

SCOPE SUMMIT 2023-2024



SCOPE Senior Capstone Projects

Amazon Robotics

Avalanche Energy

Blue Origin

Boston Scientific

Fidelity Center for Applied Technology

LineVision

Moderna

New Balance

Pfizer


Santos Family Foundation / Volpe Center

Semtech

SparkCharge

Watts Water Technologies



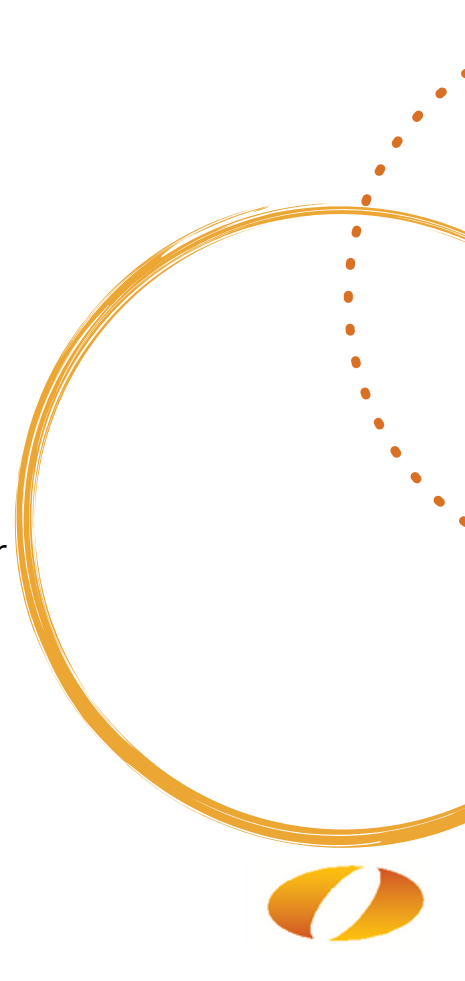


Hello and welcome to SCOPE Summit!

Today we're gathered to celebrate the 64 Olin seniors who are presenting their work as part of the Senior Capstone Program in Engineering (SCOPE). We're so glad that you're with us today to participate in our Summit, both in person and via livestream.

SCOPE is the culmination of the students' Olin experience. In it, students put into practice everything they learned at Olin about problem solving, technical and design skills, collaboration and team building. SCOPE teams work together for a full academic year to solve challenging, real-world problems. You'll hear about projects representing a broad range of topics across different industries: students designed and built things, coded software, developed expertise in new domains and applied human-centered design methods while also sharpening their skills in project management, team dynamics, budgeting and tackling unforeseen challenges. They grew personally and professionally, collaborating with sponsors and faculty. Students: we're proud of you. You made it!

We wish to thank our sponsors for 13 amazing projects. You provided us with projects which were important to your organization and challenging for our students, projects which matched the technical skills and interests of our students. Most of the outcomes you'll hear about today will be taken up and applied by you, our sponsors. This resulted in a meaningful and exciting experience for our students, which will impact them for years to come.



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 and subject matter experts who mentored and coached teams.

Lastly, we'd like to take the time to thank Ruth Levine who will be retiring from Olin this June. As Director of Strategic Industry Partnerships for the last 14 years, Ruth has left an indelible mark on the SCOPE program. For those of you who have sponsored, mentored, advised or participated in SCOPE, you have experienced first hand the impact Ruth has had on Olin's signature capstone program. We will miss her!

We hope you enjoy this year's SCOPE Summit!

Sarah Bloomer

Academic Director of SCOPE,
Visiting Professor of Design

Ruth Levine

Director of Strategic
Industry Partnerships

Alessandra Ferzoco

Assistant Professor of
Measurement Science

Jessica McCarthy

SCOPE Program Director

Lauren Palmer

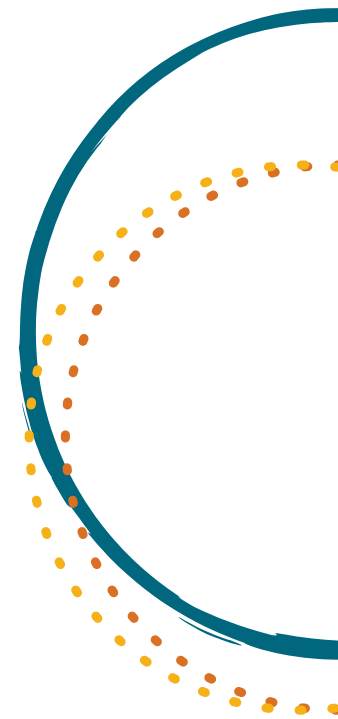
Associate Director of
Partnership
Development

Lawrence Neeley

Associate Professor of
Design and Entrepreneurship

Lynn Andrea Stein

Professor of Computer
and Cognitive Science



SCHEDULE OF EVENTS

WEDNESDAY, MAY 8, 2024

- | | |
|----------------------|--|
| 12:30–1:00 PM | Registration
Milas Hall Lobby |
| 1:00–1:10 PM | Welcome from Olin Leadership
Norden Auditorium, Milas Hall |
| 1:10–2:15 PM | Presentations by SCOPE Teams |
| 2:15–2:30 PM | Break |
| 2:30–3:30 PM | Presentations by SCOPE Teams |
| 3:30–4:30 PM | Poster Session & Concurrent Reception
Milas Hall |



Olin College
of Engineering
SCOPE

AMAZON ROBOTICS

Amazon Object Manipulation Taxonomy

Autonomous robotics is revolutionizing the current commercial landscape across many different fields to create more efficient and safe solutions for repetitive tasks. Amazon Robotics is a leader in the use of robotics in object manipulation and remains committed to pushing innovation and exploration in the field to deliver a broad range of products to consumers at a low cost. This year's SCOPE team created an extensible object taxonomy framework and implemented an integrated active perception system to predict the performance of various object gripping strategies. This system can be used to enable a more diverse range of robot picking form factors and increase accuracy in warehouse operations at Amazon.

Team Members

Abitamim Bharmal

Allison Li

Shree Madan

Anusha Karandikar

Krishna Suresh

Faculty Advisor

Lawrence Neeley

Project Poster



AVALANCHE ENERGY

Compact High-Voltage Power Supply for Nuclear Fusion Reactor

Avalanche Energy is working on new electrostatic confinement technology to make a bench top nuclear fusion generator. Our project was to investigate the feasibility of compact high voltage power supplies that can operate in the range of hundreds of kilovolts and interface with their preexisting system.

Team Members

Avery Clowes
Makenzi Fischbach
Gigi Mancuso-Jackson
Conan McGannon
Charlotte Ramiro
Chris Sanchez

Faculty Advisor

Alessandra Ferzoco

[Project Poster](#)



BLUE ORIGIN

Blue Origin: PCB Rework Station

During development, it is common to rework or modify certain aspects of printed circuit board assemblies (PCBAs) to meet ever-changing design requirements. They are the backbone of all electronic devices and hold together all the important electrical components. PCBAs are used in almost everything, ranging from simple tasks like heating up your food in the microwave to powering incredibly complex networks of computers such as Blue Origin rocket ships. The current rework process is time consuming and tedious. We worked closely with Blue Origin's research and development lab to understand the standards and difficulties of PCBA rework and designed a workstation to revolutionize this process. This station is self-contained and significantly reduces lead times, allowing Blue Origin to complete all rework in-house. Major challenges included understanding and designing around user ergonomics, mitigating environmental hazards, and providing the precision needed for PCBA rework while meeting all industry standards.

Team Members

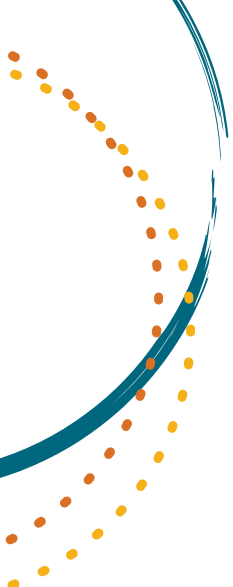
Aaron Huang
Rohith Tatineni
Jeremy Wenger
Elias Wheatfall

Faculty Advisor

Lawrence Neeley

[Project Poster](#)





BOSTON SCIENTIFIC

Identifying Potential New Materials for Endoluminal Vacuum Therapy

Endoluminal Vacuum Therapy (EVT) is a medical procedure used to treat disease conditions of the gastrointestinal (GI) tract, particularly complications that can arise after surgery, accidental ingestion, previous GI interventions among other aetiologies. It is a minimally invasive technique that can help manage conditions such as leaks, perforations, fistulas, or abscesses in the GI tract. This typically involves placing a sponge that is connected to a vacuum system at the wound site to promote and accelerate healing. Currently, EVT is seen as a novel procedure that shows promise of being an adaptable and inexpensive procedure. However, it is being held back by the various hidden costs caused by the difficulty in monitoring healing progress and the need tailoring a standard sponge to individual patients at different stages of healing.

Boston Scientific, a leader in the medical device industry, tasked the 2023-2024 BSC SCOPE team with the challenge of identifying potential alternative materials to make EVT more effective and minimize the judgement calculations needed for doctors to customize sponges to patients.

Team Members

Esme Abbot

Ale Cuevas

Grant Goodall

Jaclyn Ho

Jen Sundstrom

Faculty Advisor

Sarah Bloomer

[Project Poster](#)



**Boston
Scientific**

Advancing science for life™



FIDELITY CENTER FOR APPLIED TECHNOLOGY

Sustainable Investing: Developing a Novel ESG Tool for the Next Generation of Investors

Young investors are increasingly looking to find ways to integrate their personal values surrounding sustainability and social concerns with how they invest. However, with conflicting information and a culture of distrust, current values-based investing systems hinder the ability for new investors to align their investments with their values effectively. In response to this issue, our team has developed OVBI (Olin Value Based Investing), an experimental accessible and user-friendly values-based investing tool that could serve as a comprehensive method for evaluating and grading different companies based on their genuine practices. By providing a structured approach to values-based investing analysis, we have demystified the previously opaque data collection and ranking processes with the goal of making it more accessible to all, regardless of their financial expertise. Record ID: 1110184.1.0

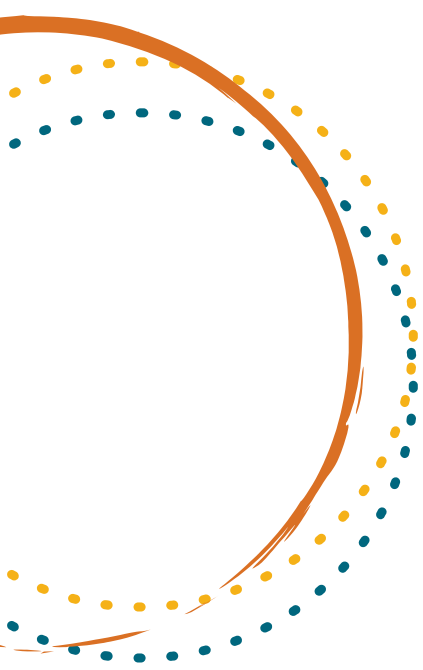
Team Members

Emma Fox
Raúl Frías Pérez
Priscila Morales
Keanu Richards
Stella Stark

Faculty Advisor

Lynn Andrea Stein

Project Poster



LINEVISION

LineVision Satellite Communications Development Team

LineVision's patented contactless LiDAR scanning service, the LUX, equips transmission providers with the analytics to optimize their power transmission efficiency. Currently, the LUX uses cellular services to transmit a LiDAR point cloud to LineVision, where it is analyzed for metrics that characterize the potential power drawn through the line.

We implemented commercial low bandwidth satellite connectivity compatibility into the LUX system; doing so allows LineVision to expand coverage to include remote areas with insufficient cellular coverage. Sending data over satellite comes with several constraints, most notably the limitation of packet transmission size and power consumption. By pivoting from a compression algorithm to conducting the metric extraction on-board before the data was sent, we reduced the transmission size by orders of magnitude, while maintaining a comparable power draw. Ultimately, our prototype successfully sent data over satellite with the frequency promised to customers while accommodating power and bandwidth constraints. These are the first steps towards improving the scalability of the LUX for a low bandwidth satellite solution.

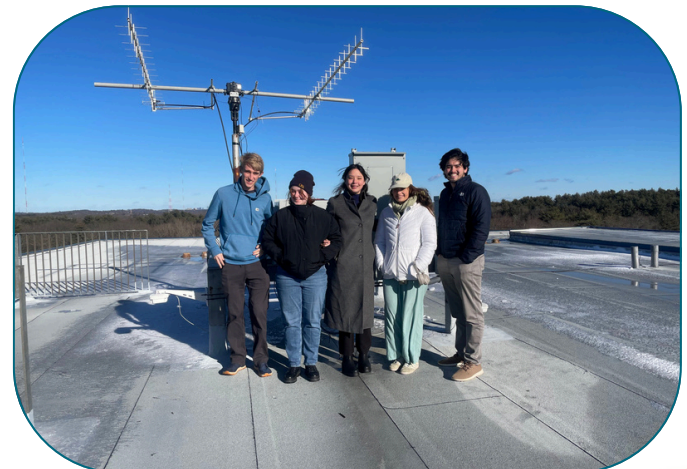
Team Members

Charlie Babe
Dasha Chadiuk
Katie Fleming
Grant Miner
Abby Omer

Faculty Advisor

Lynn Andrea Stein

Project Poster



MODERNA

High-throughput pH Characterization of Lipid Nanoparticle Formulations

Moderna's mission is to deliver the greatest possible impact to people through mRNA medicines. mRNA is an information molecule that instructs cells to produce specific proteins that can treat or prevent disease. mRNA molecules are encapsulated in lipid nanoparticles that serve as delivery vehicles, protecting mRNA until it reaches the target cells. Rapid development of new drug formulations requires thorough chemical and physical characterization of lipid nanoparticle - mRNA formulations. pH measurement is one of the key factors that contributes to the success of a drug formulations. The Olin SCOPE team was tasked with designing a device to perform 96 pH measurements within 15 minutes. This first-in-class technology is an order of magnitude faster than current methods and will greatly expedite the characterization of new formulations.

Team Members

Chris Bocamazo

Ian Eykamp

Cara Mulrooney

Van Myers

Antoinette Tan

Faculty Advisor

Alessandra Ferzoco

[Project Poster](#)



moderna



NEW BALANCE

New Balance Manufacturing Innovation

New Balance is dedicated to increasing manufacturing within the United States and building new technology into their automated manufacturing processes. The Manufacturing Innovation SCOPE team designed and prototyped solutions that will automate several critical, labor-intensive steps in materials processing for shoe manufacturing. Automating this step in the manufacturing process will increase operator safety and reduce production time.

Team Members

Sophia Borovikova

Sydney Chung

Liv Dawes

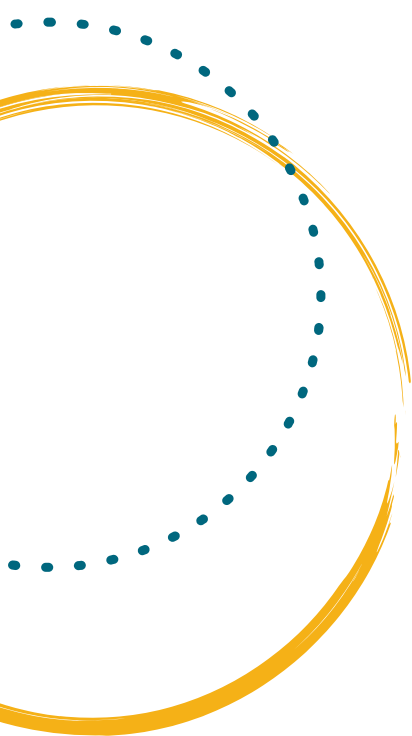
CJ Hilty

Jadelin Kirkvold

Faculty Advisor

Lawrence Neeley

[Project Poster](#)



B
new balance



PFIZER

Clinical Supply Study Complexity and Risk Assessment

Pfizer GCS evaluates clinical trial complexity to optimally allocate limited GCS resources across hundreds of trials each year. Our team was tasked with identifying opportunities for improved quantitative analysis for GCS complexity scoring. We leveraged existing data to propose a new complexity model and updated dashboard visualizations to deliver precise metrics to better inform GCS decision making. To address gaps in historical data for manually entered responses to study complexity questions and eliminate expensive manual entry processes in the future, we proposed and prototyped several automated data collection techniques for complexity scoring machine learning models that could be implemented at GCS.

Team Members

Dre Hilton
Evelyn Kessler
Berwin Lan
Miles Mezaki
Trevor Zou

Faculty Advisor

Lynn Andrea Stein

Project Poster



SANTOS FAMILY FOUNDATION / VOLPE CENTER

VIEW 2.0: Direct Vision Assessment System

Vehicle blind zone awareness is critical to the safety of all road users, whether they are in the driver's seat or outside the vehicle. Vehicles contribute to an alarming pedestrian and cyclist safety crisis, and there is an annual increase in injuries and fatalities. Our SCOPE team collaborated with the Volpe National Transportation Systems Center, the Santos Family Foundation, and the Insurance Institute for Highway Safety (IIHS) to reinvent VIEW, a blind-zone measurement tool for vehicles and a crowd-sourced database of blind-zones created by the 2017-2018 SCOPE team. We assessed and implemented a new method to calculate blind zones using LiDAR, which decreased errors by over 85% and increased data collection efficiency. In addition, we reevaluated the previous user experience of the site navigation and data collection to create a new site with improved usability. Our new site integrates the LiDAR method, displays a database of vehicle blind zones, and provides key information about direct vision. VIEW 2.0 will be used to help design, select, and deploy safer vehicles, demonstrating the importance of direct vision for traffic safety involving vulnerable road users.

Team Members
Gabrielle Blake
Myles Lack-Zell
Claire Hashizume
Alexander Matsoukas
Benjamin Morris

Faculty Advisor
Lynn Andrea Stein

[Project Poster](#)



SEMTECH

Water Everywhere: Understanding & Preventing Frozen Pipe Bursts with Modern IoT

Recent extreme weather events in places like Texas, fueled by climate change, have highlighted a key vulnerability in their existing plumbing infrastructure: water pipes are susceptible to freezing and bursting, causing untold property damage. Our SCOPE project investigated how to solve the pipe-bursting problem and improve the resilience of plumbing infrastructure everywhere with an Internet of Things (IoT) approach, where intelligent sensing and action-taking modules are distributed throughout a building. We conducted experiments on representative plumbing systems to understand why pipes burst, how to measure plumbing systems to anticipate freezing events, and how to take action to avoid bursts. We explored Semtech's LoRa® IoT communications technology to unite the disparate sensing & action-taking components of our automated solution in environments that remain challenging for other technologies. Our experimental results, prototypes, and proposed solution architectures enable the ability to provide smart infrastructure upgrades to solve the pipe-bursting problem in the real world.

Team Members

Aaron Blust
Jack Levitsky
Andrew Phillips
Luke Raus

Faculty Advisor

Alessandra Ferzoco

[Project Poster](#)



SPARKCHARGE

SparkCharge Roadie V3 Environmental Hardening

A major obstacle to the widespread adoption of electric vehicles is the inability to refuel as efficiently as their internal combustion counterparts. SparkCharge, a leader in mobile EV charging solutions, currently serves markets across the United States, with services ranging from out-of-charge assistance to large-scale fleet charging. To ensure SparkCharge products are capable of providing consistent and reliable coverage at all times, the SparkCharge SCOPE team aimed to introduce retrofittable solutions to the Roadie V3 system that eliminate vulnerabilities during severe weather conditions.

Team Members

Audrey Abraham

Carlo Colizzi

Sofia Goldberg

Jong Ho Lee

Moisés Sabido García

Faculty Advisor

Alessandra Ferzoco

[Project Poster](#)



SPARKCHARGE®



WATTS WATER TECHNOLOGIES

Failure Mode Analysis of NFC Near Plumbing Infrastructure

Temperature sensors that can be communicated with and be powered by smartphones instead of on-board electronics could improve plumbing installation and troubleshooting workflows, and demonstrate a new concept for internet of things (IoT) devices. Our objective was to learn about the possibilities and limitations of modern tools and strategies for near field communication (NFC) in various environments for smartphone-powered IoT. We researched existing technologies and standards, designed a custom PCB, app, and testing rig, and provided data-backed insights to Watts to help their future product designs.

Team Members

Ishaan Oberoi
Shamama Sirroon
Jacob Smilg
Lauren Xiong

Faculty Advisor

Alessandra Ferzoco

[Project Poster](#)

