 2D materials without expensive or unattainable equipment.

Faculty Advisor: Jason Woodard

Team Members: Zarin Bhuiyan
Scott Mackinlay
Hieu Nguyen
Hannah Twigg-Smith
William Wong
Fidelity Labs

Denarius

The goal of this year’s project with Fidelity Labs was to explore how to simplify the experience of monitoring and managing digital assets. Established in 1998, Fidelity Labs is the innovation engine for Fidelity Investments. They research and employ emerging technologies and design thinking to address big societal issues for Fidelity’s customers. With a global team of more than 100, they provide expertise across Fidelity to lead the firm in exploring new technologies, services and lines of business. More information about their work can be found at fidelitylabs.com.

Faculty Advisor: Jason Woodard

Team Members: David Abrahams
Sean Carter
Ziyi Lan
Joseph Maalouf
Joseph Sutker
Jordan Van Duyne
GE Healthcare

Increasing Mobile X-Ray Efficacy through Technology-Assisted Alignment

Mobile X-Rays are employed for patients who cannot be transferred to fixed radiography facilities. In a hospital setting, this includes both patients who can’t be moved (e.g., ICU patients) as well as time-critical ER cases. However, mobile systems also require retakes in roughly 25% of imagings - mainly due to misaligned or improperly positioned collimators and detectors. In practice, these errors expose patients to unneeded radiation and cost technologists time; in urgent care environments, this can further delay treatments and negatively affect patient outcomes. Our team explored mechanisms to reduce retake rates - both to improve standards of patient care, and to give GE an advantage over its competitors in the mobile x-ray industry.

Faculty Advisor: Samantha Michalka

Team Members: Jee Hyun Kim
Jong Nam
Jeffrey Pflueger
Matthew Ruehle
Thuc Tran

GE Healthcare
Mitsubishi Electric

Share Meals, Make Friends: Creating Communities in the Golden Years

The Center for Future Innovation of Mitsubishi Electric uses human-centered design to create new, innovative products. Last year’s SCOPE team was tasked with exploring the intersection of food, aging and technology, and developing a concept prototype to address the key issues and insights they had identified. This year’s team continued to explore the field of food, aging, and technology, with a particular focus on community development. The team leveraged last year’s insights and prototype to understand and define a device that could help older adults engage with their communities through food. Ultimately, the team developed a functional prototype based on cycles of an iterative human-centered design process.

Faculty Advisor: Alexandra Coso Strong

Team Members: Shruti Iyer
Margaret Jakus
Brenna Manning
Mary Martin
Additive Manufacturing of Magnetic Materials to Improve RF Circuitry

While active components have gotten smaller, the past few decades have seen little improvement in the size of passive integrated circuit components. By decreasing the size and increasing the functionality of these components, integrated circuits can become smaller, faster, and cheaper. Low-cost additive manufacturing of ferromagnetic inks for RF integrated circuits provides a promising opportunity to improve these large components. The 2017-18 Raytheon SCOPE team fabricated and tested additive manufactured ferromagnetic inks on passive RF circuit components. A complex RF circuit was used to demonstrate the effects of this emerging technology.

Faculty Advisor: Samantha Michalka

Team Members: Lisa Hachmann
               Thomas Heale
               Taejin Kim
               Logan Sweet
               Ezra Varady
Rockwell Automation

Improving Human-Robot Collaboration through Wearable Technology and Emotional Intelligence

Rockwell Automation provides industrial automation and information to many factories, some of which use human workers alongside automated processes to perform certain tasks. As the next generation of employees enters the workforce, Rockwell Automation wants to imagine what the factory of the future might look like. For the 2017-18 academic year, our project was to transform human-robot interaction in the industrial setting into one of teamwork and true collaboration. By harnessing wearable technologies and a user-centered design process, we created a solution that builds emotional intelligence between robots and humans, to ensure that the factory of the future can be smarter, safer, and more efficient.

Faculty Advisor: Alexandra Coso Strong

Team Members: Kathryn Hite
              Shane Kelly
              Nur Shlapobersky
              Zhecan Wang
              Byron Wasti
Sonos

PLAYTEST: Characterizing Speaker Walking

The Sonos vision is to fill every home with music and make listening a valued experience again. To achieve this, they created a family of high quality, multi-room WiFi speakers. With any powerful speaker, ‘walking’ can occur when the vibrations from the transducers align closely with the speaker’s natural frequency, causing it to move from its original position. Rigorous testing is part of the design process to ensure that no speaker is released with this problem. The SCOPE team created a test rig to characterize speaker ‘walking’ with direct sensor measurement and provided processed data to aid with the company’s design process.

Faculty Advisor: Samantha Michalka

Team Members: John Bozzella
Lilia Chan
Kai Levy
Franton Lin
Kelli Shimazu
Robert Siegel
Tata Motors/Autodesk

Collaborative Design of Autonomous Vehicles for Aging Adults

A cloud technology-based interdisciplinary collaboration between a globally distributed team of design engineers and automotive designers, focused on developing a new automotive space for aging adults

The goal of TOCA Design (Tata Motors | Olin College | Coventry University | Autodesk) was to bring autonomous vehicles to a group traditionally underserved by the tech sector: aging adults. This distributed project was a radical collaboration between students from Olin College of Engineering and Coventry University’s Automotive Design program, who worked as one team to bring insights into the public eye. The team used Autodesk’s cloud based design and CAD tools - including Fusion 360 - to facilitate collaboration, and document the insights, learnings, and processes along the way to help industry and academia learn from this experience.

Faculty Advisor: Alexandra Coso Strong

Olin Team Members:
Brett Atkinson Cecilia Diehl
Alix McCabe Rebecca Patterson
Brennan VandenHoek

Coventry Team Members:
Hassan Ahmed Alexey Andreev
Matthew Aston Owain Davies
Benjamin Thompson
TE Connectivity

Innovative Actuator Development for Aerospace Applications

TE Connectivity is a company that designs and manufactures connector and sensor products for harsh environments in a variety of industries. One of their primary clients is the aerospace industry, for which they provide actuators and relays, among other products. We worked on an innovative design for actuators to be used in aircraft. Weight is an important consideration in aerospace applications, and we designed a mechanism that is reliable, low weight and low power.

Faculty Advisor: Alexandra Coso Strong

Team Members: Gordon Haag
Giulia Klein
Manik Sethi
Suraj Shroff
Xiaozheng Xu
The Volpe National Transportation Systems Center improves transportation by anticipating and addressing emerging issues and advancing technical, operational, and institutional innovations across all modes. The Santos Foundation is a non-profit organization dedicated to improving transportation safety. With the guidance of Volpe and the support of the Santos Foundation, the VIEW project aims to help save lives by reducing collisions between heavy vehicles and vulnerable road users. Through blind spot characterization and analysis informing a truck safety rating system, we will influence future truck design and fleet policies by increasing access to design tools.

Faculty Advisor: Jason Woodard

Team Members: Gabriel Butterick
               Rebecca Jordan
               Elizabeth Sundsmo
               Kristyn Walker
               Lucy Wilcox
Thank you!

Olin College thanks our 2017-18 SCOPE sponsors. Their support of the SCOPE program represents a significant contribution to the advancement of the College’s mission and the development of a successful and challenging program for our students.

Amazon Robotics
Boeing
Boston Scientific
CUAHSI
Dassault Systèmes SolidWorks
Fidelity Labs
GE Healthcare
Mitsubishi Electric
Raytheon
Rockwell Automation
Sonos
Tata Motors/Autodesk
TE Connectivity
Volpe Center/Santos Family Foundation

A special thank you to Aramark for sponsoring today’s campus-wide lunch.
## SCOPE Summit 2018
### Schedule of Events

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 am – 10:00 am</td>
<td>Continental Breakfast and Registration</td>
<td>Milas Hall Lobby and Gallery</td>
</tr>
<tr>
<td>10:00 am – 10:15 am</td>
<td>Welcome from Olin Leadership</td>
<td>Norden Auditorium, Milas Hall</td>
</tr>
<tr>
<td>10:15 am – 11:15 am</td>
<td>Rocket Talks by SCOPE Teams 1 - 7</td>
<td>Norden Auditorium, Milas Hall</td>
</tr>
<tr>
<td>11:15 am – 11:30 am</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>11:30 am – 12:30 pm</td>
<td>Rocket Talks by SCOPE Teams 8 - 14</td>
<td>Norden Auditorium, Milas Hall</td>
</tr>
<tr>
<td>12:30 pm – 1:30 pm</td>
<td>Lunch</td>
<td>Campus Center</td>
</tr>
<tr>
<td>1:30 pm – 2:30 pm</td>
<td>Poster Session</td>
<td>Tent in the Oval</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rain location: Campus Center, 2\textsuperscript{nd} floor</td>
</tr>
<tr>
<td>2:00 pm – 3:00 pm</td>
<td>Reception</td>
<td>Tent in the Oval</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rain location: Campus Center, 2\textsuperscript{nd} floor</td>
</tr>
</tbody>
</table>

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