

DEMO DAY

Jumpstart Your
Engineering Career
SUMMER PROGRAM

2026



AshAlert,
Best Team Award Demo Day 2025



A. James Clark School of Engineering

UMD CPSE

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About UMD CPSE

The Cyber-Physical Systems Engineering (CPSE) program, located at the Universities at Shady Grove, is offered by the Department of Electrical & Computer Engineering at the University of Maryland, College Park. This innovative engineering program blends core principles from computer science, electrical engineering, and computer engineering to design and develop systems that integrate physical processes with software and hardware components.

Cyber-physical systems are becoming increasingly important in various industries, such as transportation, healthcare, environmental resilience, security and manufacturing, which is anticipated to further grow in the coming years. Our students learn about cutting edge topics such as embedded systems, real-time computing, robotics, machine learning and cybersecurity.

Jumpstart Your Engineering Career | CPSE Summer Program

The UMD CPSE “Jumpstart Your Engineering Career” Summer Program is a five-week immersive experience focused on the Internet of Things (IoT) and cyber-physical systems. Selected students gain hands-on experience working with electronics, sensors, and microcontrollers. They also collaborate on projects from ideation to rapid prototyping in a real-world design environment, culminating in a Demo Day Showcase where they present their final projects.

JUMPSTART YOUR ENGINEERING CAREER | SUMMER PROGRAM

UMD CPSE DEMO DAY AT USG



Friday, August 14th, 2026 | 3:45pm-8:45pm

◆ This year's keynote speaker is Dr. Tsu-Jae Liu. ◆

Food and refreshments will be served from 3:45 PM - 6:00 PM

3:45 Engineering Project Showcases

11 Jumpstart Student Teams

6:00 Welcome, Program Video & Opening Remarks

Juliana Rozario, Administrative Specialist, UMD CPSE

Video Production: Jake Speer, Digital & Visual Media, UMD CPSE

Dr. Anne Khademian, Executive Director, The Universities at Shady Grove

Dr. Romel Gomez, Program Director, UMD CPSE

6:25 Keynote Address

Dr. Tsu-Jae Liu, President, National Academy of Engineering

6:45 Remarks

Dr. Nestor Tiglao, Jumpstart Chief Innovation Architect, UMD CPSE

6:50 Engineering Project Pitches

11 Jumpstart Student Teams

8:00 Special Recognitions & Awards

Matt Schuyler, Jumpstart Lead Technical Advisor, UMD CPSE

8:45 Event Concludes

Special Appreciation to our Demo Day Judges

Judges for the Engineering Excellence Award & Impact & Innovation Award***

Joyce Fuhrmann**

Director, The Universities at Shady Grove

Michelle Marcellino**

Director of College Park Programs, USG

Dr. Lan Xiang*

Department Chair of Engineering, Physics &
Geosciences, Montgomery College - Rockville
Campus

Cara Rocha-Ortanez**

Director of Operations, RNO E-Tech

Tracey Brown**

Training Program Manager, World BioHazTec

Dr. Abhishek Motayed*

CEO & Founder, N5 Sensors



JUMPSTART TEAM

BIKE E-BUDDY

Bike safety needs a buddy.

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THE CHALLENGE

For cyclists, sharing the road with larger vehicles can be dangerous, especially on narrow or poorly lit streets. Riders may not always realize when a car is approaching from behind, while drivers can have difficulty seeing a bicycle or understanding where the cyclist intends to move.

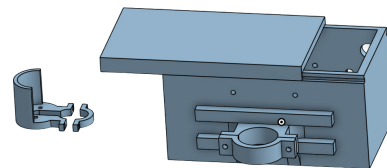
THE SOLUTION

Bike E-Buddy developed a smart bicycle safety system. A rear-facing radar sensor detects approaching vehicles and measures their distance and relative speed. GPS directions are sent from a mobile application to an ESP32 microcontroller, which activates vibration motors in the handlebars to guide the rider through left and right turns. Brake

lights, LED indicators, and turn signals also help the bicycle communicate with nearby drivers.

THE IMPACT

By giving cyclists greater awareness without requiring them to look away from the road, Bike E-Buddy could make everyday riding safer, smarter, and more comfortable.



CAD of bike attachment

Designed by
Matthew Boyce &
Benjamin Peng

ENGINEERING TOOLBOX



Radar sensor



Bluetooth Communication



GPS



Haptic Navigation



Team Members

Matthew Boyce

Software, Hardware & CAD Developer

Owen Garland

Electronics & Hardware Developer

Austin Hwang

Electronics & Hardware Developer

Jayden Williams

Project Leader, Software & App Developer

Benjamin Peng

CAD Developer

JUMPSTART TEAM

DOT BOT

Small dots. Big stories.

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**WORLD
BioHazTec**
PRACTICE SAFE SCIENCE

CELEBRATING
30
YEARS

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Team Members

Andrew Chestnut

Software & App Developer

Brianna Yan

*Project Leader, CAD, &
Mechanical Developer*

Kiyoma Algama

Hardware Developer

Nina Faustini

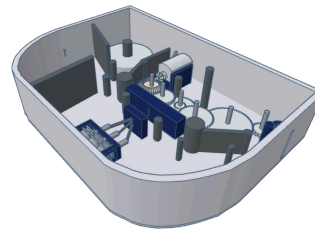
Software Developer

THE CHALLENGE

Labels help people organize and navigate their surroundings, but most printed labels are inaccessible to individuals who are blind or have low vision. Inspired by a team member's blind friend, Team Dot Bot created a portable device that produces customized Braille labels.

THE SOLUTION

Through a companion application, users can type or speak the words they want printed. The software translates the input into Braille and sends the information to the device. Push-pull solenoids then emboss the correct pattern of raised dots onto adhesive label tape. The team combined speech recognition, Python programming, wireless



CAD of
Braille mechanism

*Designed by
Brianna Yan*

communication, electronics, CAD, and mechanical design to bring the system together.

THE IMPACT

Dot Bot could allow users to label food containers, medications, and other everyday items. By making customized Braille labels easier to create, the device could support greater independence at home, at school, and in unfamiliar environments.

**ENGINEERING
TOOLBOX**



Solenoids



Raspberry Pi



Python



Companion App

JUMPSTART TEAM

WECYCLE

Do your part, sort smart.

THE CHALLENGE

Recycling can be confusing. When people are unsure which bin an item belongs in, recyclable materials may become contaminated or be sent to landfills instead. WeCycle made proper waste disposal easier through an automated, AI-powered sorting system.

THE SOLUTION

Users place an item into a single opening, where cameras connected to a Raspberry Pi capture images from multiple angles. An artificial intelligence model analyzes those images and identifies the object as plastic, paper, metal, glass, or trash. The classification is then sent to an Arduino, which moves a motorized platform along a

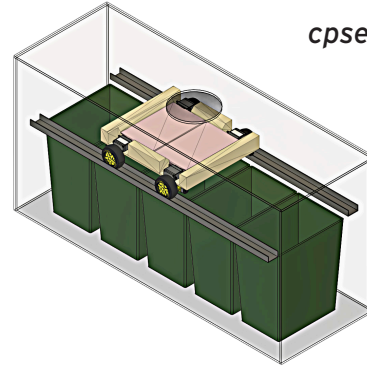
rail system. Once the platform reaches the correct bin, servo motors open it and release the item.

THE IMPACT

By removing much of the guesswork from recycling, WeCycle could improve sorting accuracy and encourage more sustainable habits in homes, schools, offices, and public buildings.

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CAD of sorting
mechanism

Designed by
Mischa Desai

ENGINEERING TOOLBOX



Arduino

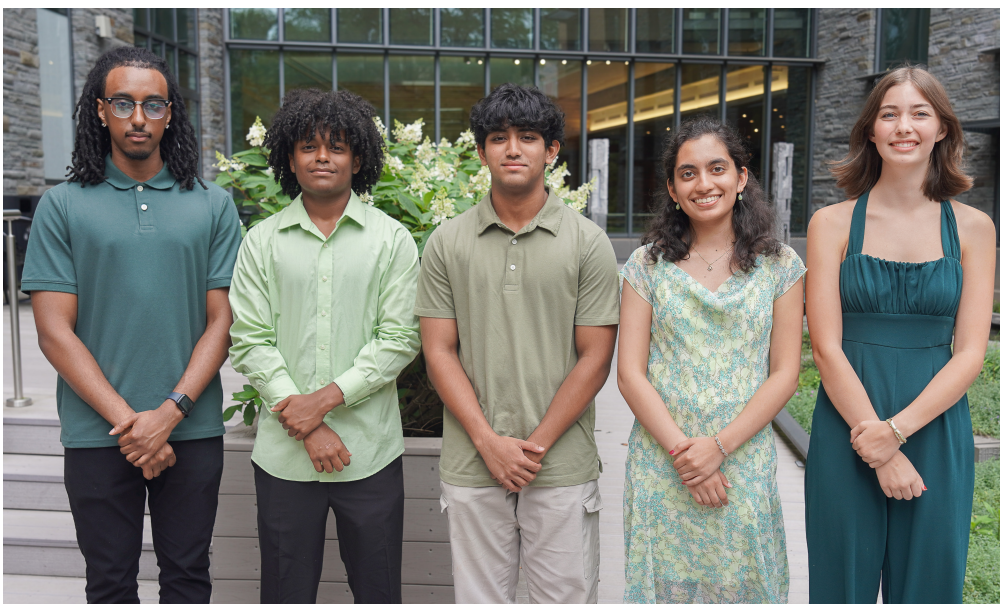


AI Image
Classification



Raspberry Pi

Servo Motors



Team Members

Leul Yohannes

Software Developer

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CAD & Electronics Developer

Vyomesh Parasa

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Mischa Desai

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Caroline Timmons

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JUMPSTART TEAM

FLOODGATE

Smarter drains for a safer city.

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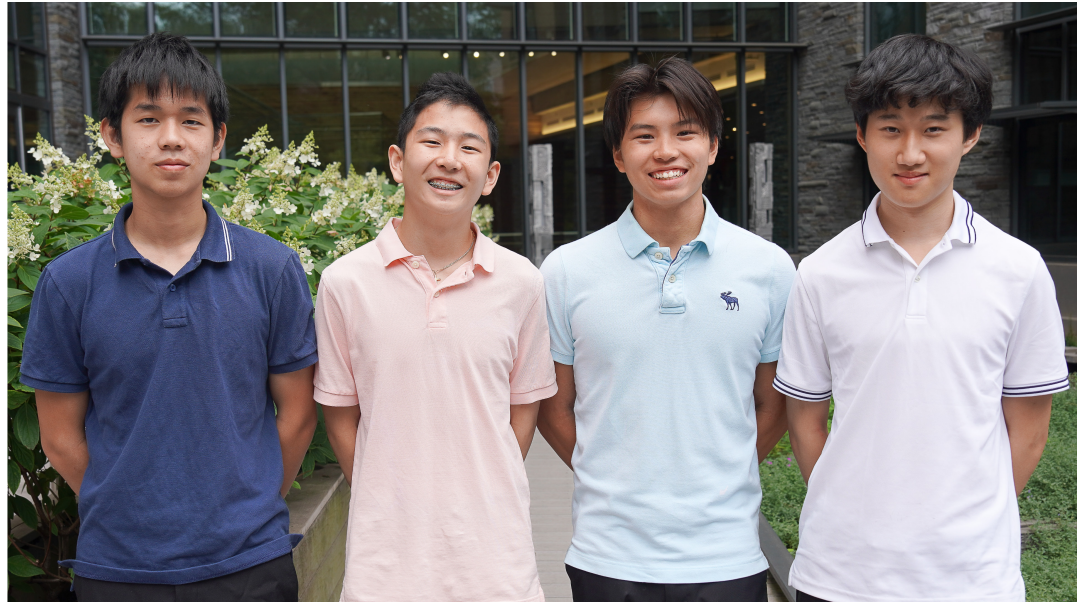
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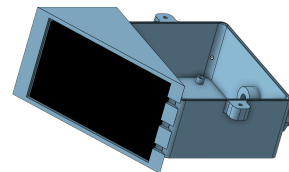


THE CHALLENGE

Flash flooding can develop quickly when storm drains become clogged and water has nowhere to go, and local officials may not recognize a dangerous problem until nearby roads, homes, or public spaces are already affected.

THE SOLUTION

FloodGate developed a low-power monitoring system that measures water levels inside storm drains. A submersible pressure transducer collects depth readings, while an ESP32 microcontroller processes the information and sends it wirelessly to a cloud-based platform. Through a graphical interface, officials could monitor multiple drains and receive alerts when



CAD of assembled
solar enclosure

Designed by
Dylan Siah

water reaches a potentially dangerous level.

THE IMPACT

The system is designed to conserve energy by remaining in a low-power state between readings and using solar power for longer deployments, while using weather forecast data to increase its alertness during periods of elevated risk. By identifying rising water earlier, FloodGate could help communities respond to blocked drains and reduce the damage caused by flash flooding.

**ENGINEERING
TOOLBOX**



ESP32



Pressure Transducer



Cloud Based
Monitoring System



GUI

JUMPSTART TEAM

GALEA GUARD

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Guard the game. Guard the brain.

THE CHALLENGE

Head impacts are a serious concern in football, particularly in youth sports. After a collision, coaches and trainers may have limited information about the force, direction, or location of the impact, making it difficult to determine whether an athlete may require further evaluation.



3D model of helmet
with accelerometer &
pressure sensors

AI Generated

THE SOLUTION

Galea Guard developed a smart football helmet that collects and displays impact data in real time. Accelerometers and gyroscopes measure movement, force, and rotation, while pressure sensors are designed to identify where the helmet was struck. An ESP32 microcontroller sends the information to a companion application that records measurements such as peak acceleration,

impact duration, estimated force, and impact history.

THE IMPACT

Galea Guard is not intended to replace medical evaluation. However, by providing objective data immediately after a collision, the system could help coaches, trainers, athletes, and families make more informed decisions about player safety.

ENGINEERING TOOLBOX



Accelerometer



MPU Gyroscope



Pressure
Sensors



Custom Monitoring
Systems



Team Members

Bennett Parisi

Project Leader & Hardware Developer

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Website Developer & Graphic Design

Kaleb Teshale

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JUMPSTART TEAM

LITALOUD

Books without barriers.

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Team Members

Aahan Gandhi

Hardware, Software & App Development

Aaron Humes

Software Developer

Matthew Habib

Project Leader, CAD, AI, Software Developer

THE CHALLENGE

Printed books may not be easily accessible to people who are blind, have low vision, or learn more effectively by listening. Digital versions are not always available, leaving many physical books difficult to use independently.

THE SOLUTION

LitAloud developed a wearable system that converts printed words into spoken audio. A camera captures an image of the page, and optical character recognition software extracts the text. Artificial intelligence helps correct recognition errors before text-to-speech software reads the words aloud through headphones.

THE IMPACT

By working directly with physical pages, LitAloud could make books, worksheets, handouts, and other printed materials more accessible without requiring them to be converted into specialized formats beforehand.

3D Model of fanny pack attached to headphones

Designed by Matthew Habib



**ENGINEERING
TOOLBOX**



Raspberry Pi



Camera



Text-to-Speech Software



Headphones

JUMPSTART TEAM

PHANTOM WEIGHT

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Bringing real-world sensations into virtual reality.

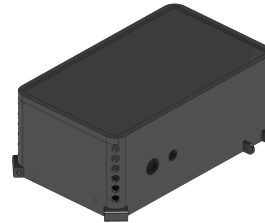
Contact:
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THE CHALLENGE

Traditional workouts can feel repetitive and boring, leading to low motivation and poor adherence. Many people struggle to stay engaged and miss the feeling of real resistance and progress in virtual fitness.

THE SOLUTION

Phantom Weight combined virtual reality with electrical muscle stimulation to create more immersive exercise experiences. In a Unity-based environment, users can complete activities such as lifting objects or climbing. When an action occurs in VR, the program communicates with an ESP32 microcontroller, which controls a modified electrical muscle stimulation device. The



CAD of main compartment

Designed by
Don Algama

stimulation activates opposing muscle groups to create resistance that corresponds with the virtual movement.

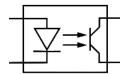
THE IMPACT

By synchronizing physical feedback with virtual actions, Phantom Weight could make exercise more interactive and engaging. The team envisions the technology will blend fitness, gaming, and immersive engineering.

ENGINEERING TOOLBOX



EMS Device



Optocouplers



ESP32



VR Environment

Team Members

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Lead Unity Environment Developer

Pablo Figueredo

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Don Algama

CAD Design & Hardware Developer

Dat Nguyen

Unity Environment Developer & Software Developer



JUMPSTART TEAM

NUDGE

Think it. Move it.

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digital
Infuzion®

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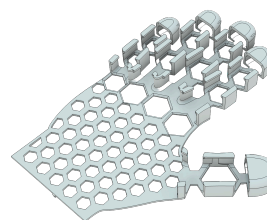


THE CHALLENGE

After a stroke or neuromuscular injury, some individuals lose the strength or coordination needed to open and close their hands. This can make everyday activities difficult and create additional challenges during physical rehabilitation.

THE SOLUTION

Nudge developed a wearable robotic hand exoskeleton that responds to the user's muscle activity. Electromyography sensors placed on the forearm detect the electrical signals produced when the user attempts to move. Software processes those signals and sends commands through Bluetooth to a microcontroller. Servo motors then



CAD of glove

Designed by
Steven Saenz

pull Bowden cables routed through a 3D-printed glove assisting the fingers as they bend or extend. Users data is streamlined to an app and can connect to medical professionals

THE IMPACT

Nudge could eventually serve as both a rehabilitation tool and an assistive device, helping users practice hand movements and complete daily tasks with greater independence.

ENGINEERING TOOLBOX



EMG Sensor



Servo Motors



Exoskeleton Glove



Machine Learning

JUMPSTART TEAM

PATHFINDER

Confidence in every step.

THE CHALLENGE

The traditional white cane is an essential mobility tool, but it alerts users to obstacles only after the cane physically touches it. Pathfinder explored how sensors and haptic feedback could provide earlier awareness of the surrounding environment.

THE SOLUTION

PathFinder's smart cane uses time-of-flight sensors to measure the distance between the user and nearby objects. An ESP32 microcontroller processes the readings and controls vibration motors embedded in the handle. The vibrations become stronger as an obstacle gets closer, giving the user information about distance.

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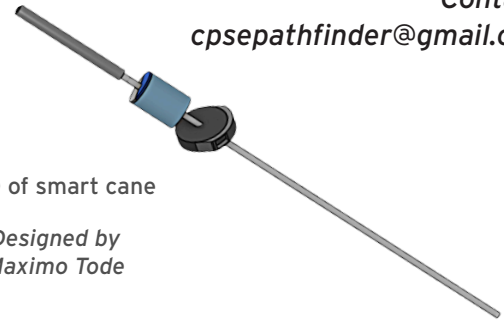


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Contact:

cpsepathfinder@gmail.com



CAD of smart cane

*Designed by
Maximo Tode*

THE IMPACT

To test and refine the system, the team also created a web-based tool that displays live sensor data as a three-dimensional visualization. This allows them to study sensor alignment and field of view before completing the portable device. PathFinder could complement the traditional cane by helping users detect obstacles sooner and navigate with greater awareness and confidence.

ENGINEERING TOOLBOX

ToF Sensors



ESP32



Haptic Control



Web Socket



Arduino



Team Members

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Dominic Ye
Hardware Developer

Maximo Tode
Hardware & CAD Developer

Artur Khachatryan
*Project Leader &
CAD Designer*

JUMPSTART TEAM

SURGISIGHT

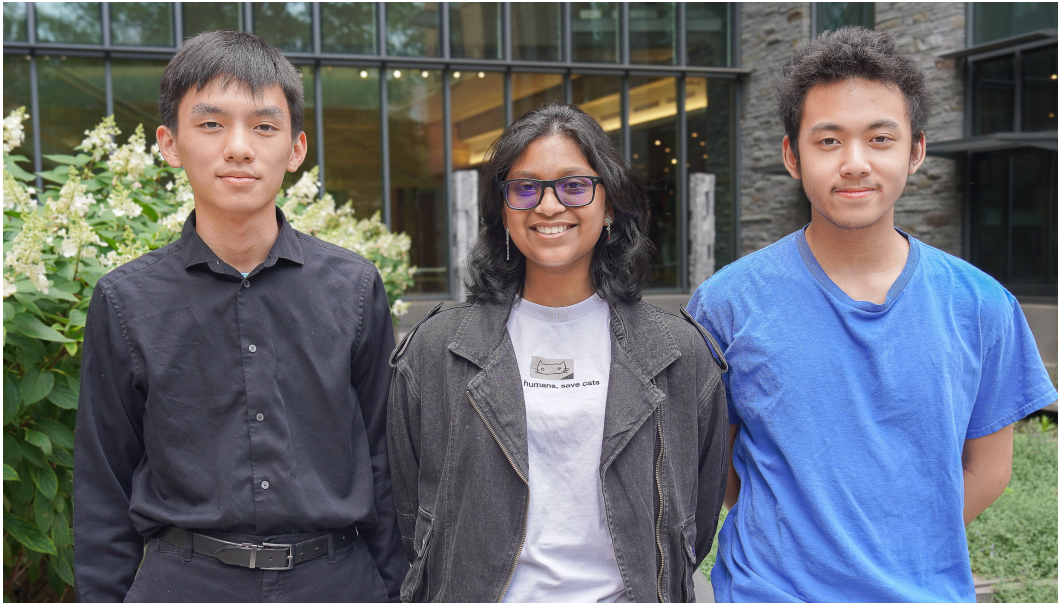
Where vision meets precision.

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Contact:

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Team Members

Neo Cheng

*Electrical &
Software Developer*

Aadya Mani

*Project Leader &
Hardware Developer*

Thomas Yu

Hardware Developer

THE CHALLENGE

Before certain procedures, surgeons draw lines and guides directly onto a patient's skin with markers. While markings are vital for planning, they can be difficult to adjust once applied, and the marker adds a layer of contamination and human error.

THE SOLUTION

SurgiSight developed a system that replaces physical markings with projected laser guides. A depth camera and webcam help identify the patient's position, while a Raspberry Pi processes the visual information. A laser is directed toward a mirror mounted on a motorized ball joint. By moving the mirror rapidly, the system can steer the beam and create the appearance of adjustable

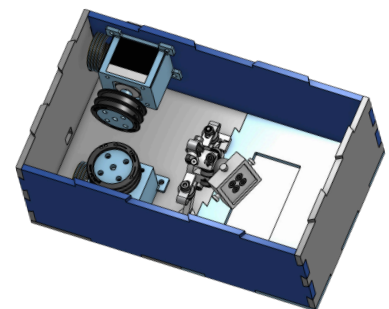
lines projected onto the body.

THE IMPACT

SurgiSight could provide medical professionals with a more flexible method of visualizing procedure plans, allowing guides to be changed without repeatedly drawing on the patient's skin.

CAD of stepper
motors & mirror
mount

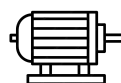
*Designed by
Aadya Mani &
Thomas Yu*



ENGINEERING TOOLBOX



Laser



Stepper Motors



Depth Camera



Computer Vision

JUMPSTART TEAM

PIPE PATROL

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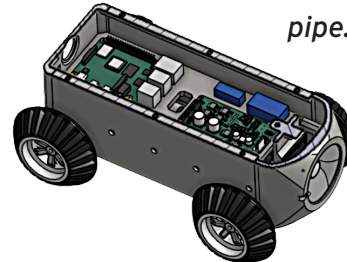
Check your pipes before trouble strikes.

THE CHALLENGE

Sewer systems are difficult to inspect, yet aging pipes may contain cracks, defects, and blockages that can lead to costly failures. Sending people into confined or hazardous spaces can also make traditional inspection methods challenging and time consuming.

THE SOLUTION

Pipe Patrol developed a semi-autonomous rover that combines robotics with artificial intelligence. The four-wheel vehicle carries a Raspberry Pi, wide-angle camera, and onboard sensors as it travels through a pipe. Its camera captures inspection footage, while machine-learning models analyze the images and identify possible structural defects. A graphical interface allows operators to



Contact:
pipe.patrol.usa@gmail.com

CAD of rover

Designed by
Andrew Zhao

view the rover's feed and monitor the inspection. The team trained its object-detection software using sewer inspection datasets and designed an interactive demonstration that recreates an underground pipeline.

THE IMPACT

By helping operators locate damage remotely, Pipe Patrol could make sewer inspections safer, faster, and more efficient, while preventing major catastrophic pipe failures.

**ENGINEERING
TOOLBOX**



Rover



Wide-Angle Camera



Onboard Sensors

**AI Object
Detection
Model**

Team Members

Newton Yang

AI & ML Developer

Leah Wang

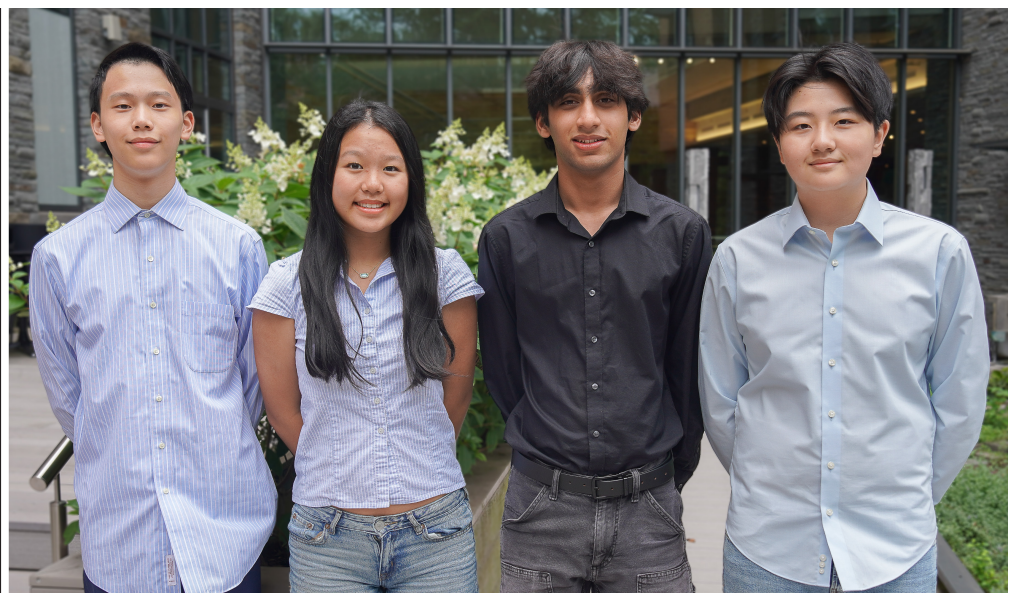
Project Leader & Designer

Arav Assija

Hardware & CAD Lead

Andrew Zhao

*CAD Lead, Hardware &
Software Developer*



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Zena Kishek



UMD CPSE EXPRESSES SINCERE THANKS TO ALL THE FOLLOWING ORGANIZATIONS & CORPORATE AFFILIATES WHO SPONSORED DEMO DAY

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