Welcome to SCOPE Summit

Olin College of Engineering
SCOPE

SCHEDULE OF EVENTS
FRIDAY, MAY 8, 2026

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

Scan for today's program

This event is being recorded and will be available on the SCOPE webpage.

SCOPE SUMMIT 2025-2026

SCOPE
Senior Capstone Projects

Amazon Robotics

Blue Origin

Boston Scientific

Boston University (WISE)

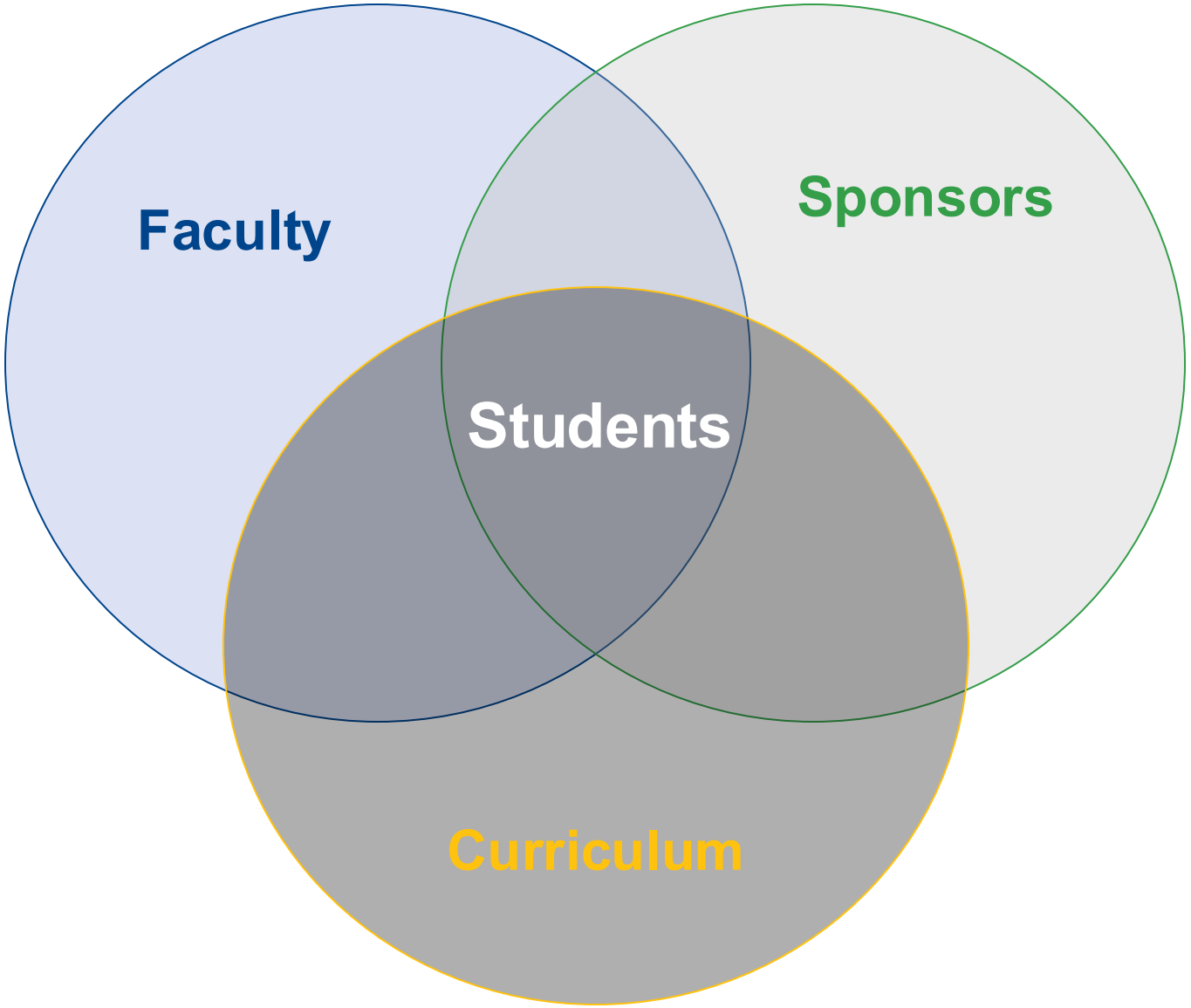
Lasso Labs

New Balance

Processing Fish

Santos Family Foundation / Volpe Center

SCOPE: Senior Capstone Program in Engineering



Olin College of Engineering SCOPE

SCOPE serves both students and sponsors

Compelling and complex real-world projects executed in collaboration with external partners, both:

- Provide opportunities for the **personal and professional development** of our students
- **Create value** for sponsors and for the world

1 Mission critical projects

2 Projects with significant potential value

3 Topics which would be nice to explore

Olin College of Engineering SCOPE

SCOPE projects take many forms

- Exploration of new product directions
- Product enhancements
- Manufacturing challenges
- Improved user experiences

Every project is very different:

- Disciplinary domain
- Social, technical, & ethical contexts
- Starting point and goal endpoints
- Confidentiality constraints and IP assignments

SCOPE Leadership

Lauren Palmer
Associate Director of Partnership Development

Jessica McCarthy
SCOPE Program Director

Amon Millner
Professor of Computing and Innovation

Jessica Townsend
SCOPE Academic Co-Director
Professor of Engineering

Scott Hersey
SCOPE Academic Co-Director
Associate Professor of Chemical and Environmental Engineering

amazon robotics
WISE
new balance
BLUE ORIGIN
Boston Scientific
Lasso
PROCESSING FISH
SANTOS FAMILY FOUNDATION
U.S. Department of Transportation Volpe Center

Thank you Subject Matter Experts (SMEs)!

Brandonn Chen

Helen Donis-Keller

Daniela Faas

Chhavi Goenka

Chris Lee

Ben Linder

Caitrin Lynch

Kene Mbanisi

Brad Minch

Victoria Preston

Paul Ruvolo

Dan Sambor

Tim Sauder

David Shuman

Georgia Van de Zande

Format for this session

- 8 SCOPE team presentations
- 15-minute break half-way through
- Followed by poster session

Slides and program are available on Summit webpage:
https://www.olin.edu/events/scope-summit-2026

Scan for Program

2025-26 SCOPE Teams

Amazon Robotics

Olin College of Engineering SCOPE

Low-Cost Sensing Systems for Robotics Applications

SCOPE Summit 2026

Team

Hazel Sudzilouski

Mark Belanger

Noah Rand

Satchel Schiavo

Sparsh Gupta

Warehouse Vs Dynamic Robotics

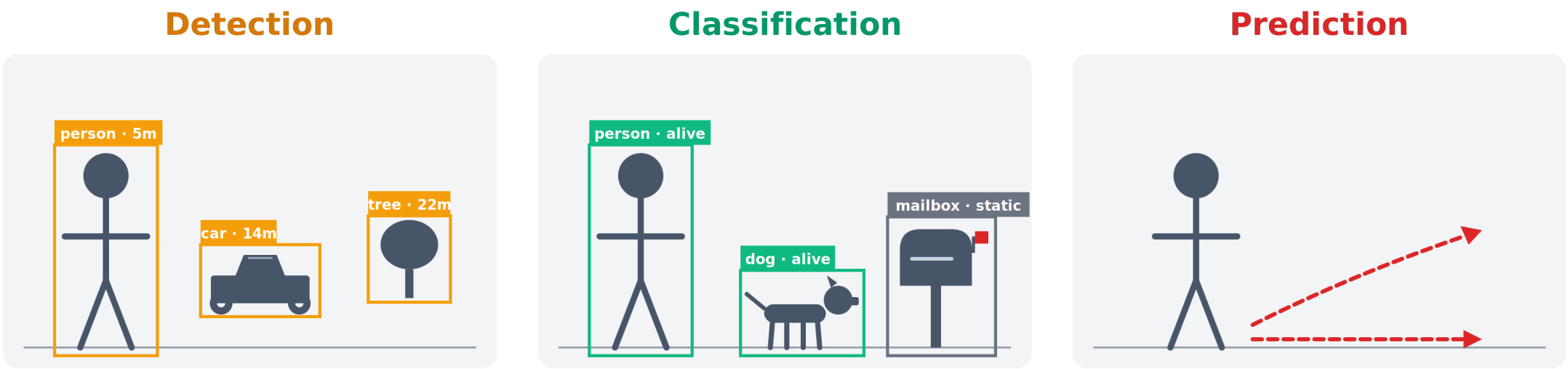
Warehouse

- Indoors
- Known paths (mostly)
- Predictable entities
- Well established

Dynamic

- Unknown environments
- Unpredictable entities
- Weather
- Still in development → $$$$

What do robots need to sense the world?



How do robots sense the world?

Starship

Delivery robots use GPS and IMU to track location relative to others

Zipline

Cameras to target landing pads and compare that data to its GPS location to move

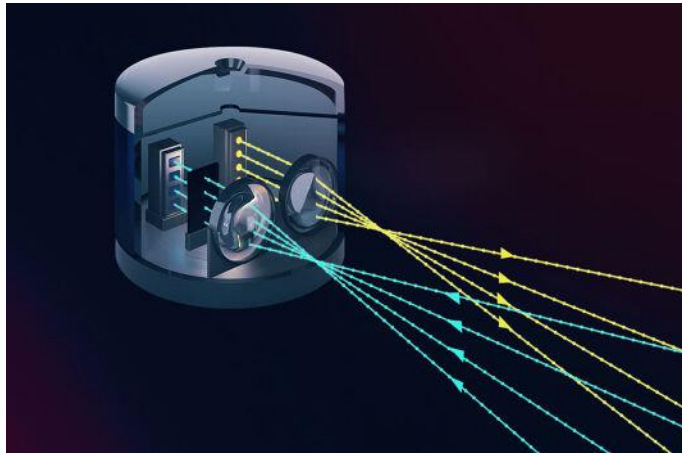
Waymo

Multiple LiDARs, cameras, and radars to sense the distance of its surroundings

The Goal

Create a series of low-cost hardware and software suites to detect, classify, and predict the motion of animate objects in a dynamic environment

What Type of Sensors We Chose



Cameras

- Low cost (relatively)
- Low fidelity depth
- Simple interfaces
- Faster integration

LiDAR

- High precision depth
- Higher cost

Hardware Configurations

HexaView Lite

HexaView Pro

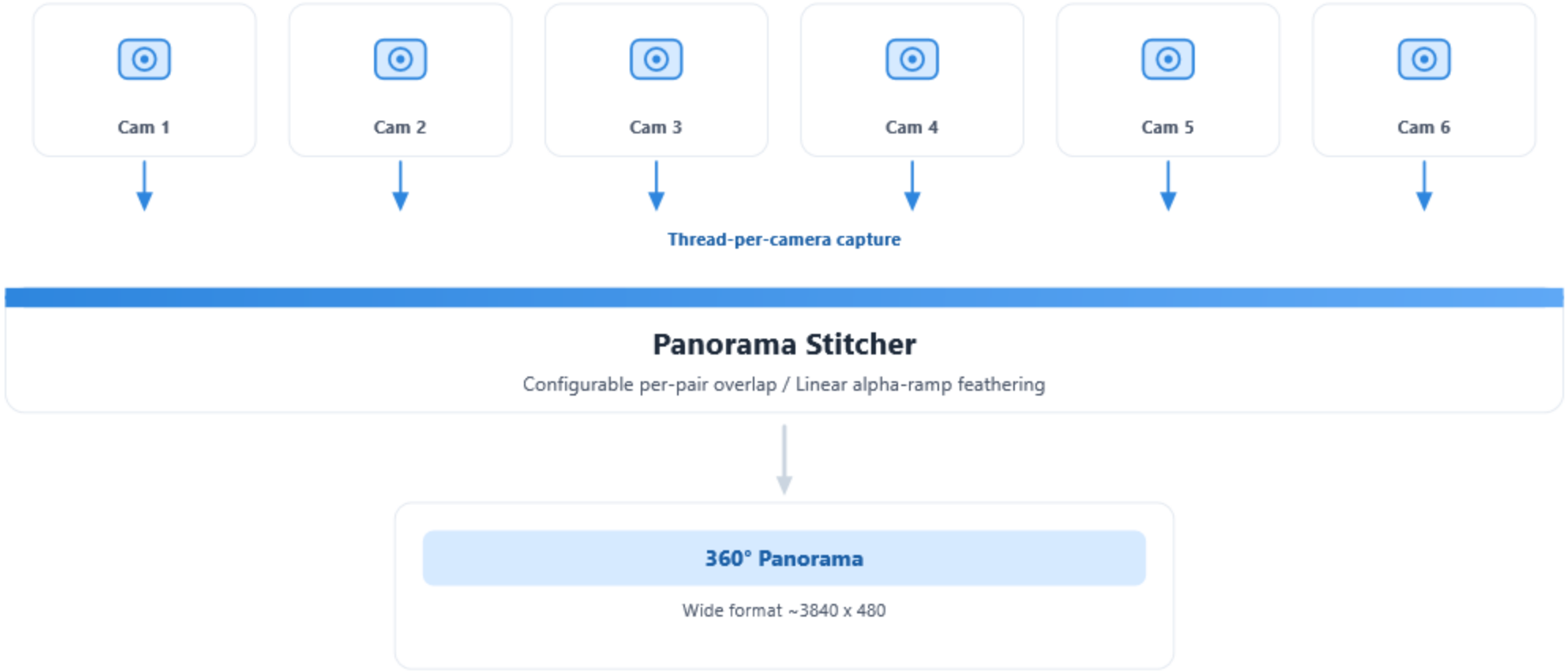
HexaView Pro + LiDAR

HexaView Lite + RealSense

HexaRealView

HexaRealView + LiDAR

Panoramic Stitching



Detection

360° Panorama Input

Full stitched panorama from Stage 1

↓

Letterbox + Normalize

Resize, normalize to GPU tensor

↓

YOLO11n TensorRT

FP16 inference on Jetson GPU / ~6 ms

↓

Post-Processing

Confidence > 0.25 / NMS IoU > 0.45 / Animate object only

↓

Detection[] Output

(x1, y1, x2, y2, confidence) per detection

Tracking

Detection[] Input

Bounding boxes from YOLO11n

ByteTrack Tracker

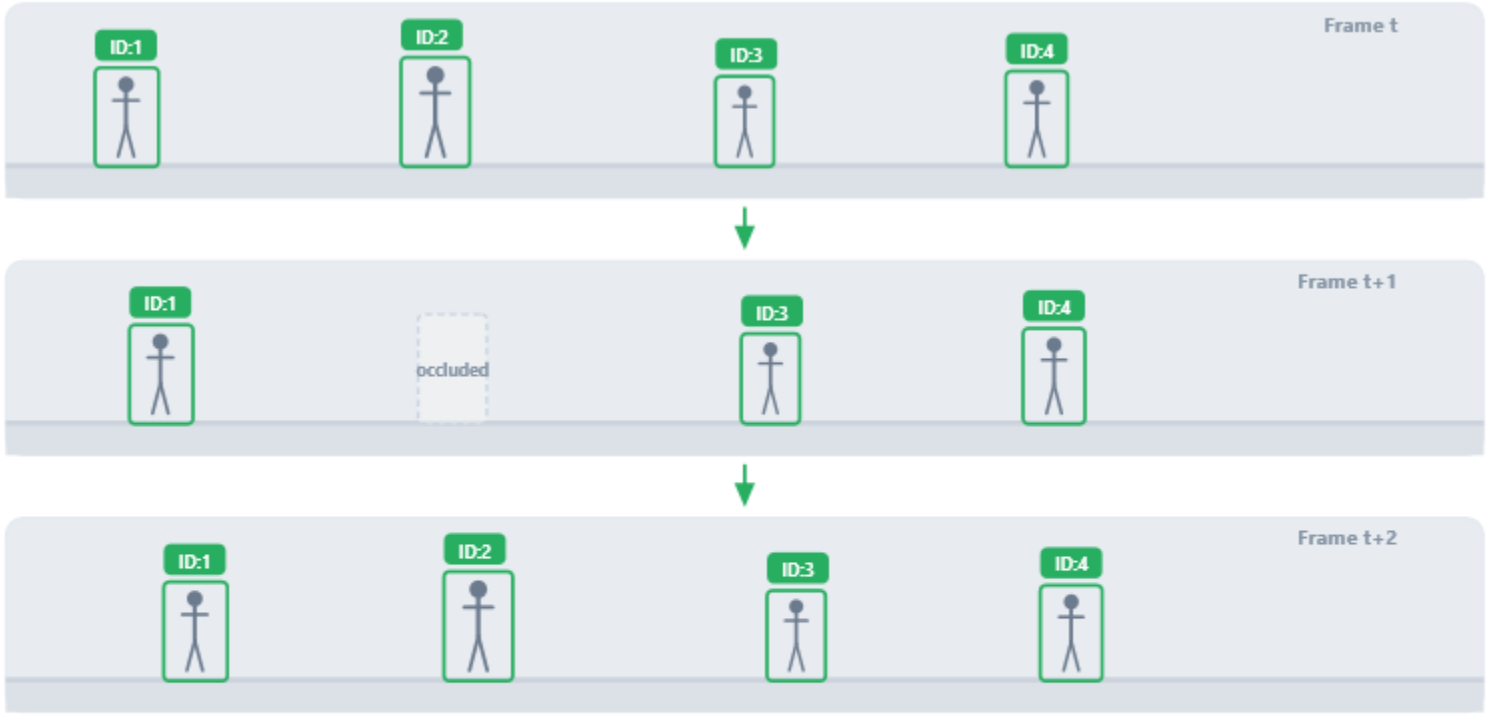
Motion predict / Two-stage associate / Update

Track Management

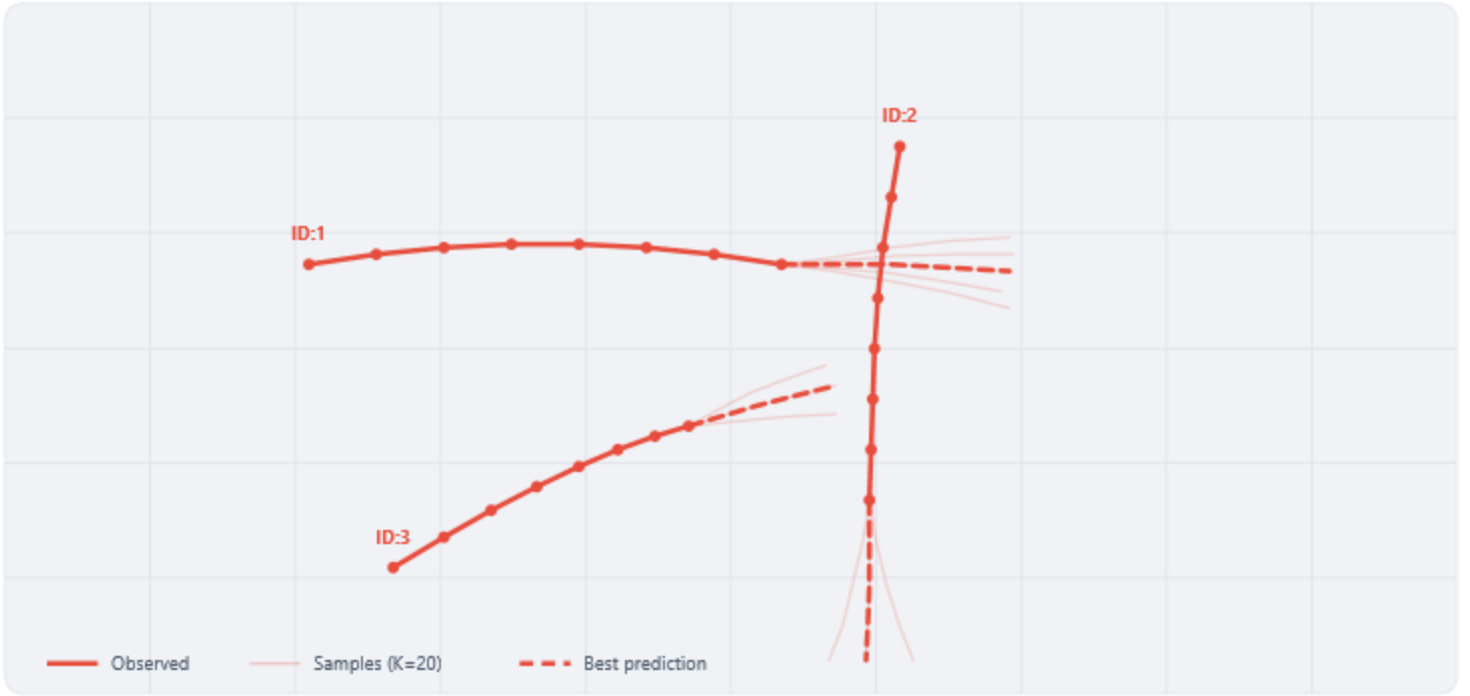
Create, maintain, or age-out tracks

Track[] Output

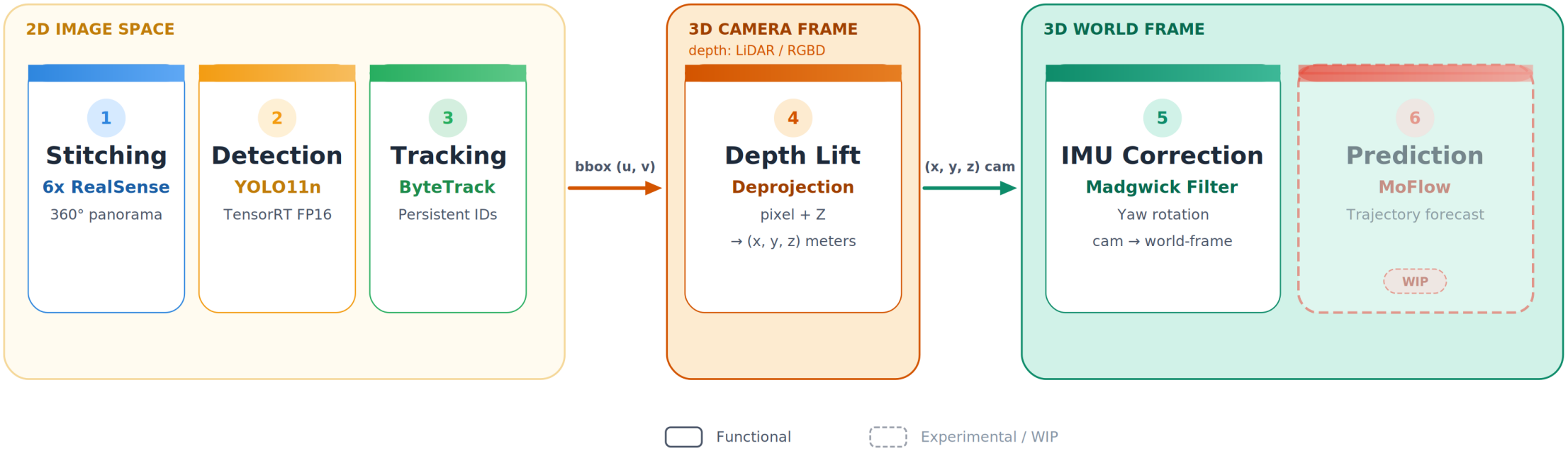
Persistent ID + velocity per object



Prediction (Experimental)



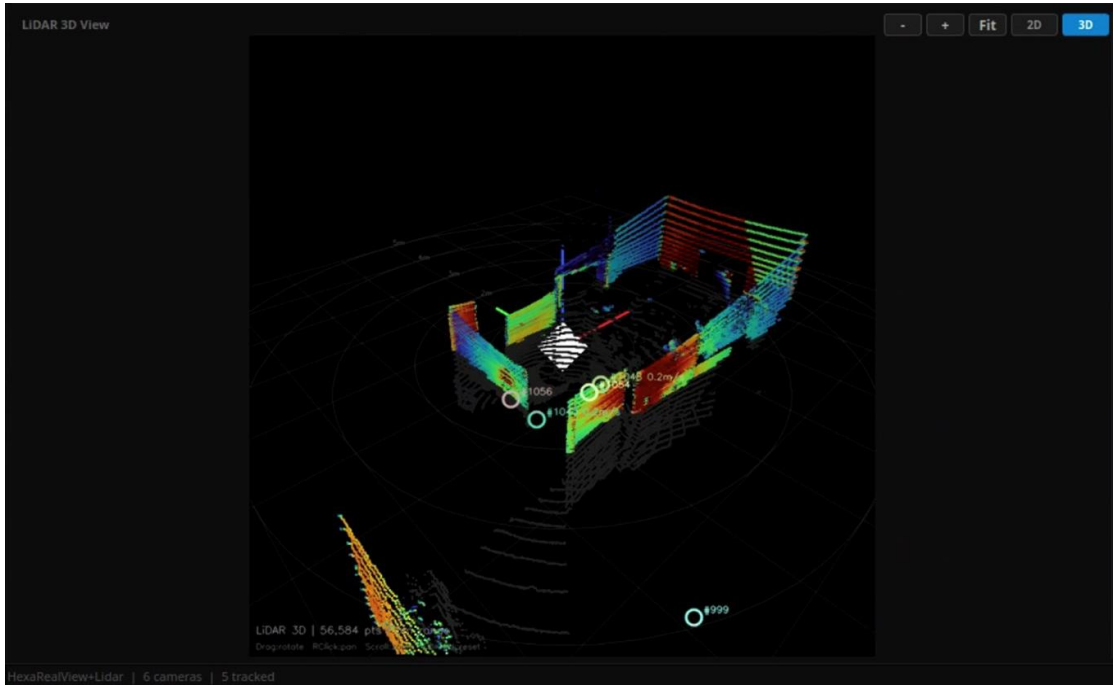
Overall Algorithmic Architecture

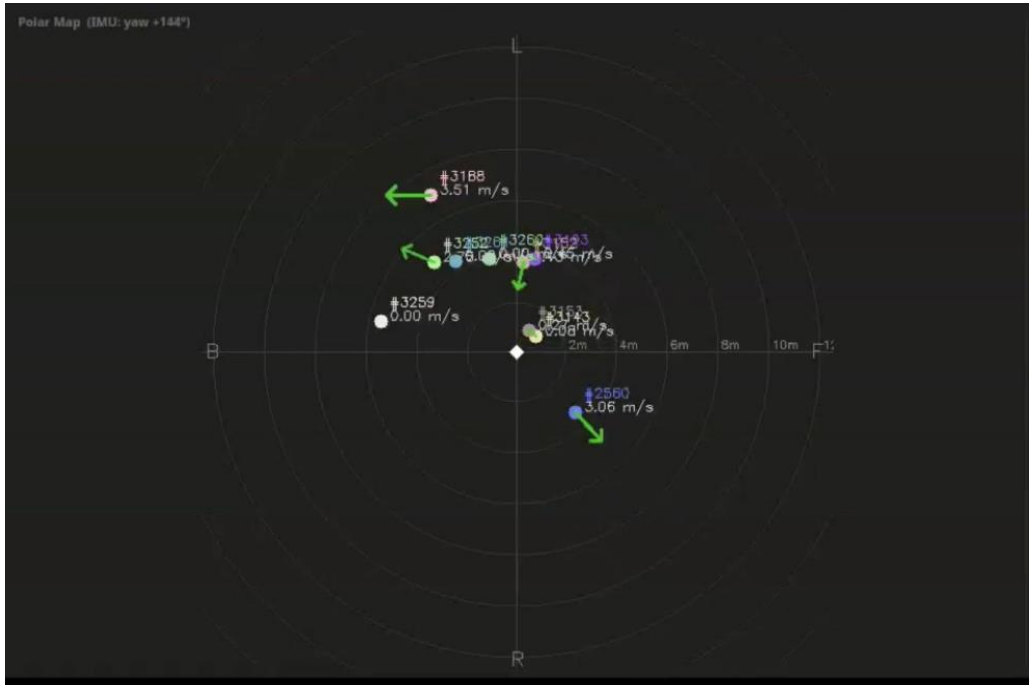


Testing Infrastructure

- Develop a modular testing system
- Individually rapidly prototype and test sensors, sensor configuration, and algorithms

Real-World Testing





Broad Configuration Tradeoffs

HexaView Lite

$

- ✓ Extremely low cost
- ✗ Low frame rate
- ✗ Low quality footage

HexaView Pro

$$

- ✓ Better footage quality
- ✓ Still relatively low cost
- ✗ No depth sensing

HexaView Lite + RealSense

$$

- ✓ RGB + front-facing depth
- ✗ Footage quality mismatch
- ✗ Depth in one direction only

HexaView Pro + LiDAR

$$$$

- ✓ Precision 360° depth
- ✓ Richer tracking data
- ✗ LiDAR drives up cost

HexaRealView

$$$$

- ✓ High quality vision + depth
- ✓ 360° depth without LiDAR
- ✗ Highest cost cameras

HexaRealView + LiDAR

$$$$$

- ✓ High quality vision
- ✓ Precision LiDAR depth
- ✗ Highest cost overall

Lower cost → Higher cost

Conclusion

- Off-the-shelf sensors deliver strong results at a low cost
- Proven configs start at $360; cost scales with performance needs
- Higher-end suites require more integration but significantly boost reliability

Future Work

- Evaluate higher-quality monocular cameras
- Refine single-camera depth calibration
- Add thermal sensing capabilities
- Test & develop custom prediction models

Thank You!

Acknowledgements

Olin SCOPE Advisor: Prof. Amon Millner
Amazon Robotics Liaison: Alex MacLean

Blue Origin

Olin College of Engineering SCOPE

Automated Thermal Interface Material Applicator

Blue Origin SCOPE Team

The Team

Mihir Vemuri

Emery Lauer

Owen Himsworth

Rohan Giancaspro

Brooke Wager

Austin Cline

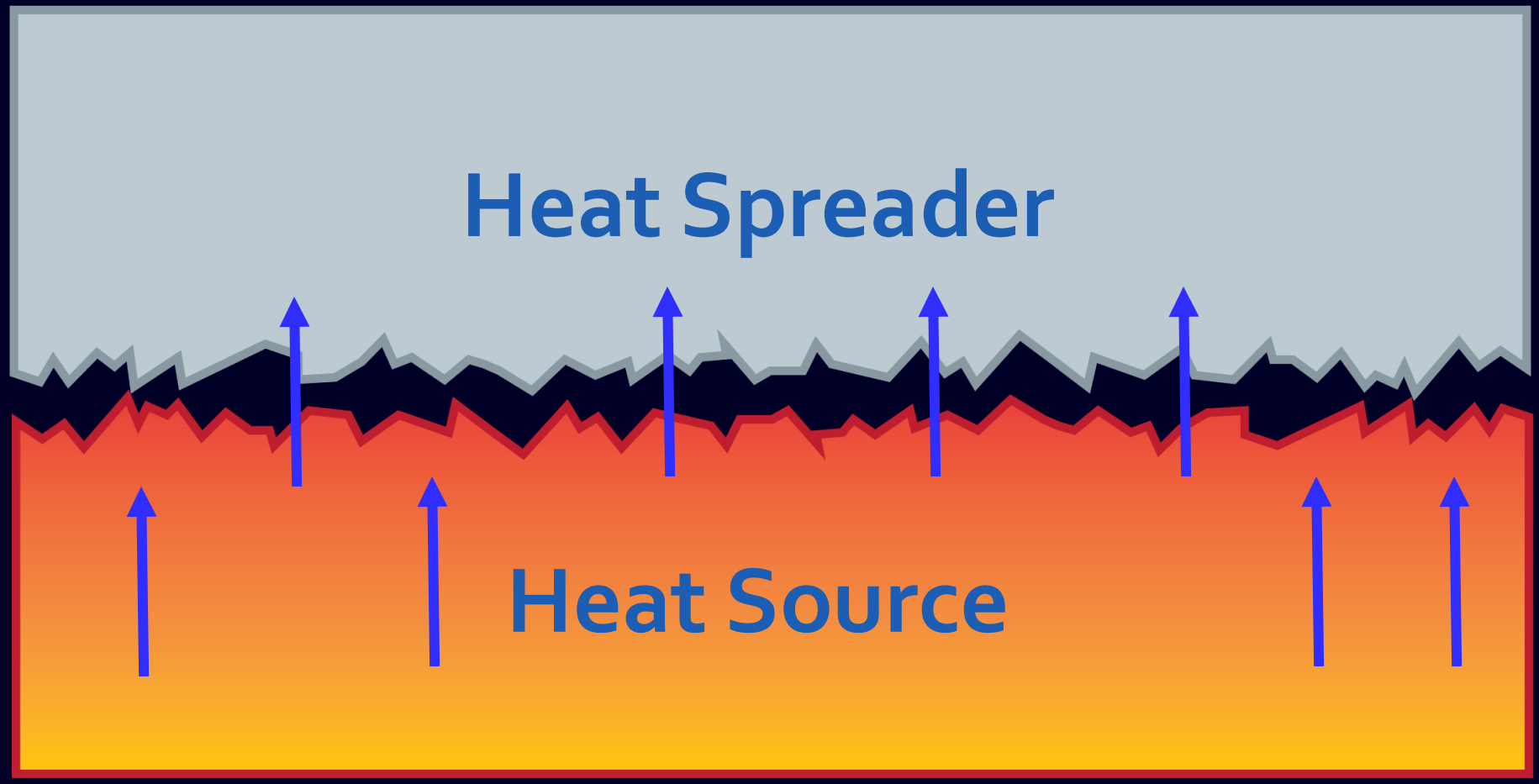
Alan Tate
Liaison

David Llapitan
Liaison

Sara Olson
Liaison

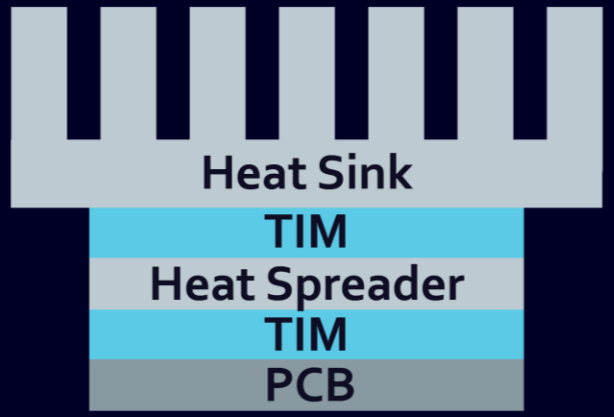
Jessica Townsend
Faculty Advisor

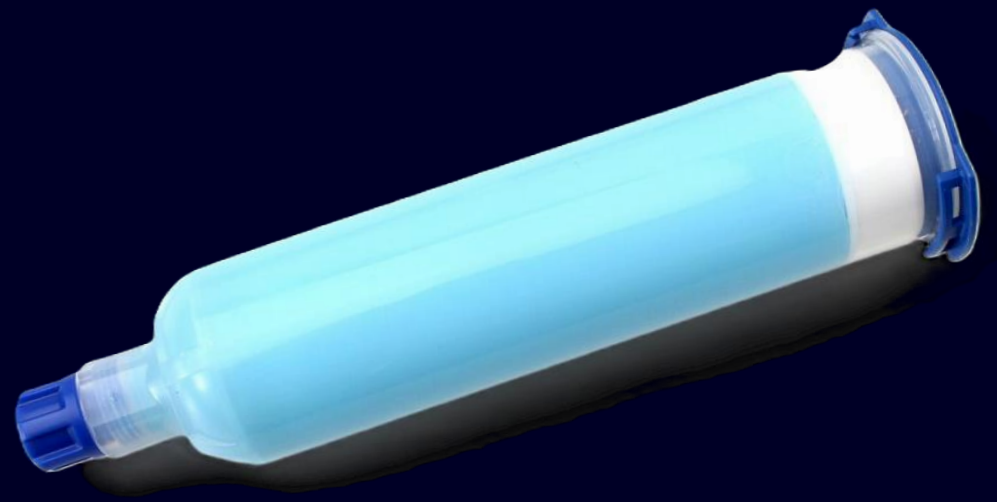
Heat Transfer



Thermal Interface Material (TIM)

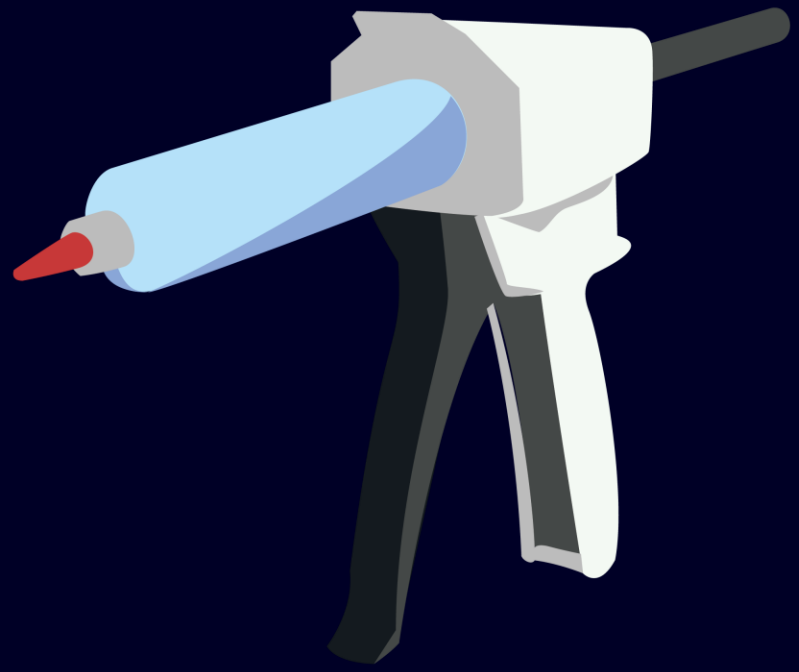
Increases thermal conductivity through two touching materials.





Current Dispensing Method

TIM application at Blue Origin is done manually which is time consuming, labor heavy, and has inconsistent application



Existing Designs

$10,000-$60,000

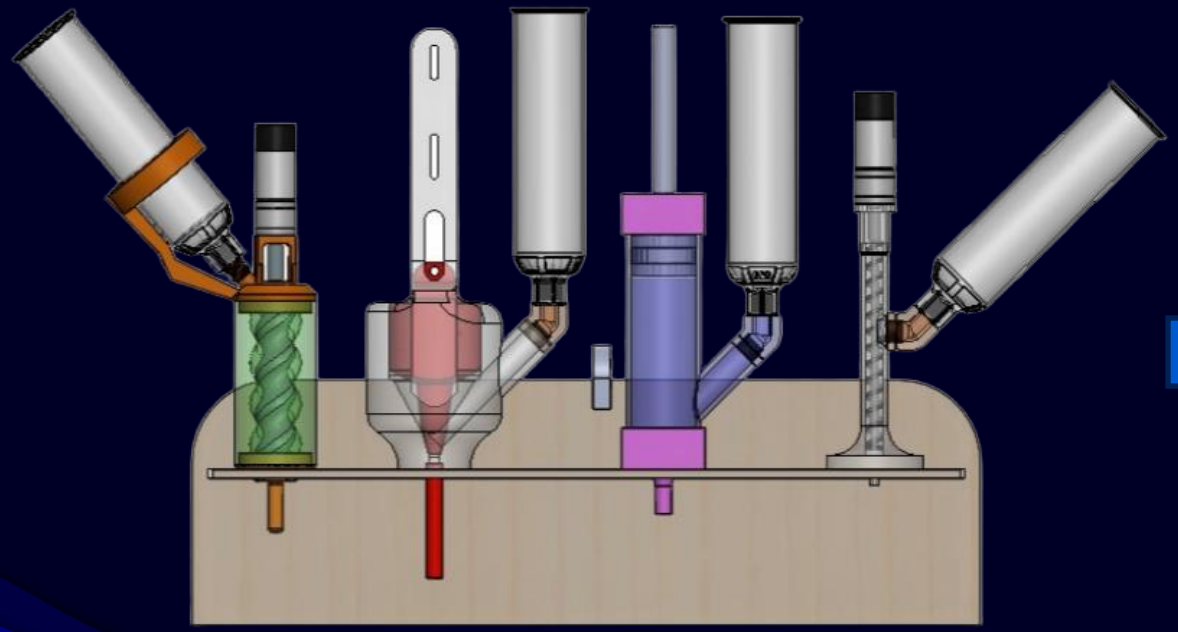
Not customizable

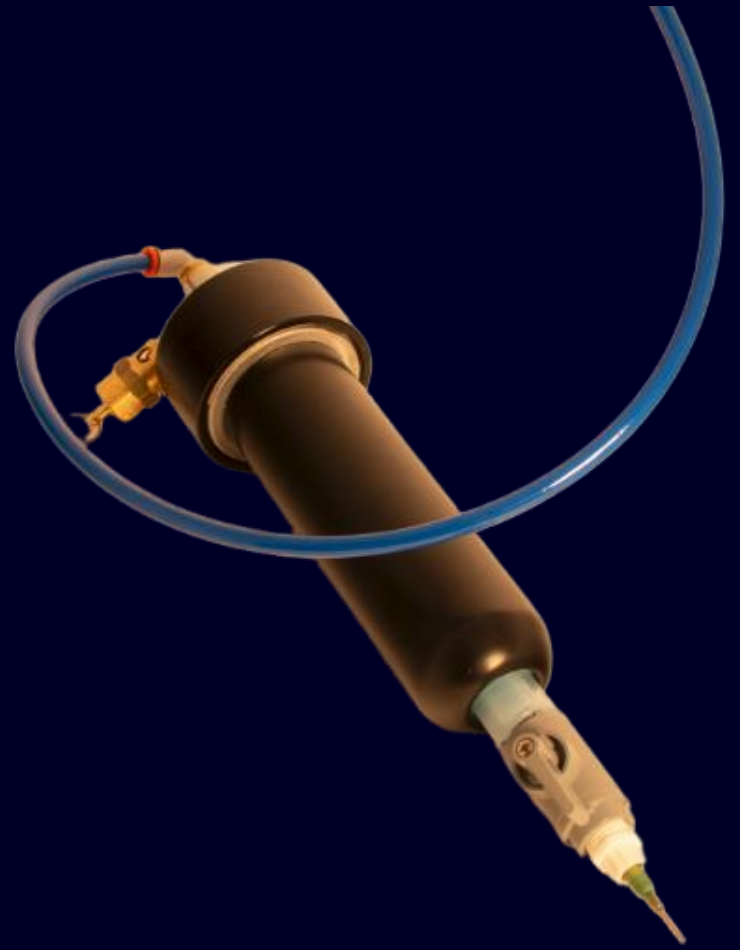
Cannot mass produce

Value Proposition

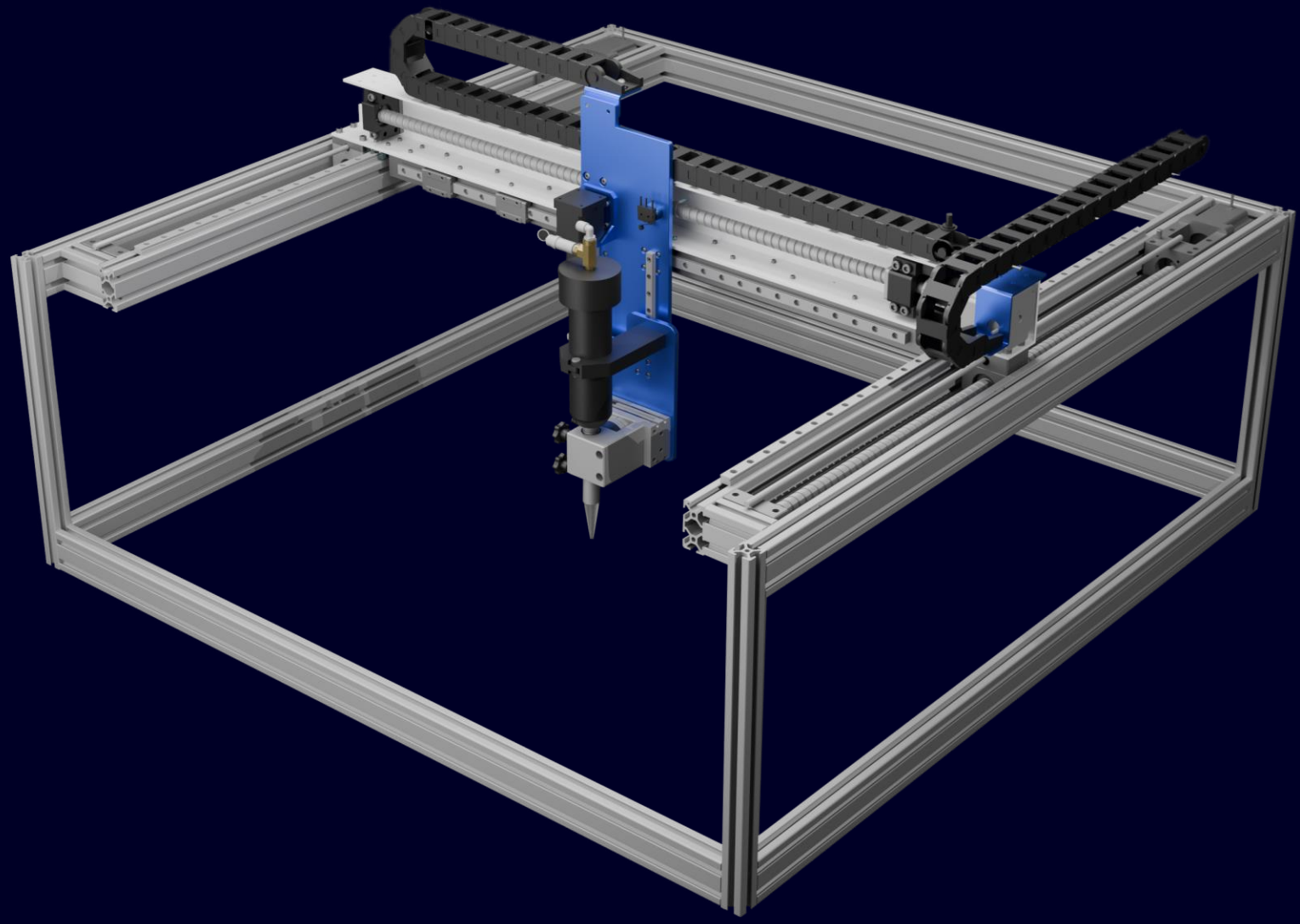
Our Solution

Nozzle Selection

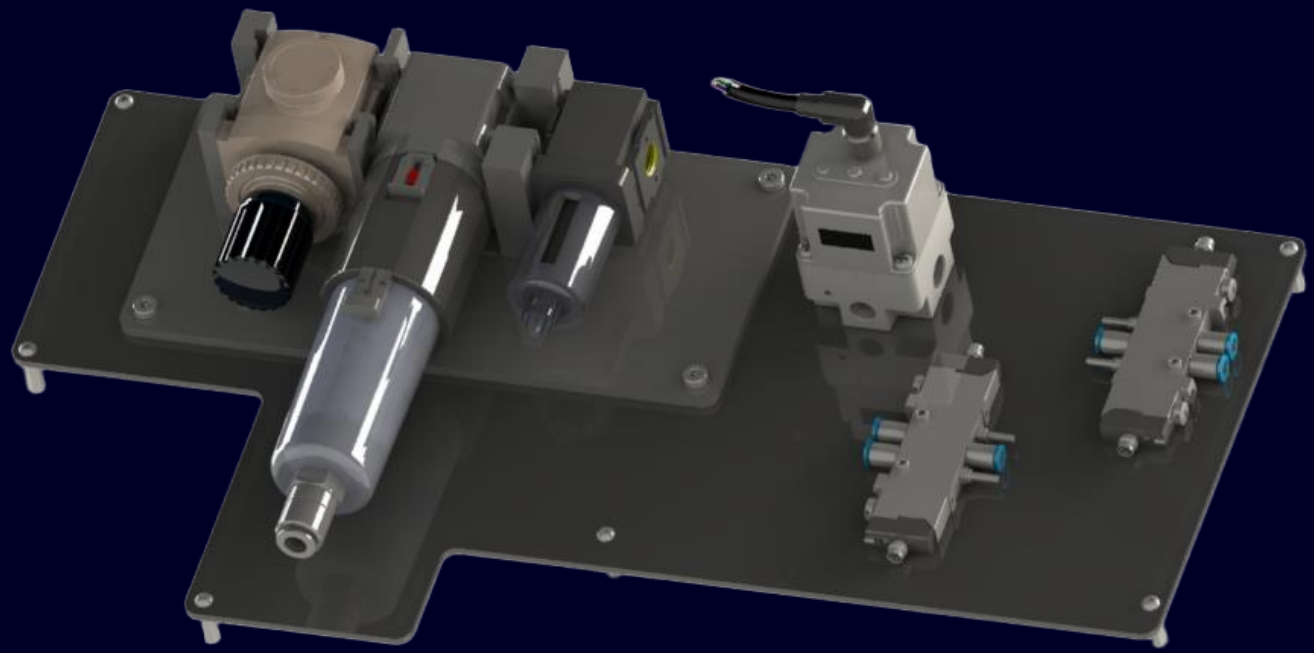




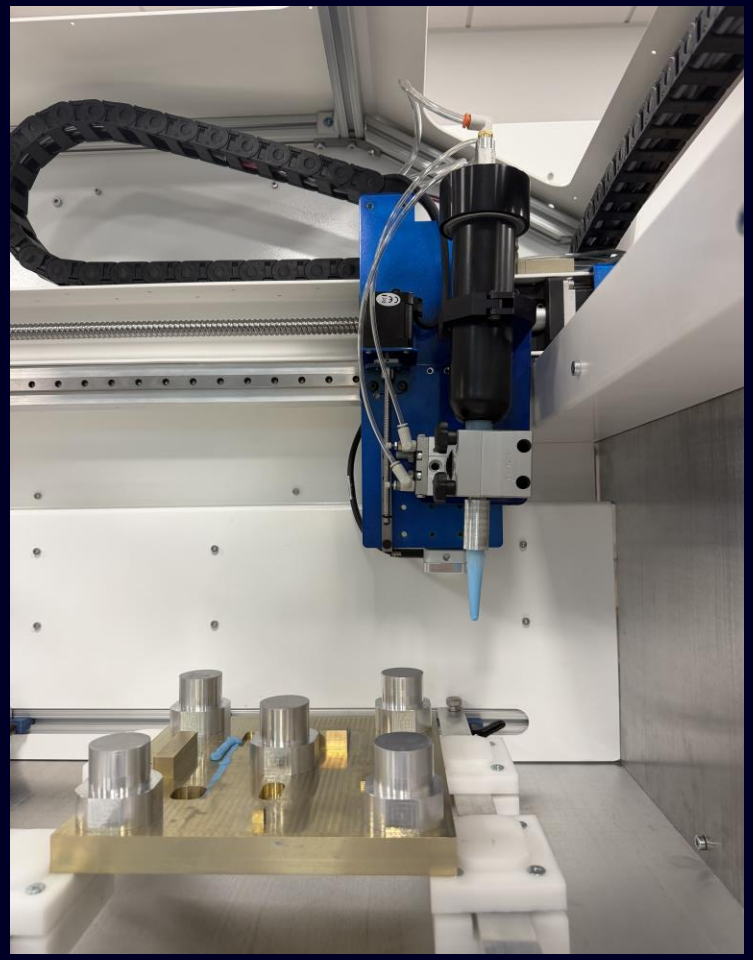
Functional Gantry

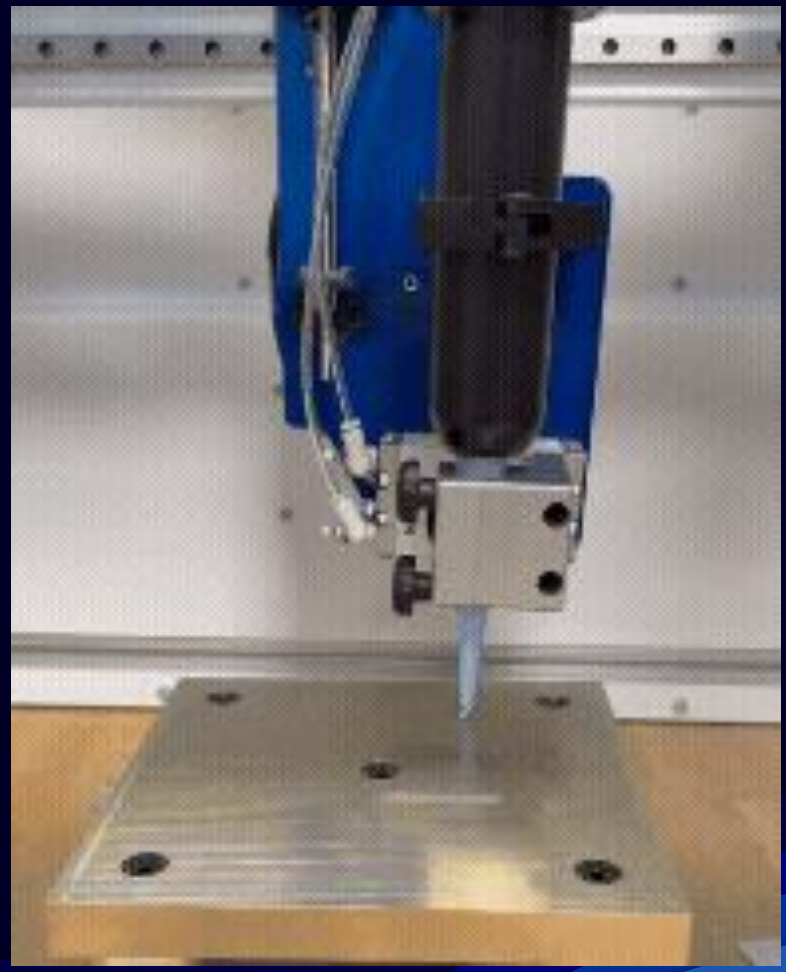


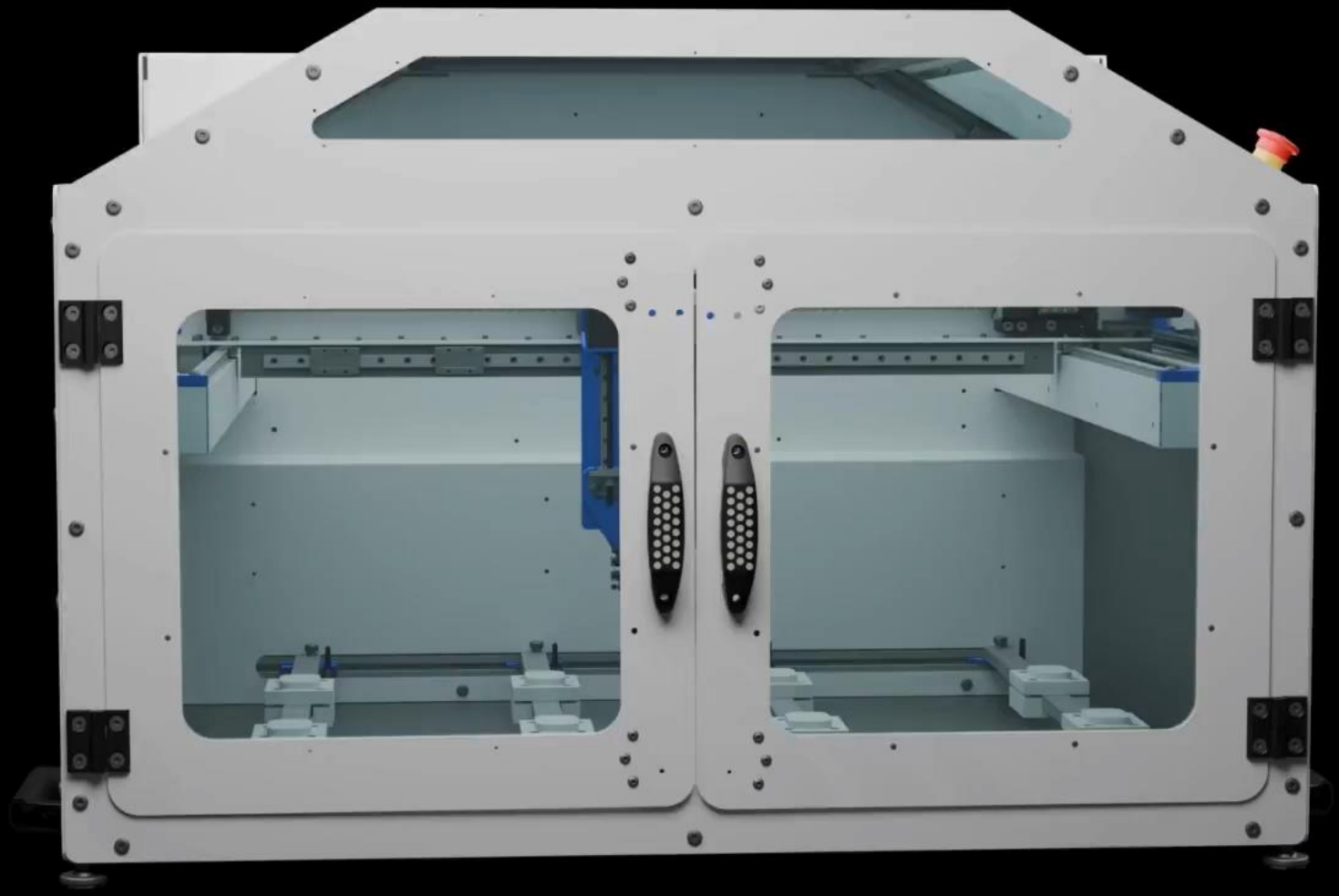
Pneumatics System

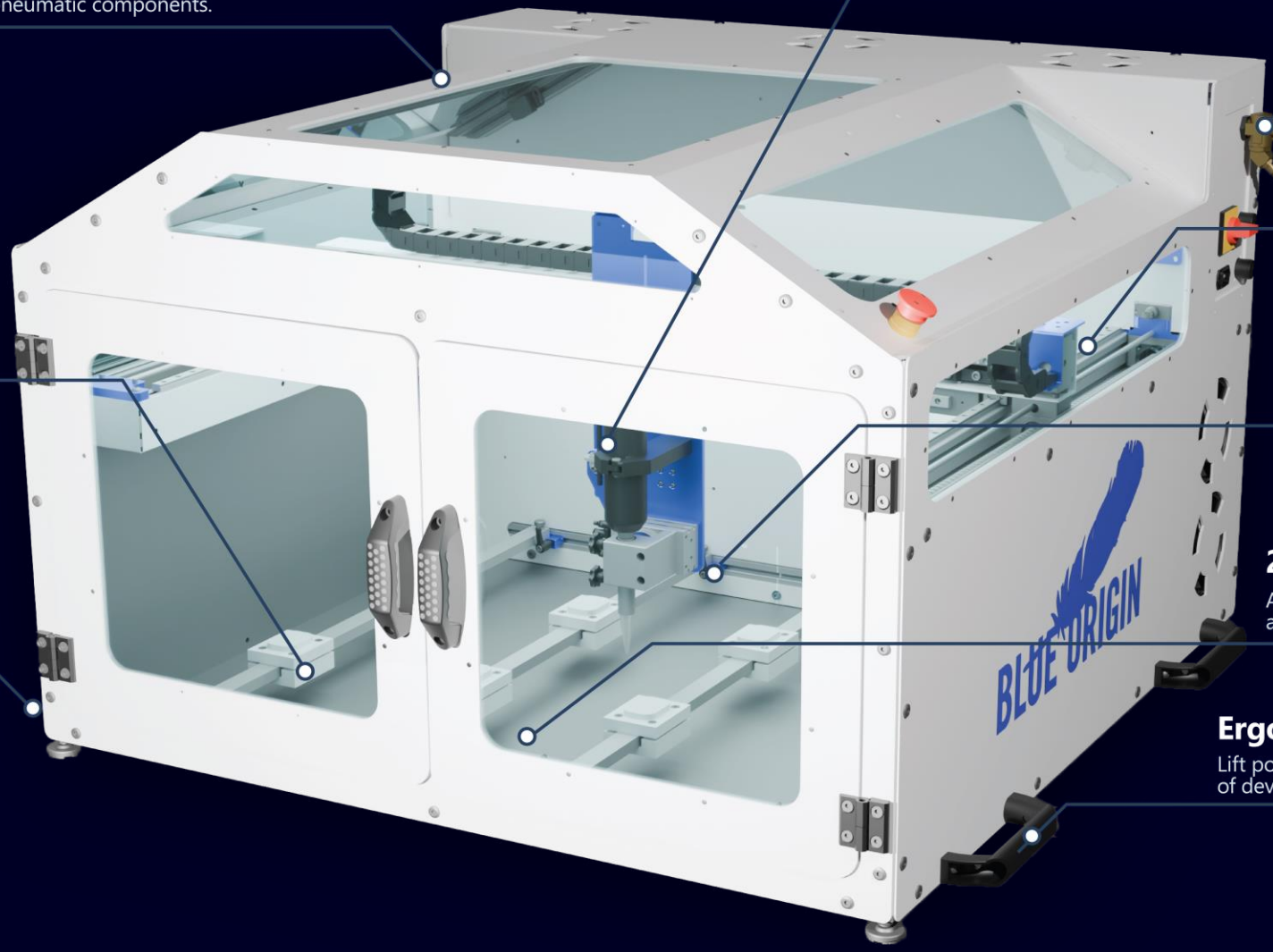


Dispensing Test









Pneumatic TIM Dispensing Nozzle
Binary on/off valve to control flow of TIM material from pressurized storage vessel.

Removable Back
Allows easy components access to all electrical and pneumatic components.

Interface Panel
Houses power, air, and ports for data transfer for ease of use

3-Axis Gantry
Allows precise movement of toolhead through printbread.

Modular Fixturing
Designed to securely hold most heat spreader and PCB boards

Depth-Sensing Camera
Multipurpose camera for topographic scanning of pieces, monitoring of print area.

40x40 in Footprint
Fits most lab and workstation table sizes.

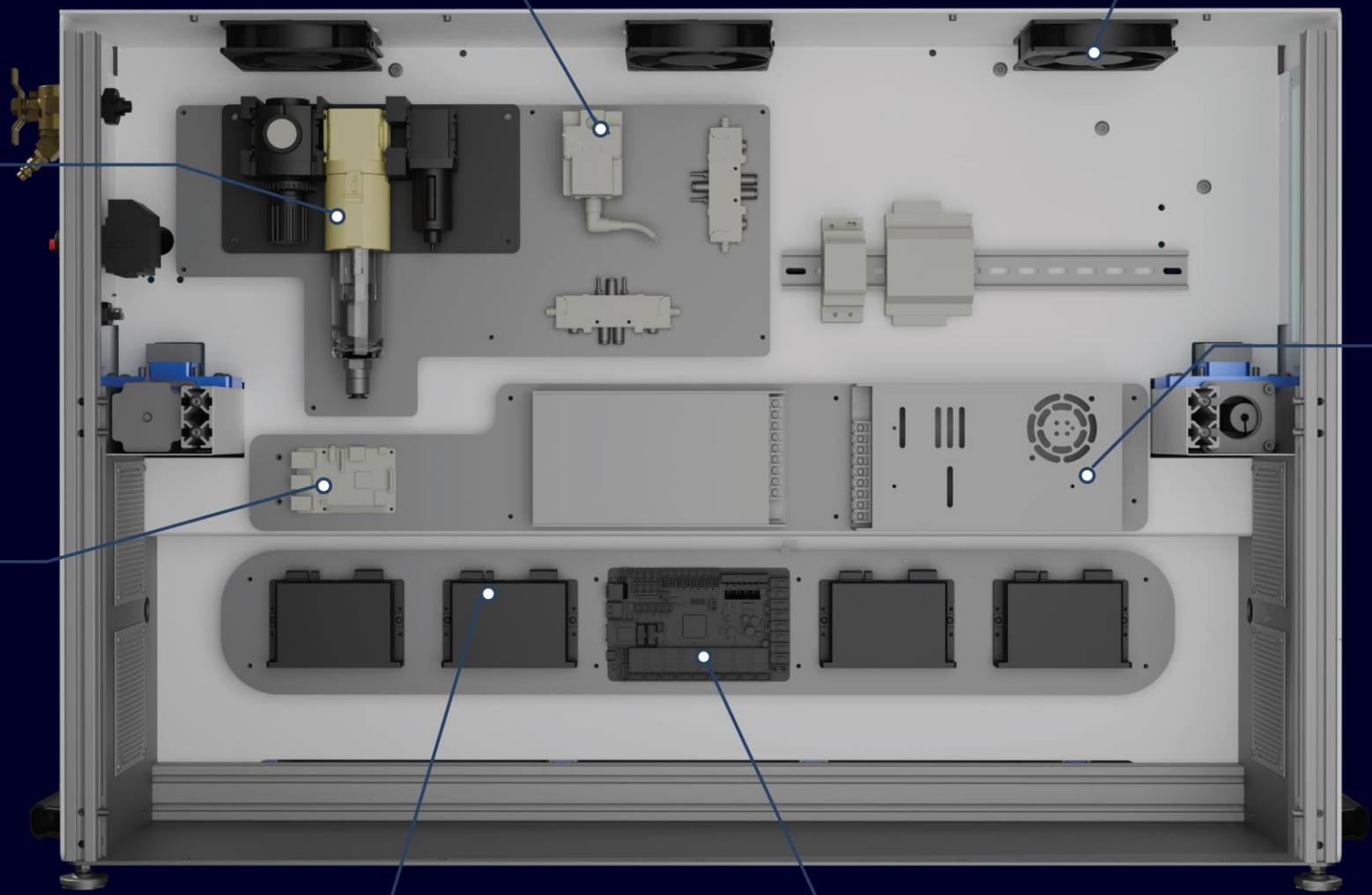
24x20 Dispensing Area
Able to fit up to 4 large heat spreaders at once to efficiently dispence TIM.

Ergonomic Lift Handles
Lift points for safe and secure moving of device.

EPR
Regulates airflow to change TIM dispense rate

Fans
2 zone cooling allows for positive pressure and convection

Pneumatics
Controls TIM dispensing



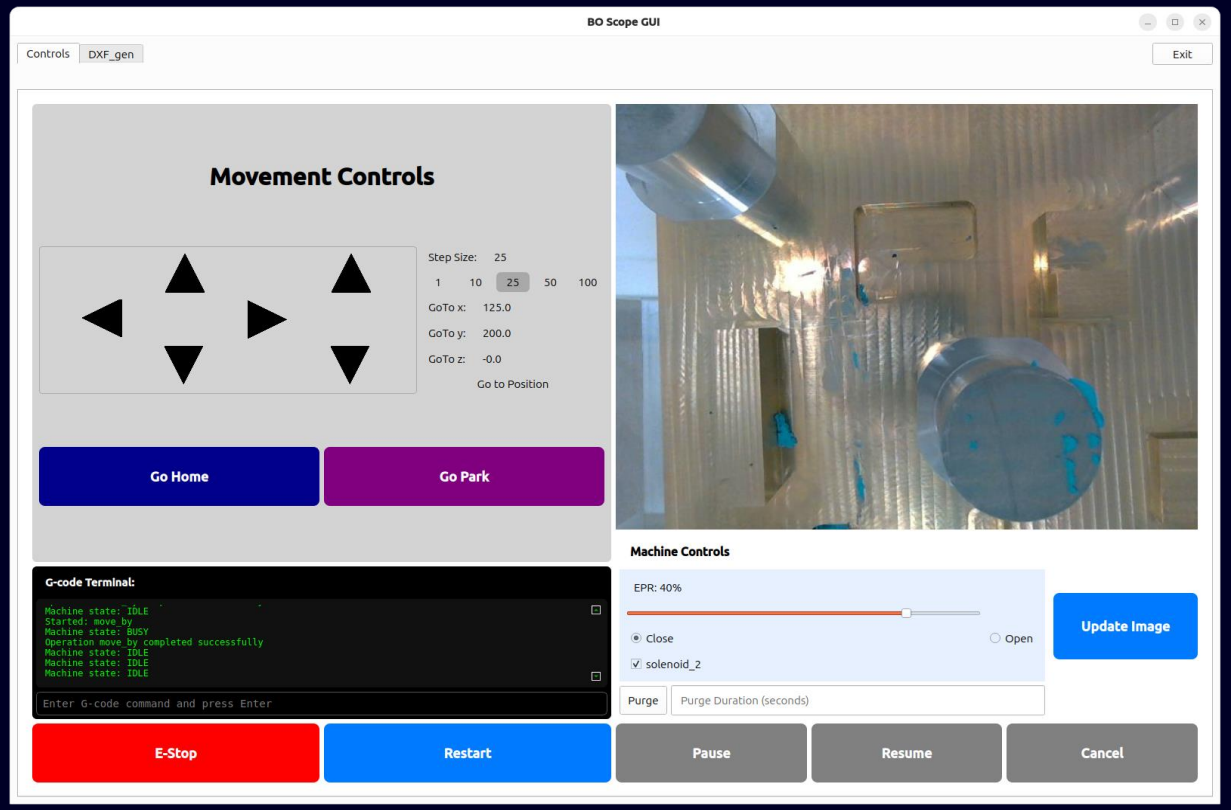
Power Supply
120V, 48V, and 24V rails

Raspberry Pi
Logic and visual computer for whole device

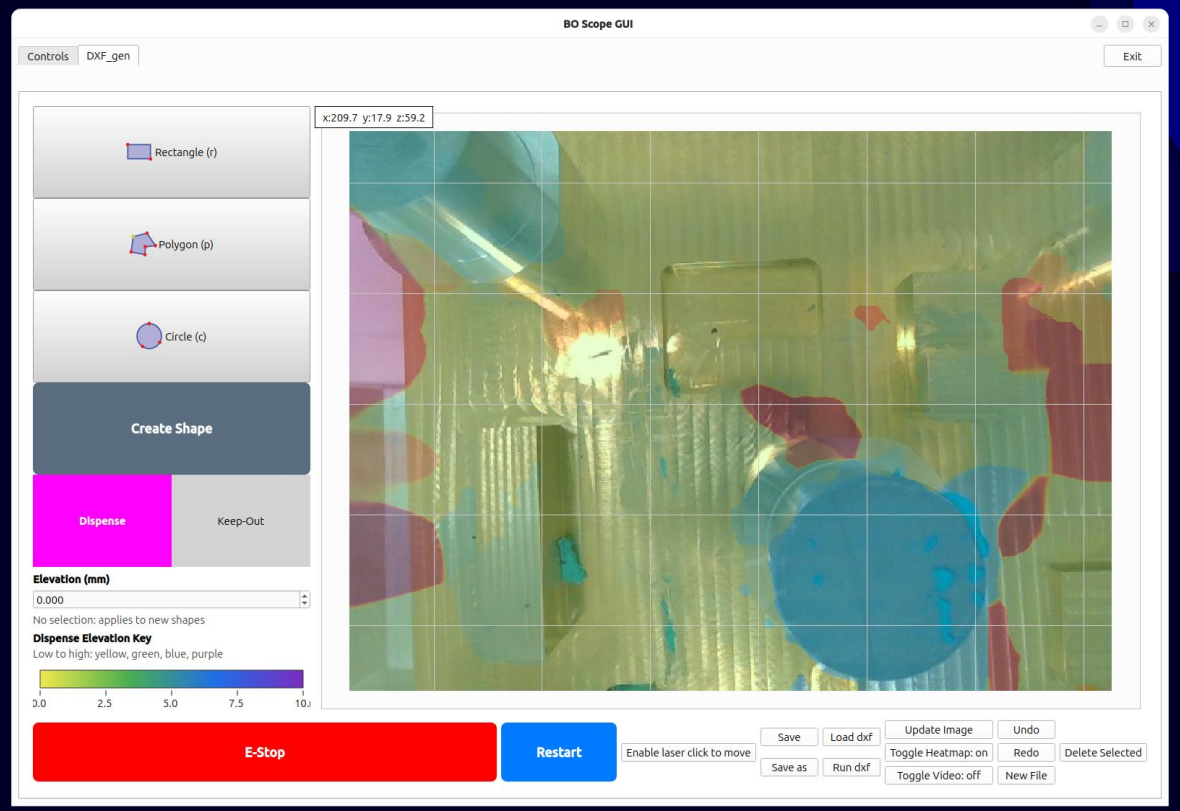
X, Y1, Y2, Z Drivers
Translates instructions and powers stepper motors

Octopus Pro
Main control unit for all live time functions

User Interface

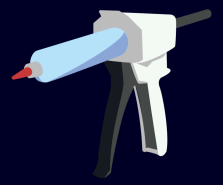


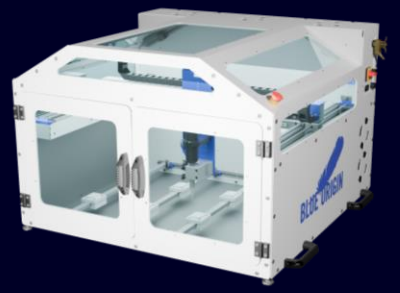
Control Tab



GCODE Generator

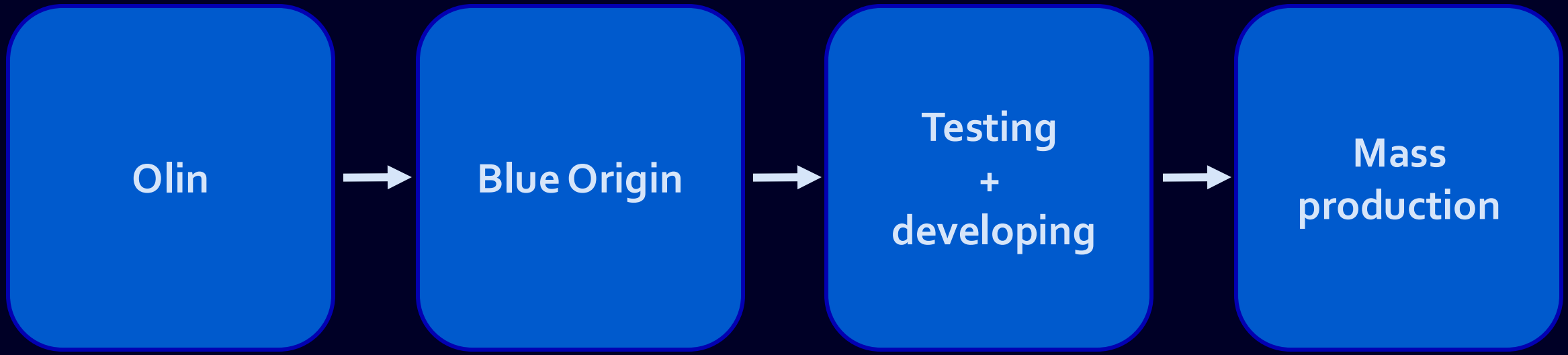
Impact





1 board at a time	4 boards at a time
Manual, time consuming	Automatic, fast
Inconsistent, inaccurate	Accurate, repeatable

Next Steps



Thank you

- We would like to thank our liaisons,
- David Llapitan, Alan Tate, and Sara Olson,
- our subject matter specialist Greg Stai,
- and our advisor, Jessica Townsend

Boston Scientific

Olin College of Engineering SCOPE

Reducing Physician Strain Through Duodenoscope Tip Rotation

A Boston Scientific Endoscopy Project

Meet the Team!

Akshat Jain

Alex George

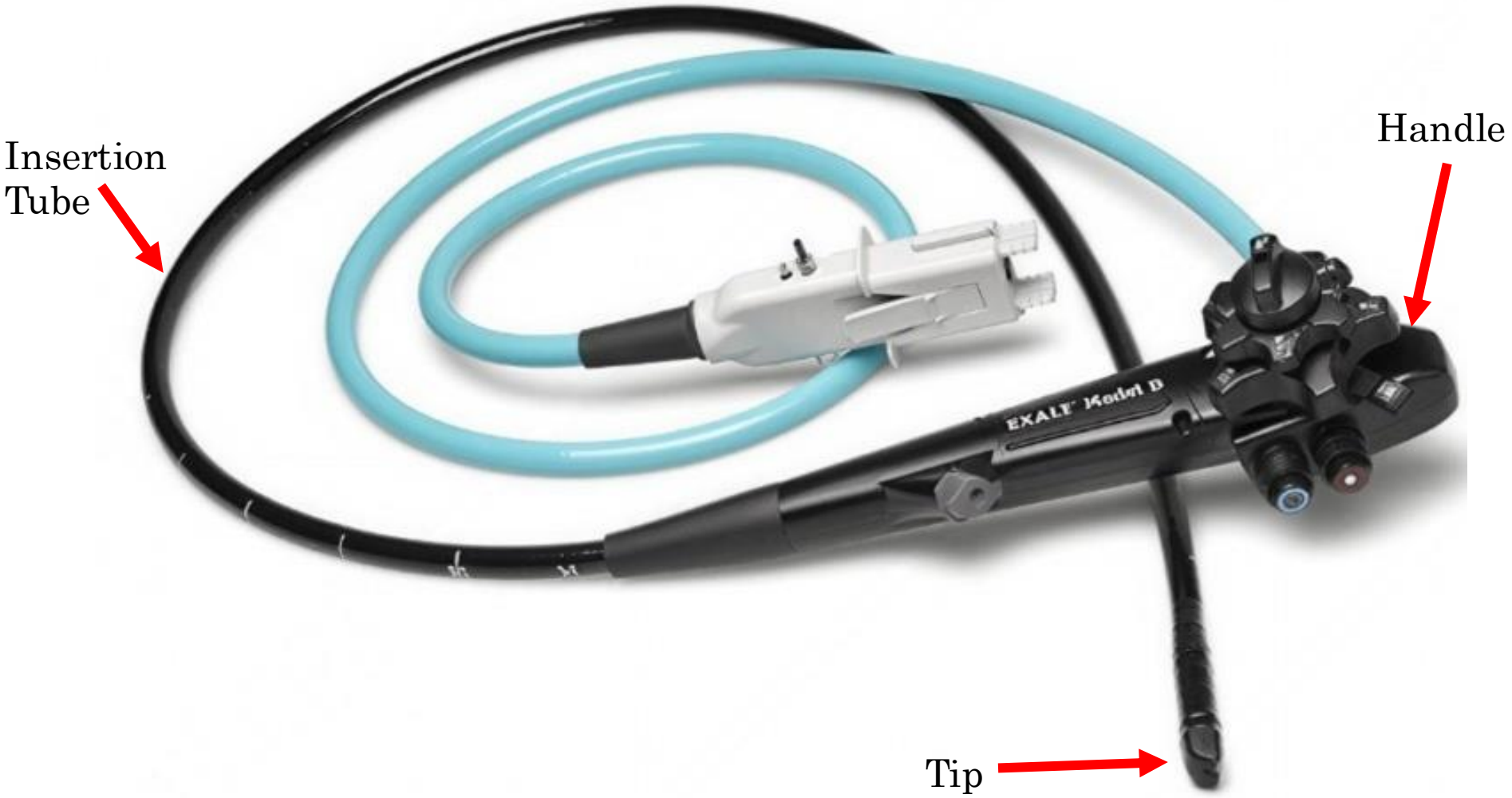
Ellen Sun

Matt Farmar

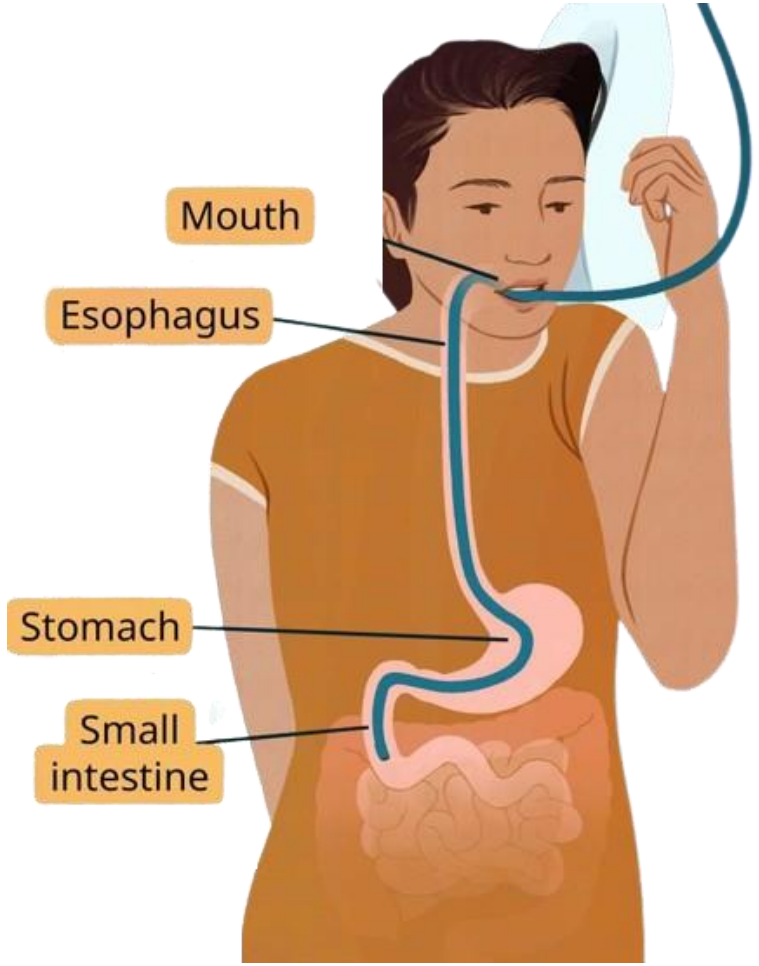
Maya McKone-Sweet

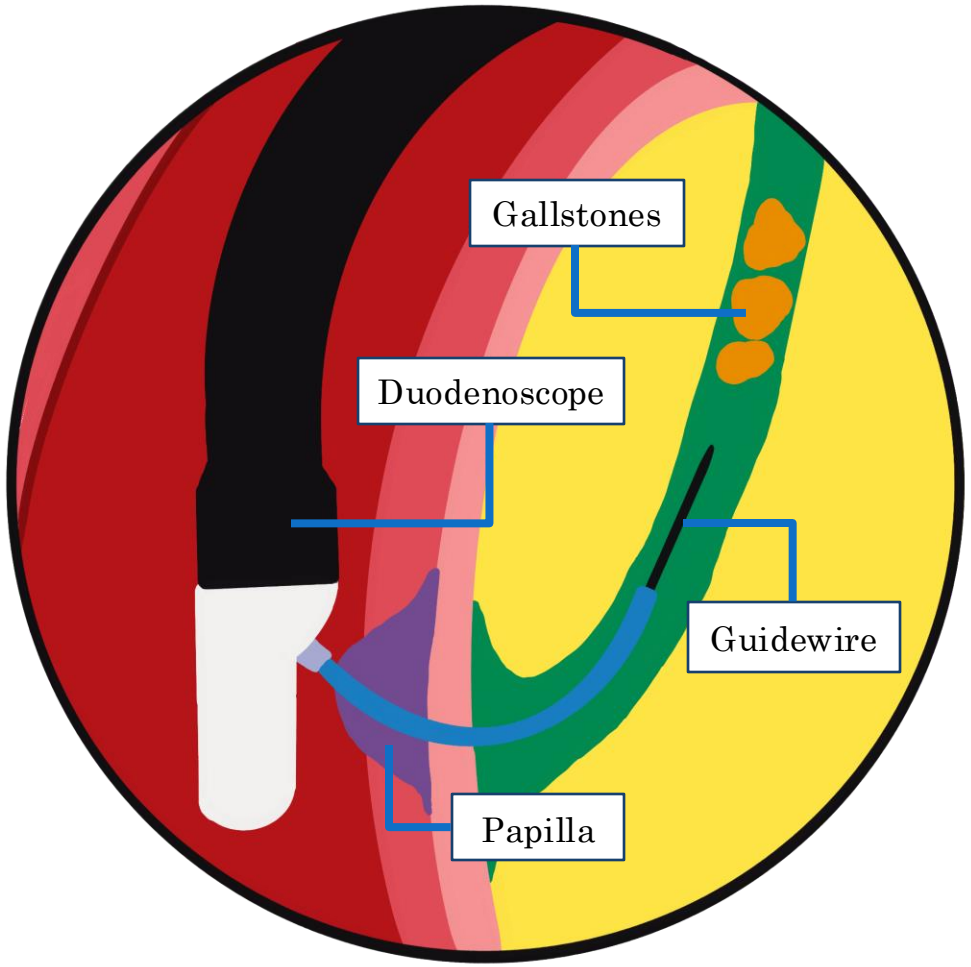
Tabitha Davison

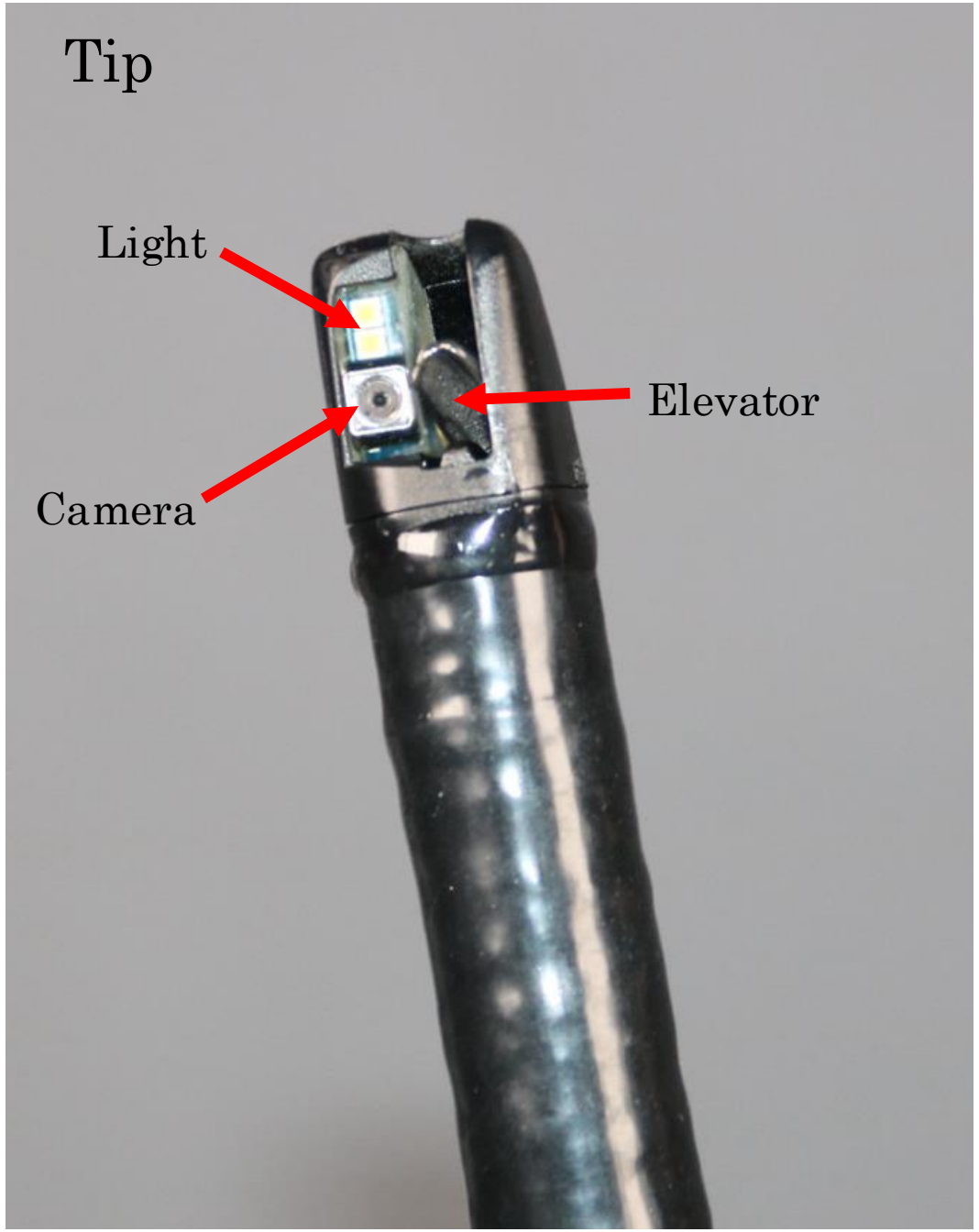
EXALT Model D Duodenoscope



Endoscopic Retrograde Cholangiopancreatography (ERCP)






Tip
Light
Elevator
Camera


Handle

Three Major Scope Capabilities

Articulation

Catheter Use

Elevator Operation

650,000

ERCP procedures are performed every year in the United States.

*(Yang, Huai-Yu et al.)

Pain Points

46 minutes

is the average length of ERCP, with some over ***200 minutes.***

*(Mehta, Paresh P et al.)

75.2%

of endoscopists report having sustained an endoscopy-related injury.

*ERI's reported by 1,277 out of 1,698 physicians.
*(Pawa, Swati et al.)

The Goal

Reduce that strain on physicians by improving visualization and accessibility to anatomy.

What We Did

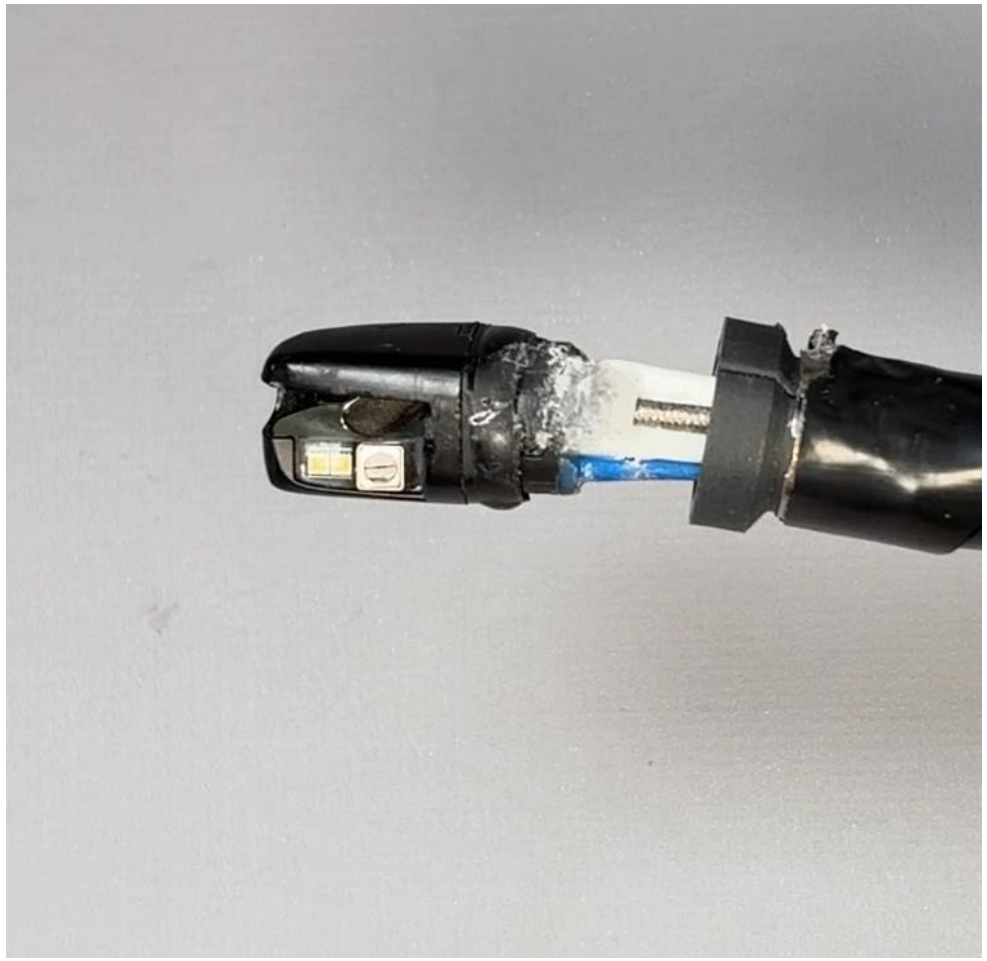
Added rotation to the distal tip of the scope to improve the range that the scope can access.

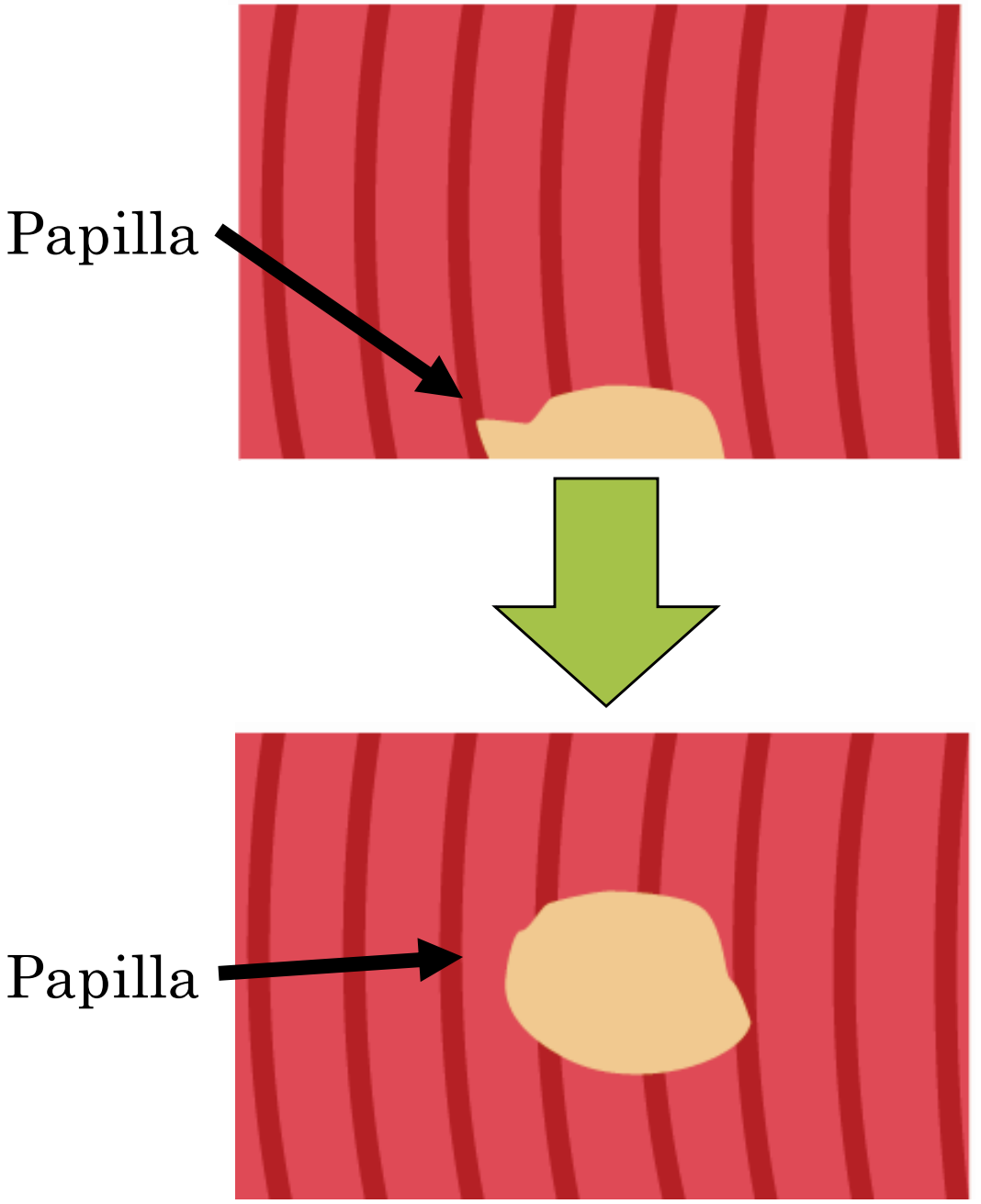

S
2013

Our Solution

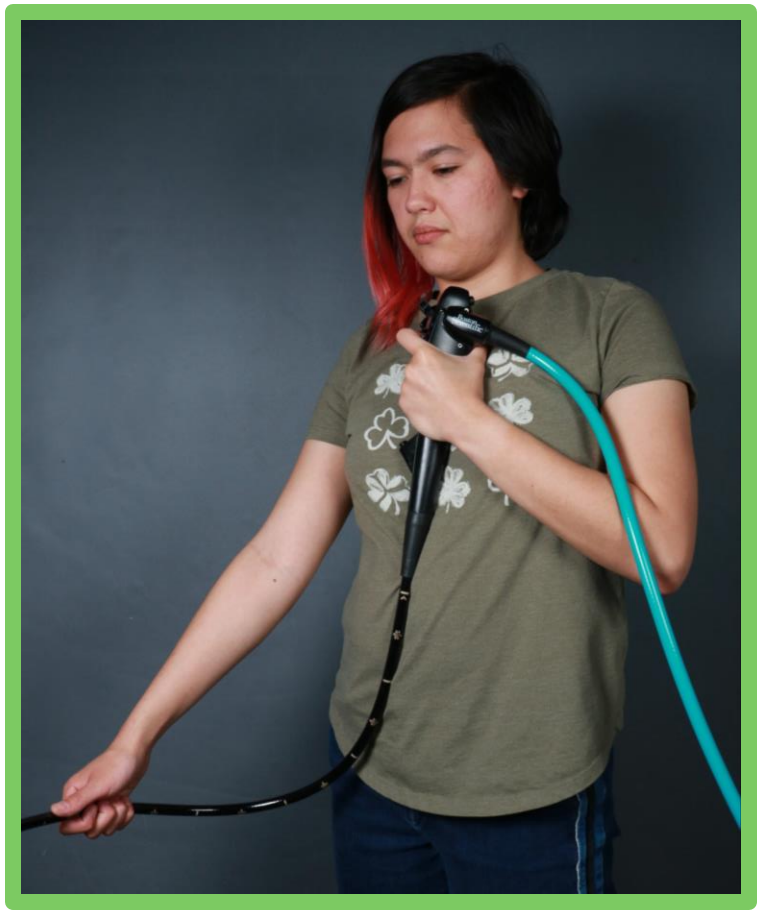
An **electromechanical system**, controlled by the user at the handle, that **rotates the distal tip**.


Counter-Clockwise
Clockwise
MCU

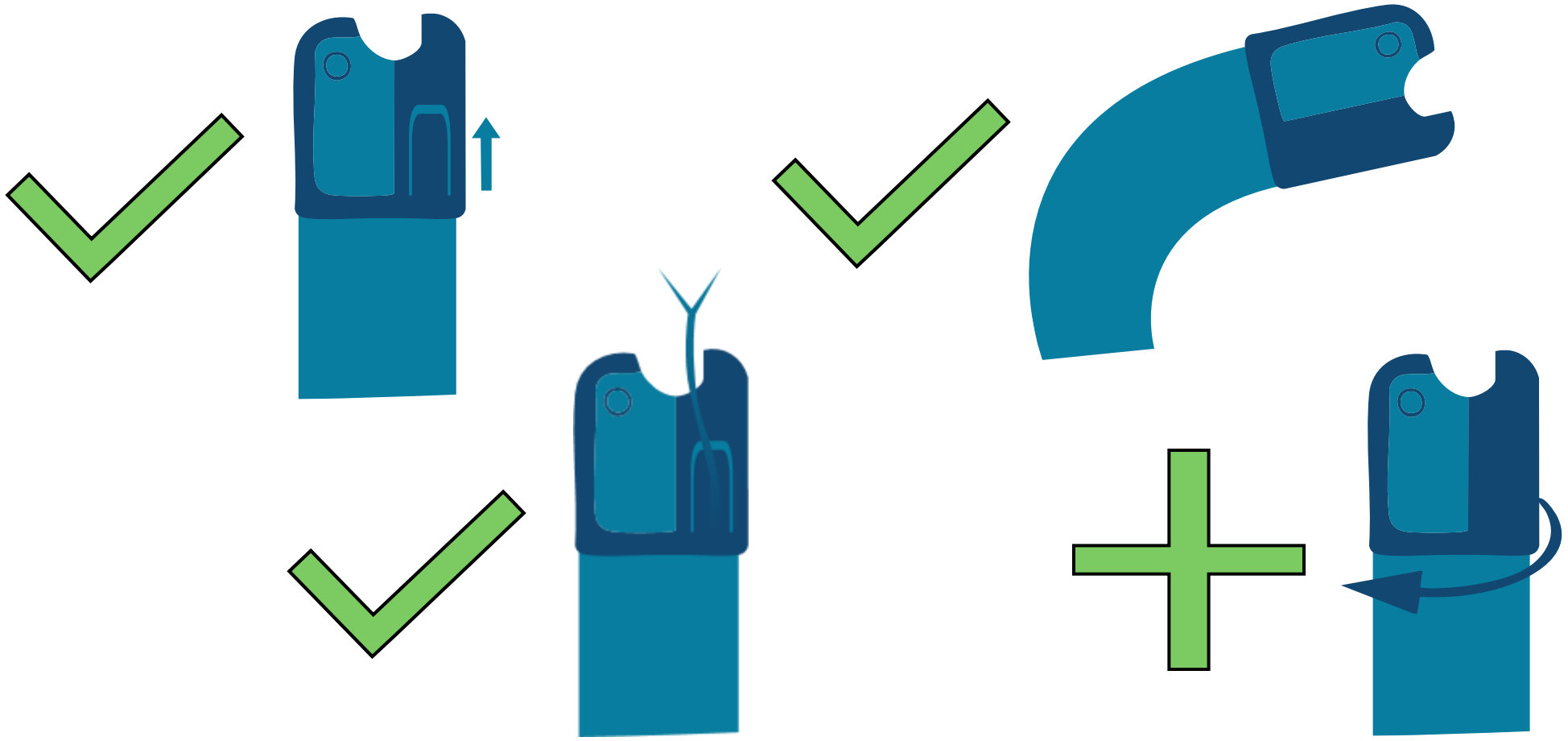



Papilla
Papilla

We **reduce** physician strain to control the duodenoscope



We **maintain** full duodenoscope functionality



What's Next?

Integration of our design into the **next-generation duodenoscope**

Approval of

4

patent-pending designs

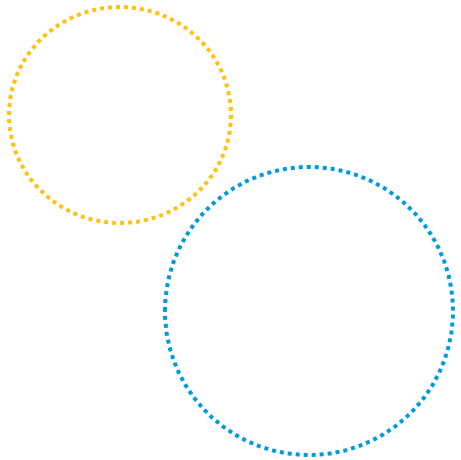
With a great design, we **improve the physician experience**.

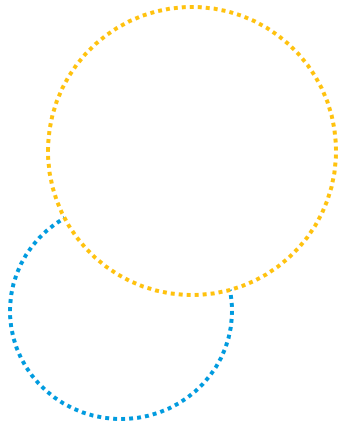
Positively **impacting the lives** of millions of future patients and thousands of physicians.

Thank you!

Collin Murray, Sean Powell, and Jessica Townsend

BU WISE



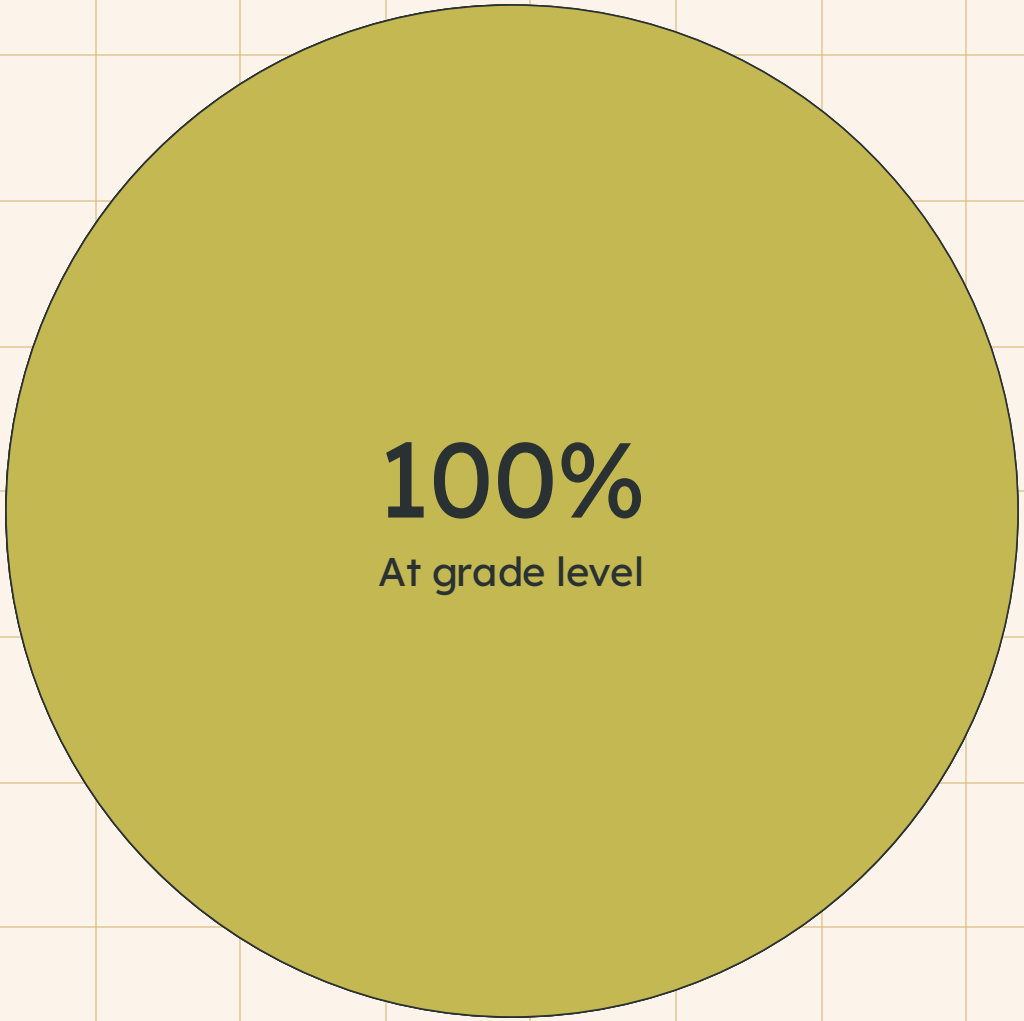


Olin College of Engineering SCOPE

Enhancing Early Literacy:

Exploring Applications of Technology in Education

BU WISE SCOPE Team



All 4th graders in U.S. primary schools have potential to read at grade level.

However, current education system assessments show only 31% at that mark.

Source: https://www.nationsreportcard.gov/reports/reading/2024/g4_8/

BU WISE SCOPE Team

Elin O'Neill

E: Computing
Project Manager

Ian Lum

E: Computing

Kelsey McClung

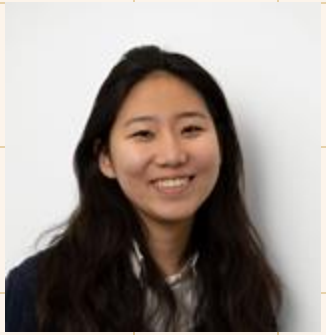
E: Computing

Belén Hutchins

E: Sustainability

Dokyun Kim

E: Robotics
Budget Manager



Sally Lee

E: Computing

SCOPE Sponsor

Boston University

Wheelock Institute for the Science of Education

Reach Every Reader Research Initiative

Our Liaisons

Amon Millner

Olin College
SCOPE Advisor

Julianne Masser

BU WISE
Primary Liaison

Aidan Mclaughlin

BU WISE
Technical Liaison

David Shuman

Olin College
Subject Expert

Jamell Dacon

Morgan State University
Technical Expert

Nancy Nelson

BU WISE
Literacy Expert

Reach Every Reader

Launched 2018

Olin College of Engineering

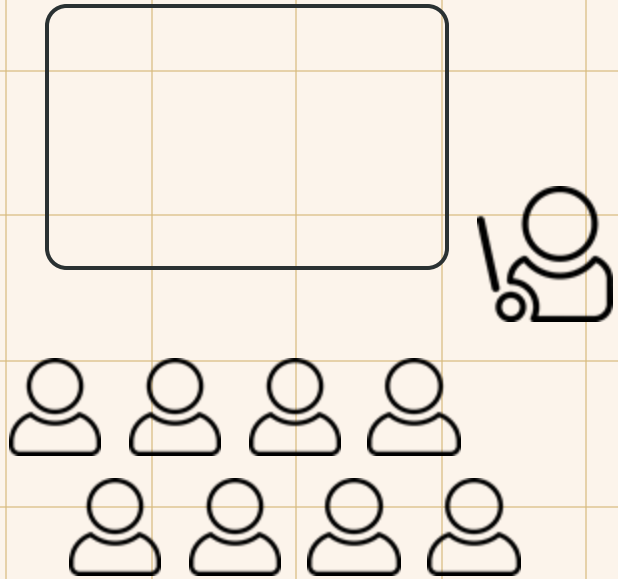
Mission to improve reading outcomes using:

1. Research-backed curricula
2. Appropriate assessments
3. Social work considerations
4. Cutting edge technology

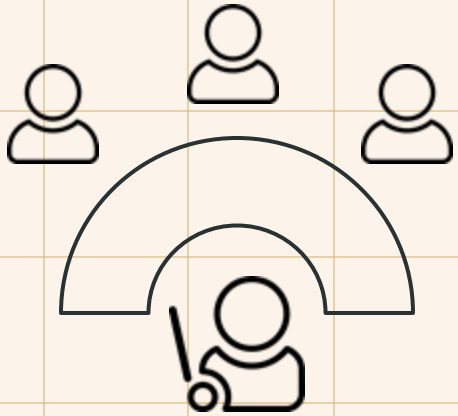
Learning Games

Image: Reach Every Reader: Gaming Considerations for Educational Assessment

Full Class Lessons

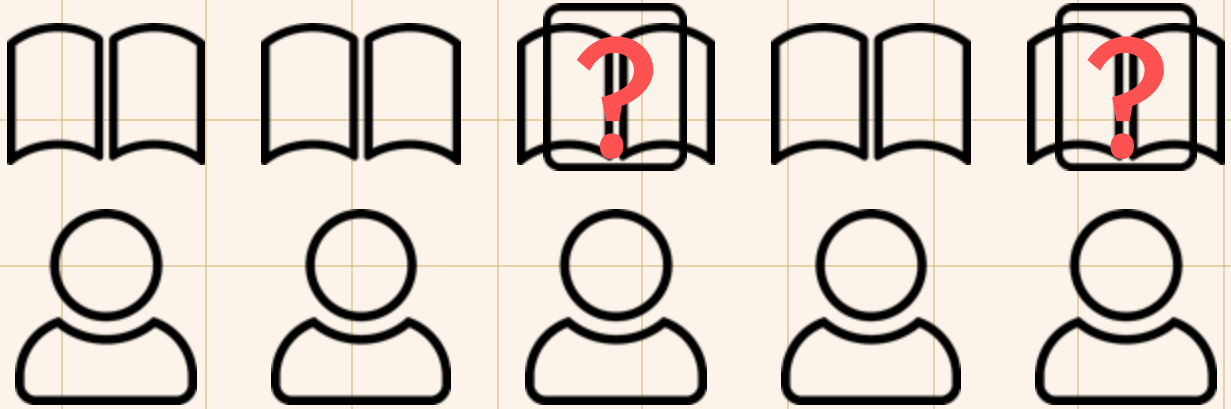


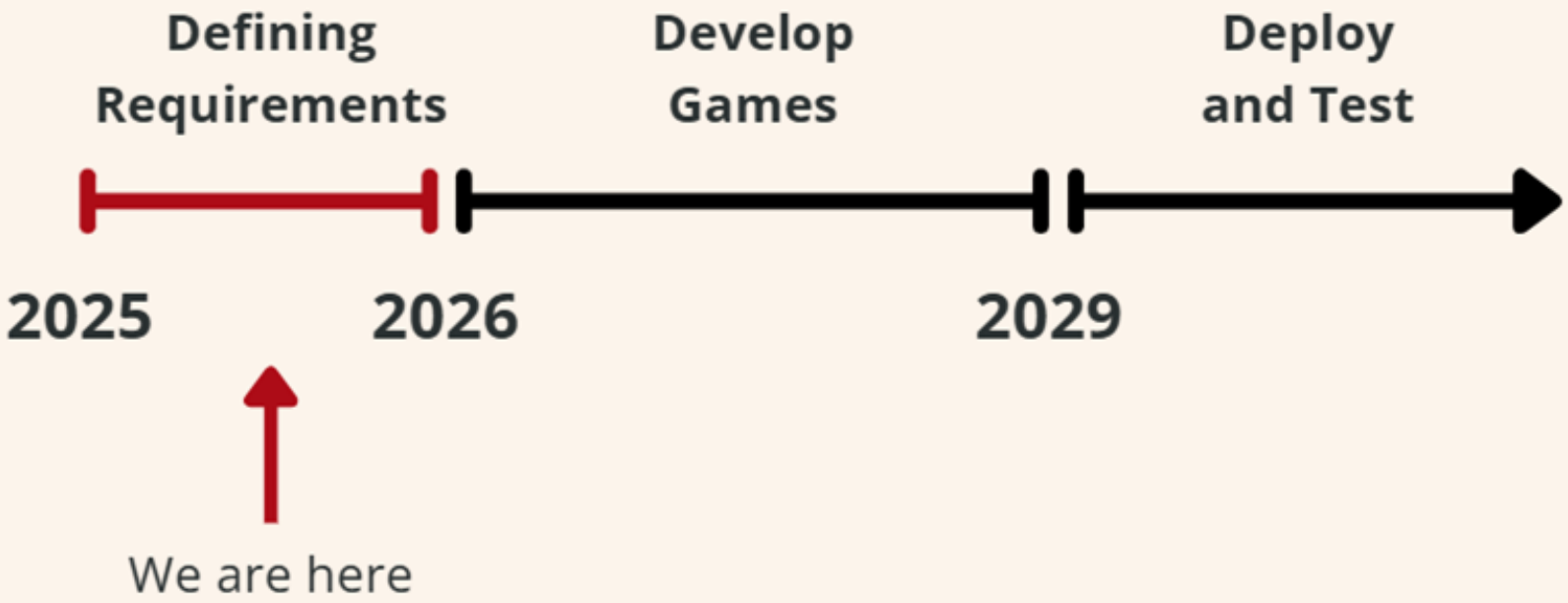
Small Group Lessons

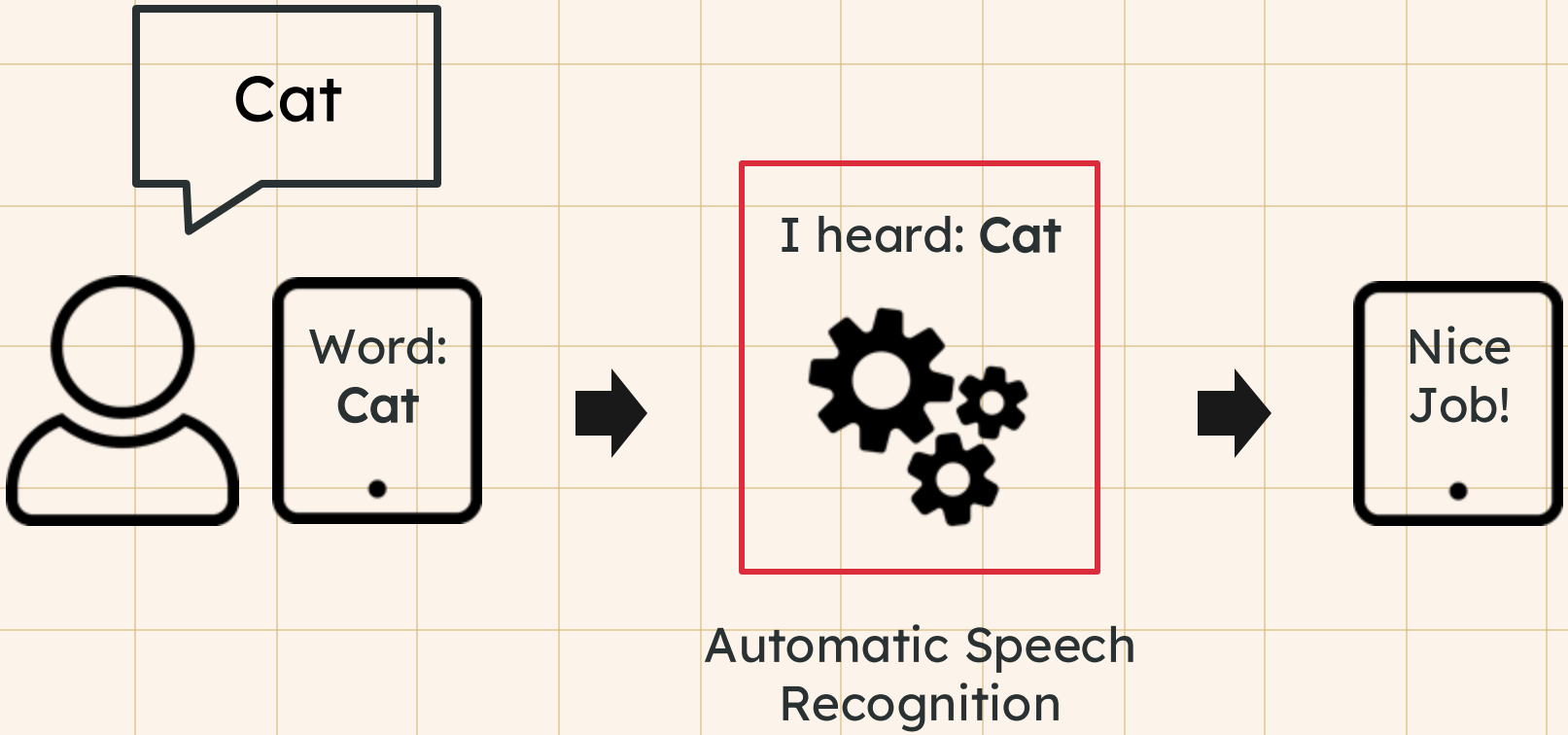


Independent Reading

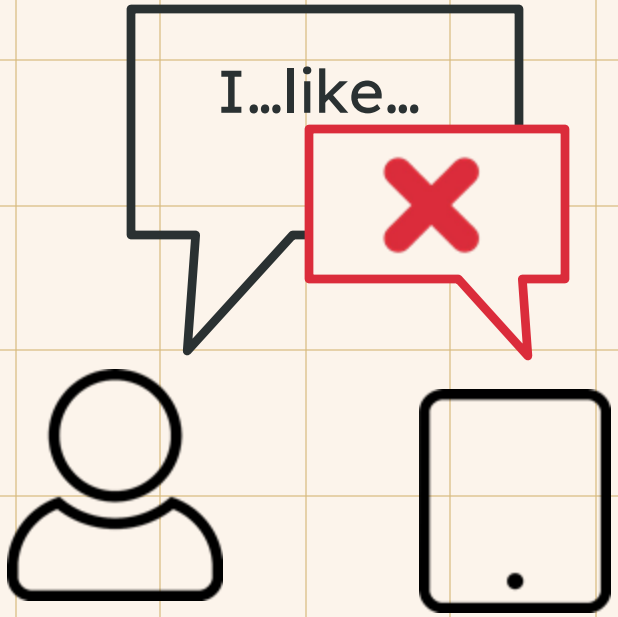
Independent Reading



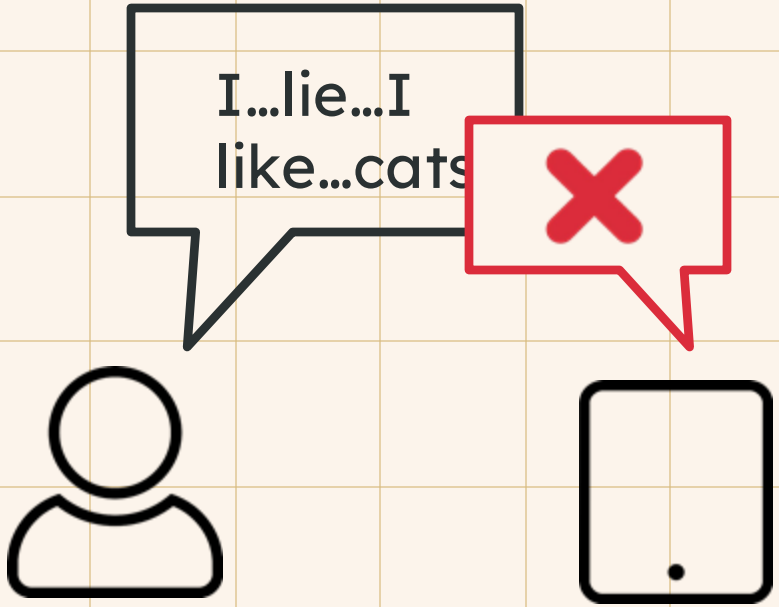

Defining Requirements
Develop Games
Deploy and Test
2025
2026
2029
We are here



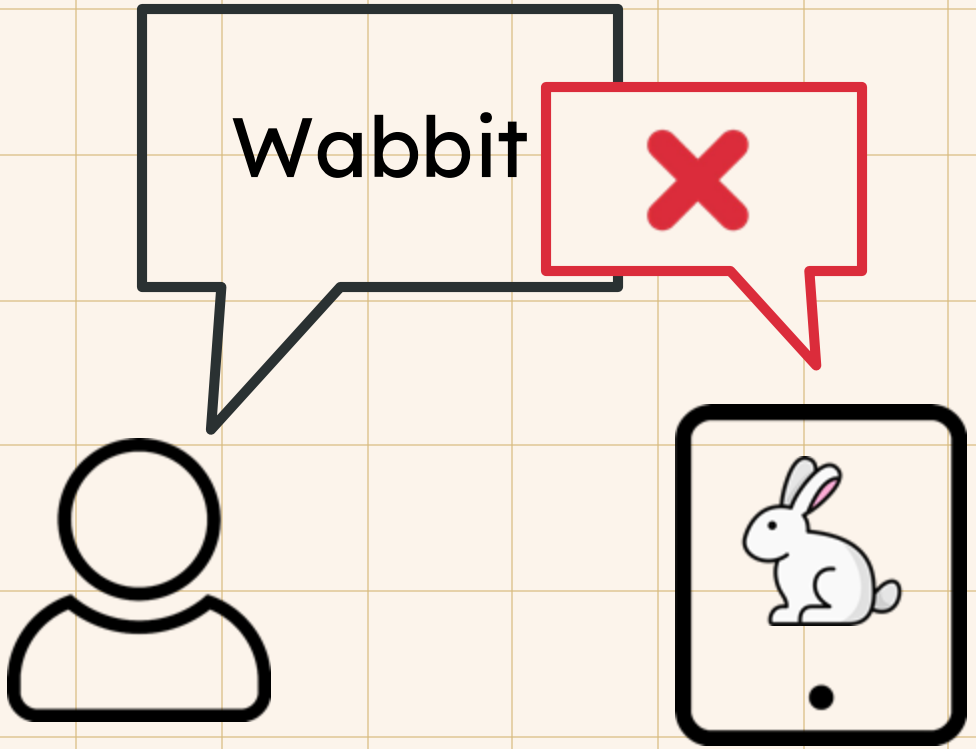
Automatic Speech Recognition



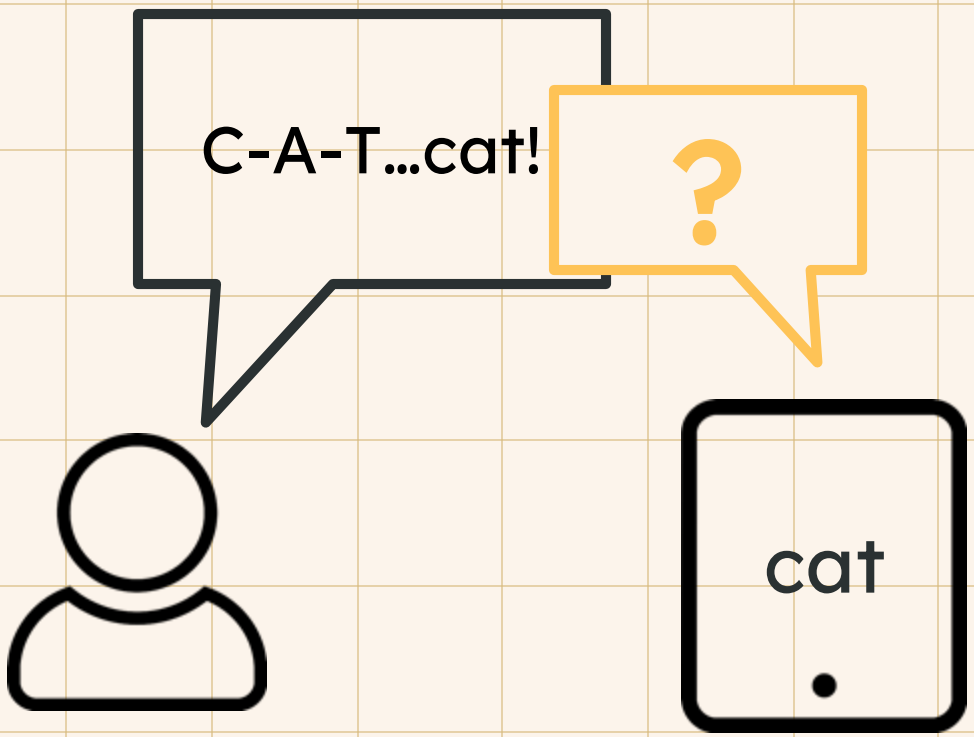
Pauses



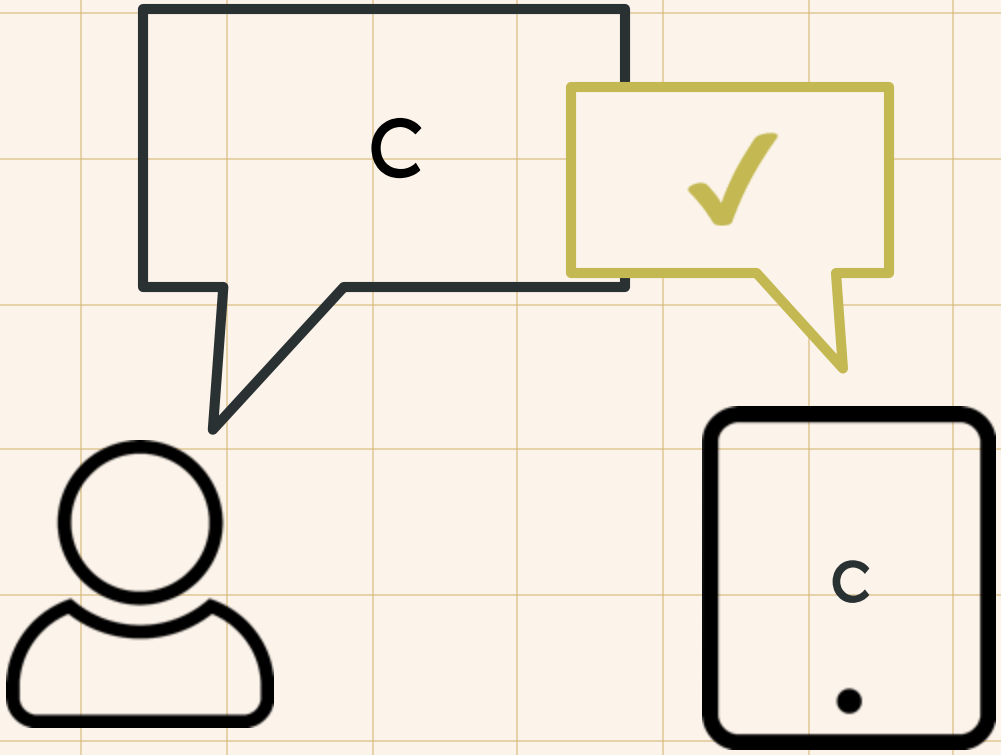
Insertions



Developmental Differences

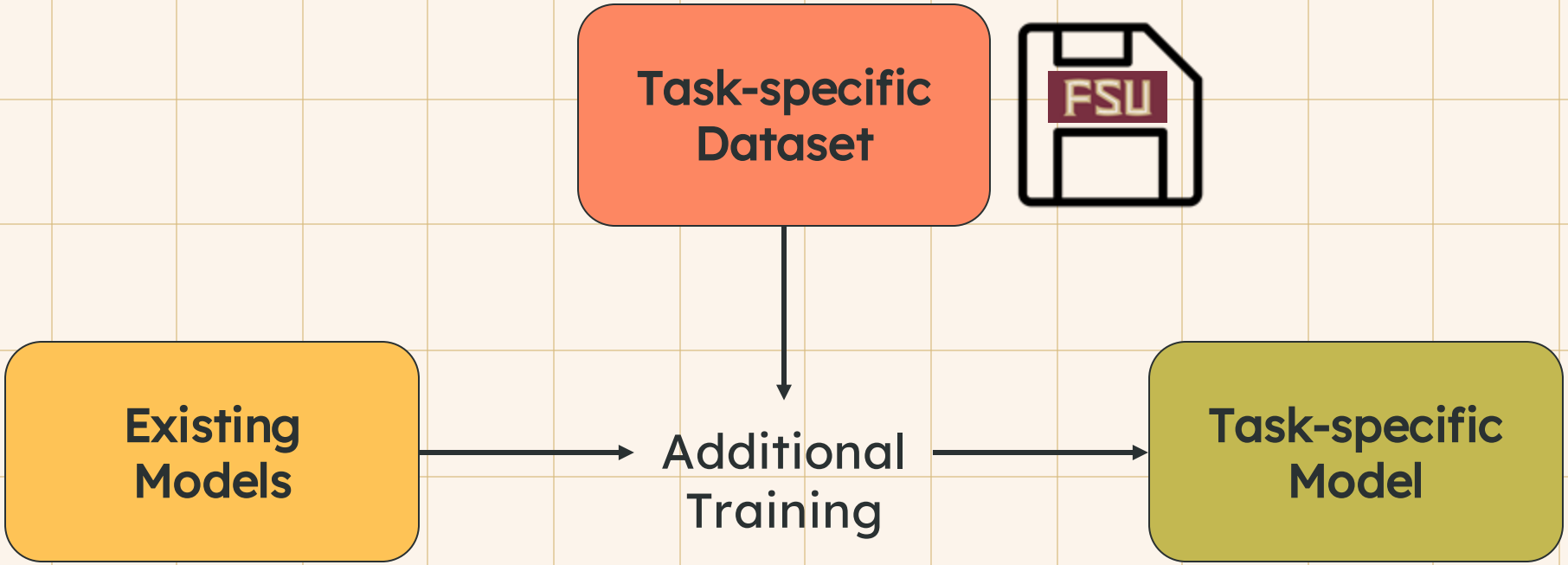


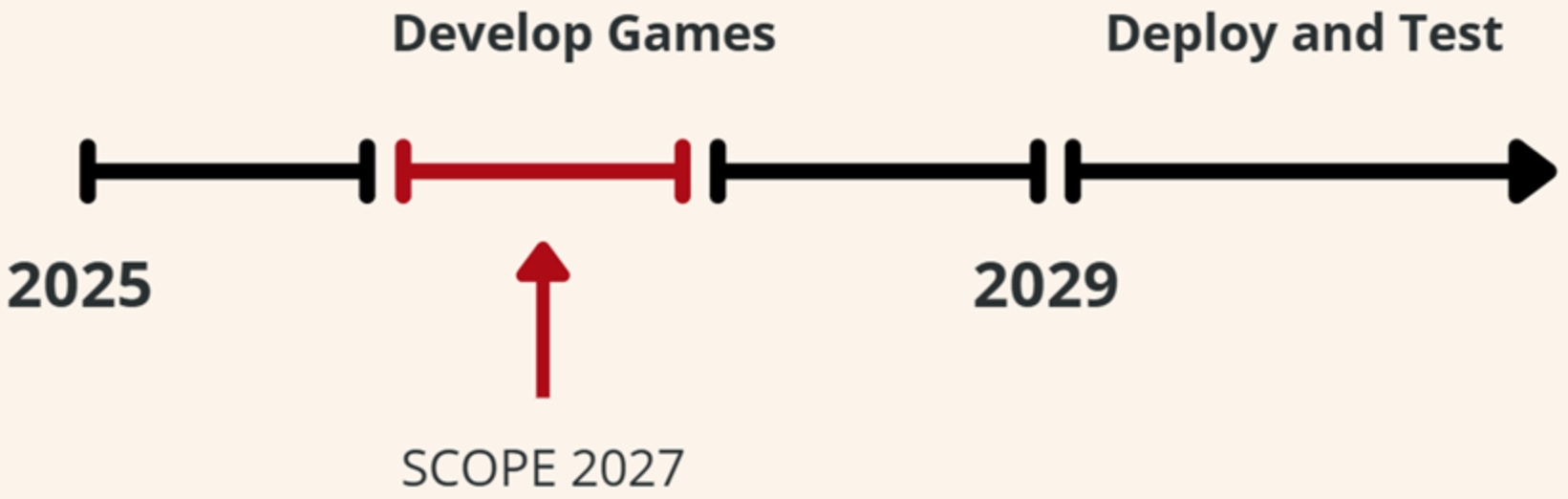
Individual Sounds



Individual Sounds

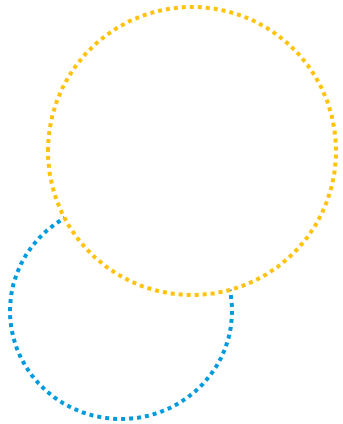
So what do we do?

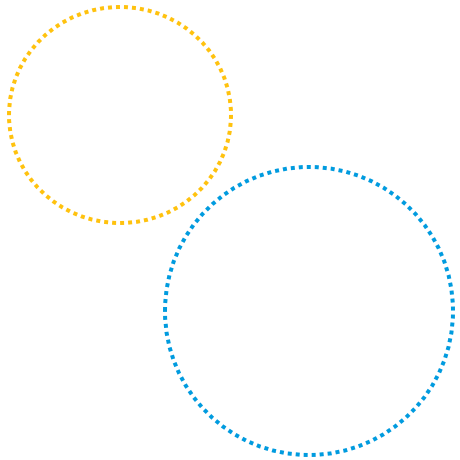



Develop Games
Deploy and Test
2025
2029
SCOPE 2027

Next steps

1. Learning Games
2. Teacher Data Dashboard
3. Sustainability & Ethics

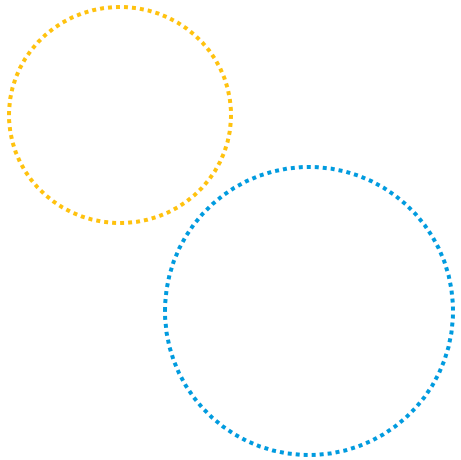


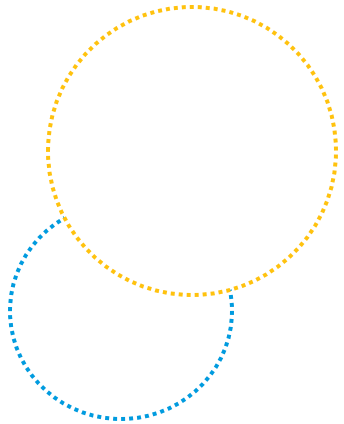


Intermission

Olin College of Engineering SCOPE

Lasso Labs





Olin College of Engineering SCOPE

Olin College of Engineering
SCOPE

Flat Sheet Fiber Dewatering

Lasso - SCOPE 2026

Camilo Cuartas, Camden Droz, Angela Huang, Reuben Lewis, Will Young

Lasso

Everything you love about meat, made Tender™.

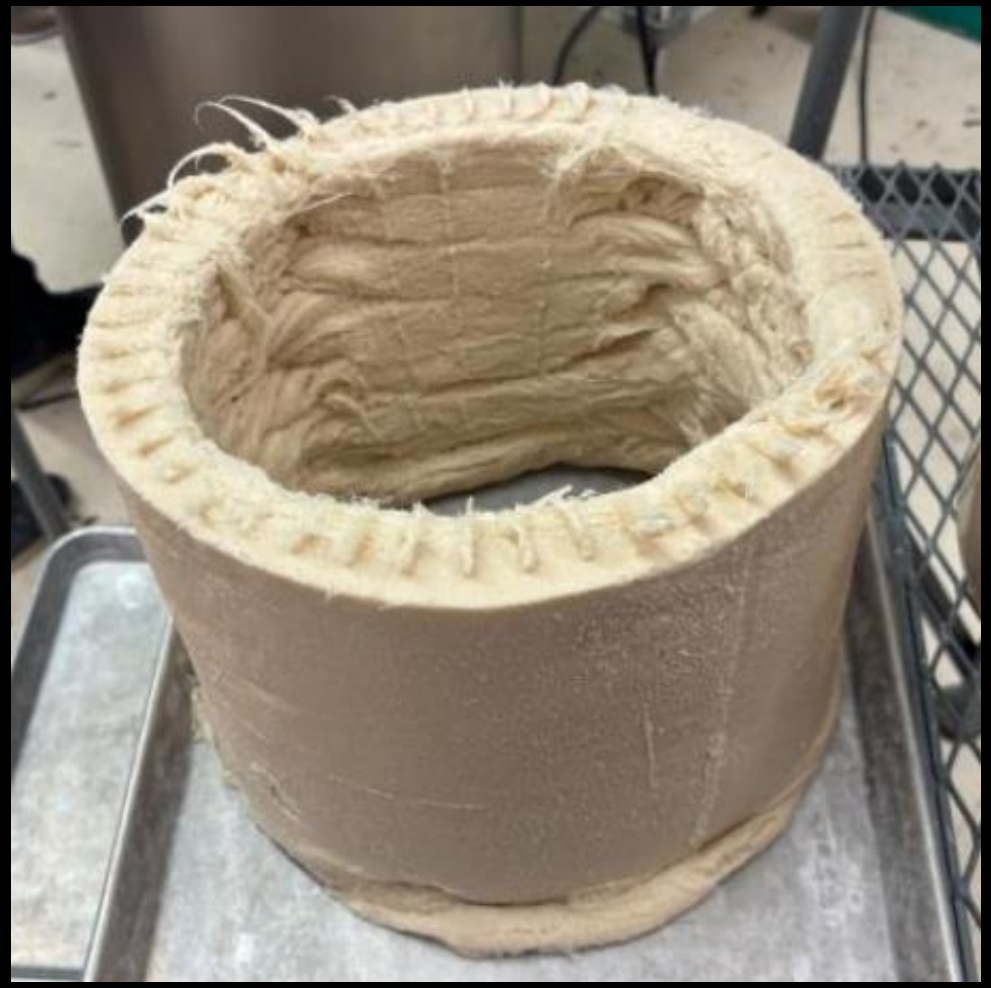
Juicy, flavorful, and cooks like the real thing. Plant-based meat that's truly a cut above.

FROOBIES

YOUR FAVORITE FRUIT SNACK

Context

Fiber Collection → **Mechanical Dewatering** → Thermal Drying



Context

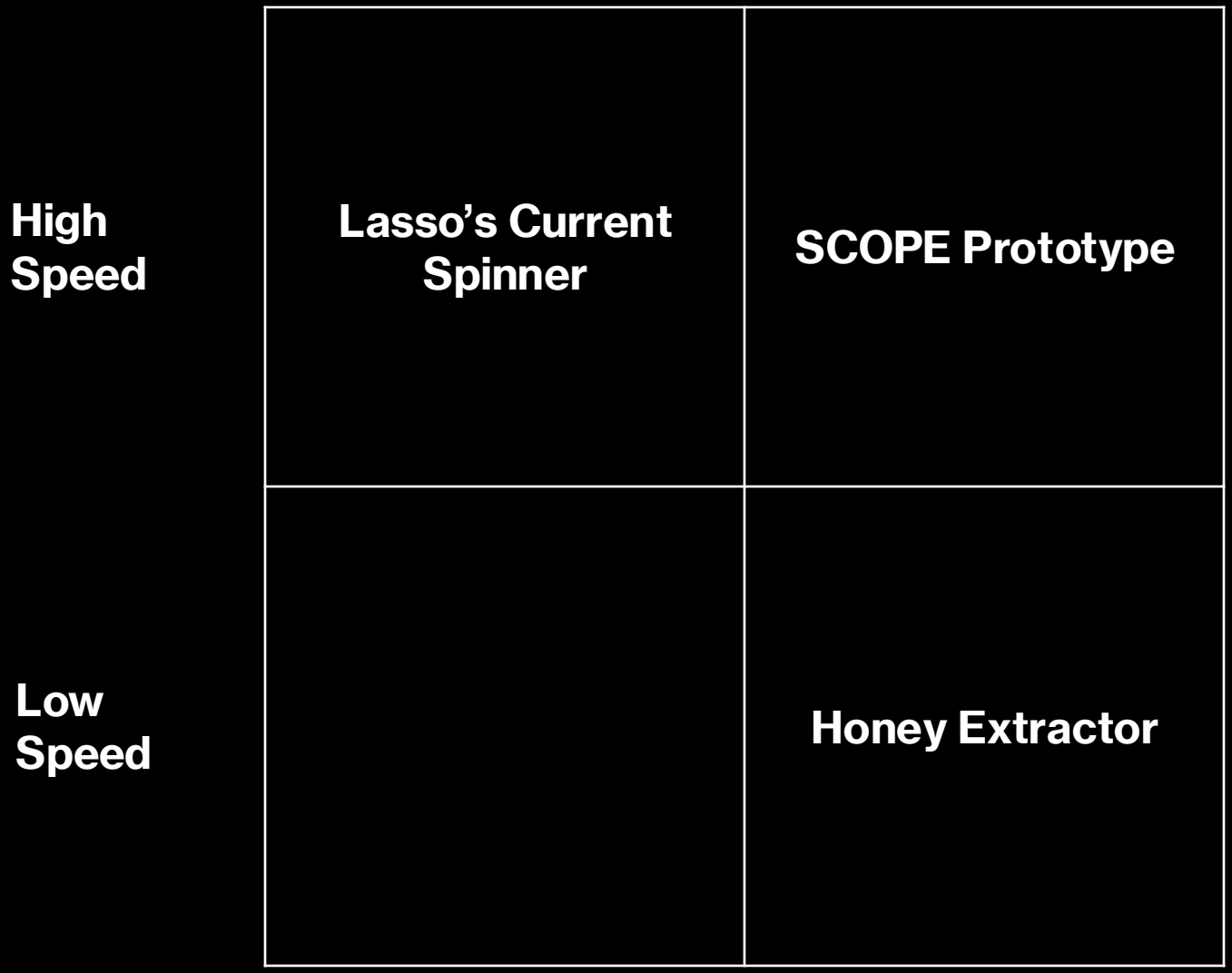
Donut shape fiber format

Flat sheet fiber format

Existing Solutions

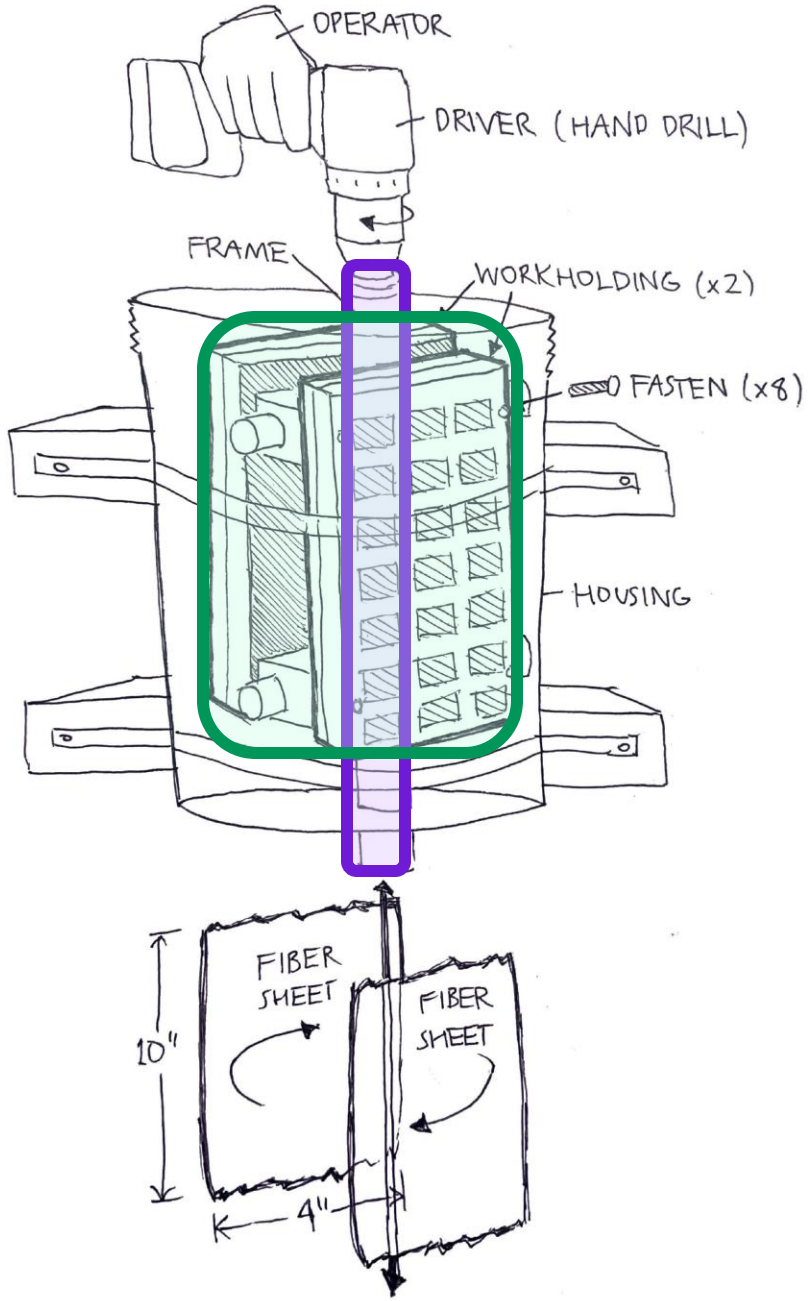
Industrial
Salad Spinner

Centrifugal
Honey Extractor

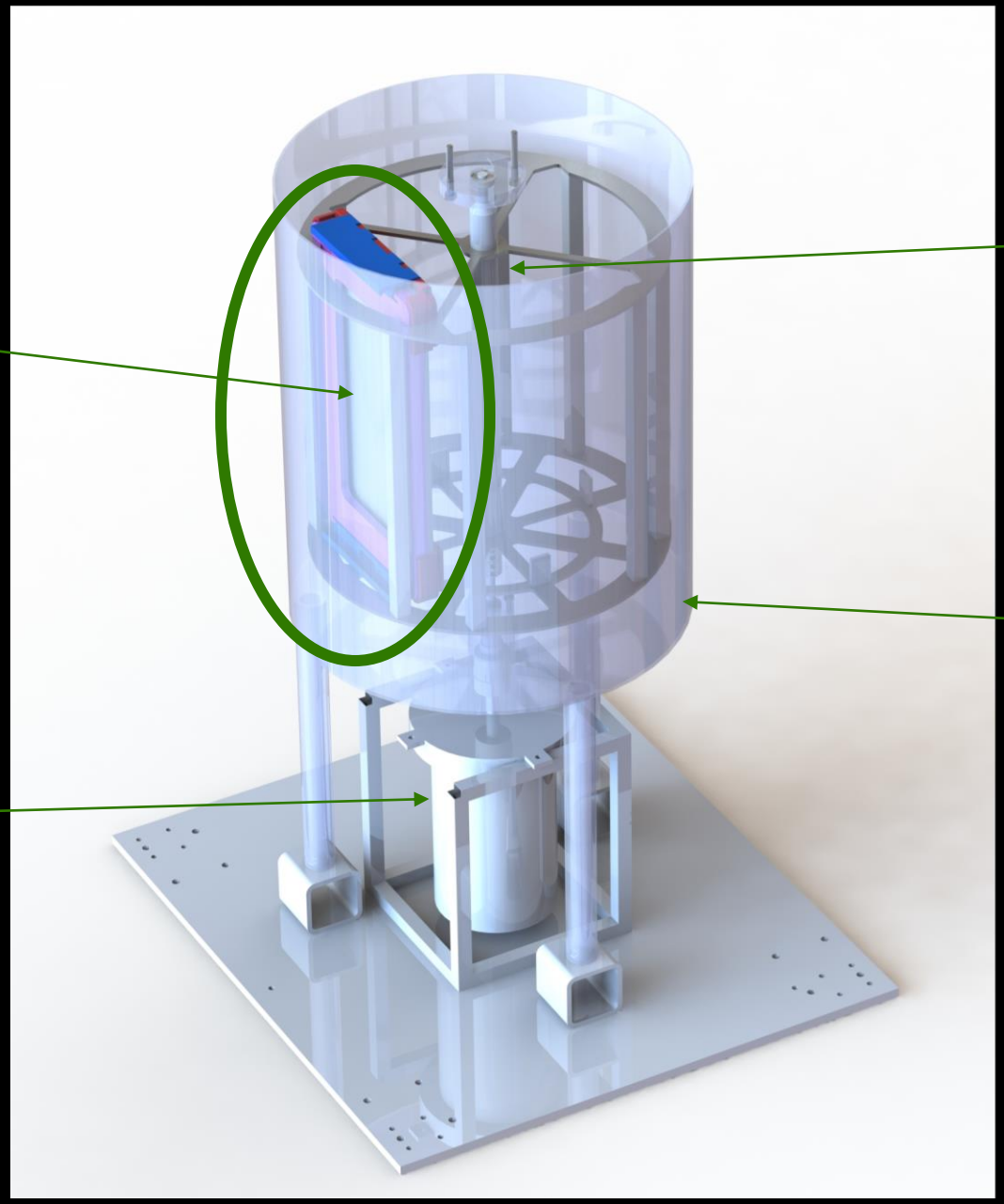

High Speed
Low Speed
Lasso’s Current Spinner
SCOPE Prototype
Honey Extractor
Accepts Raw Product
Accepts Frames Containing Product

Problem Insights

- **High-speed centrifugal dewatering** was most effective
- **Vertical spinning axis** has less vibration
- **Two-part removable workholding** most effectively prevented fiber breakage



Final Prototype



Workholding
Two-part clamping prevents tearing during spinning

Spindle
Vertical orientation ensures stability during high-speed operation

Housing
Contains extracted water during operation

Motor
VFD enables precise speed control and future automation

Testing

- Our machine dewaters fibers to the desired moisture content!
- Spin time ≤ 30 seconds is sufficient
- Cycle time is slightly longer than donut style dewatering (but not a lot longer)

Next Steps

- Explore manufacturing processes involving flat sheet fiber collection
- Further testing with actual fibers to determine optimal dewatering parameters
- Refine design for manufacturability, food safety, and automation

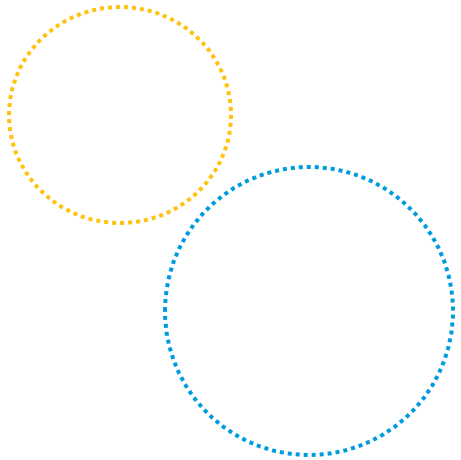
Acknowledgements

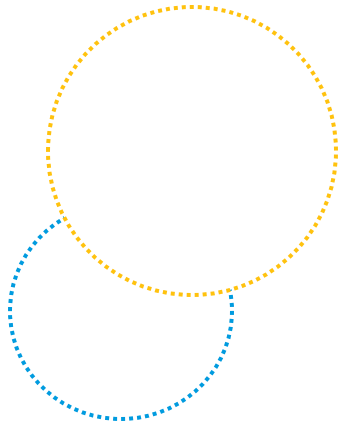
We would like to extend a huge thank you to:

- Scott Hersey and the Olin SCOPE team
- Ethan Miller and Mary Feyrer
- Our Subject Matter Experts at Olin (Daniela Faas, Chris Lee, Ben Linder)

Thank You!

New Balance





Olin College of Engineering SCOPE

AUTOMATED PUSH TESTING

2025-2026 NEW BALANCE SCOPE TEAM

By Anagha Babu, Daniel Heitz, Maurice Ampane,
Owen Johnston, Swasti Jain

new balance

Olin College of Engineering

The Team

Daniel Heitz
Electrical Engineering

Owen Johnston
Mechanical Engineering

Swasti Jain
Robotics Engineering

Anagha Babu
Mechanical Engineering

Mo Ampane
Mechanical Engineering

The Push Test

Why the Push Test

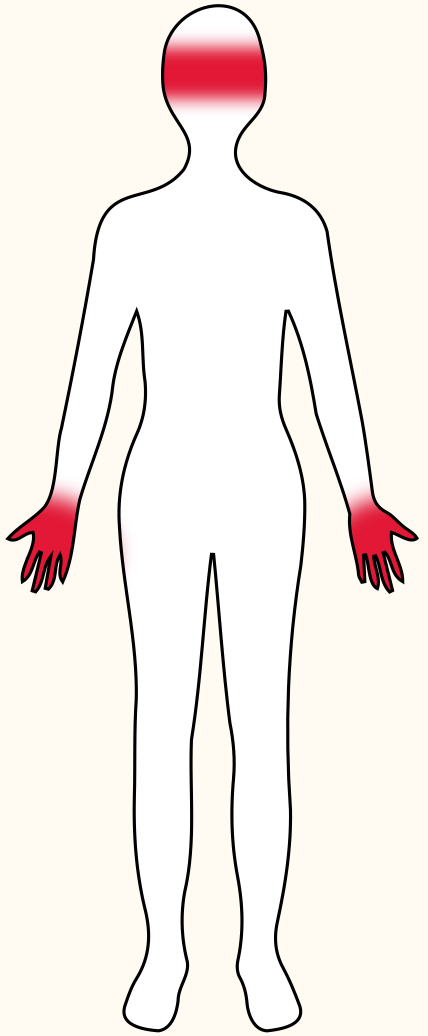
- Quality assurance
- Checking for gaps between the sole and upper

7-points in 30 seconds

Why Automate Shoe Pushing?

8,400 pushes/day

"Push until you see the whites of your thumbs"

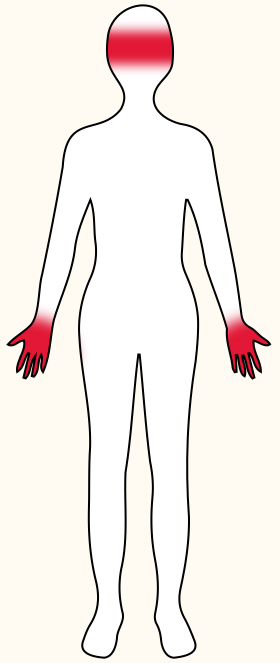


Who Will This Help?

New Balance

Customers

Associates

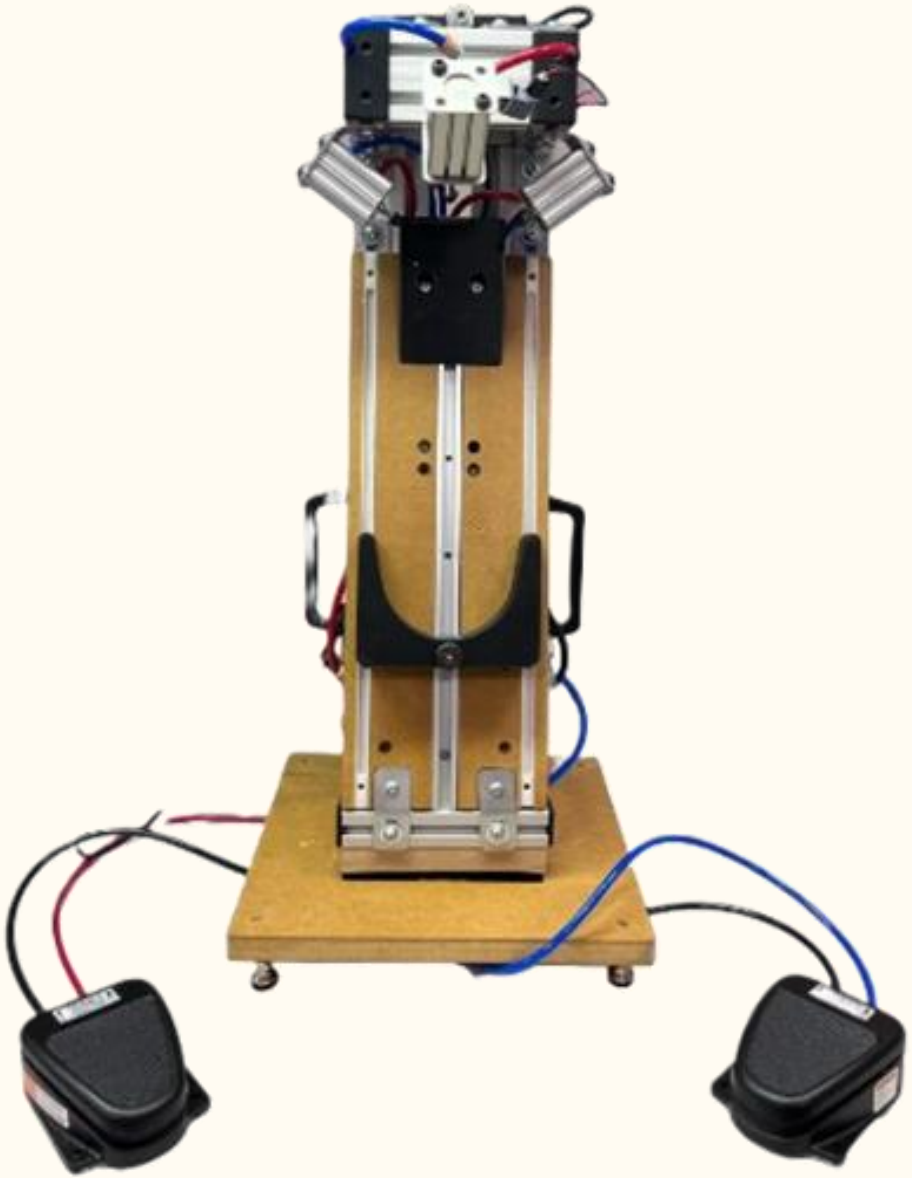


Goal:

Develop a gap checking system that performs the 7-point-push-test within 30 seconds to reduce associate fatigue while smoothly integrating into the production line

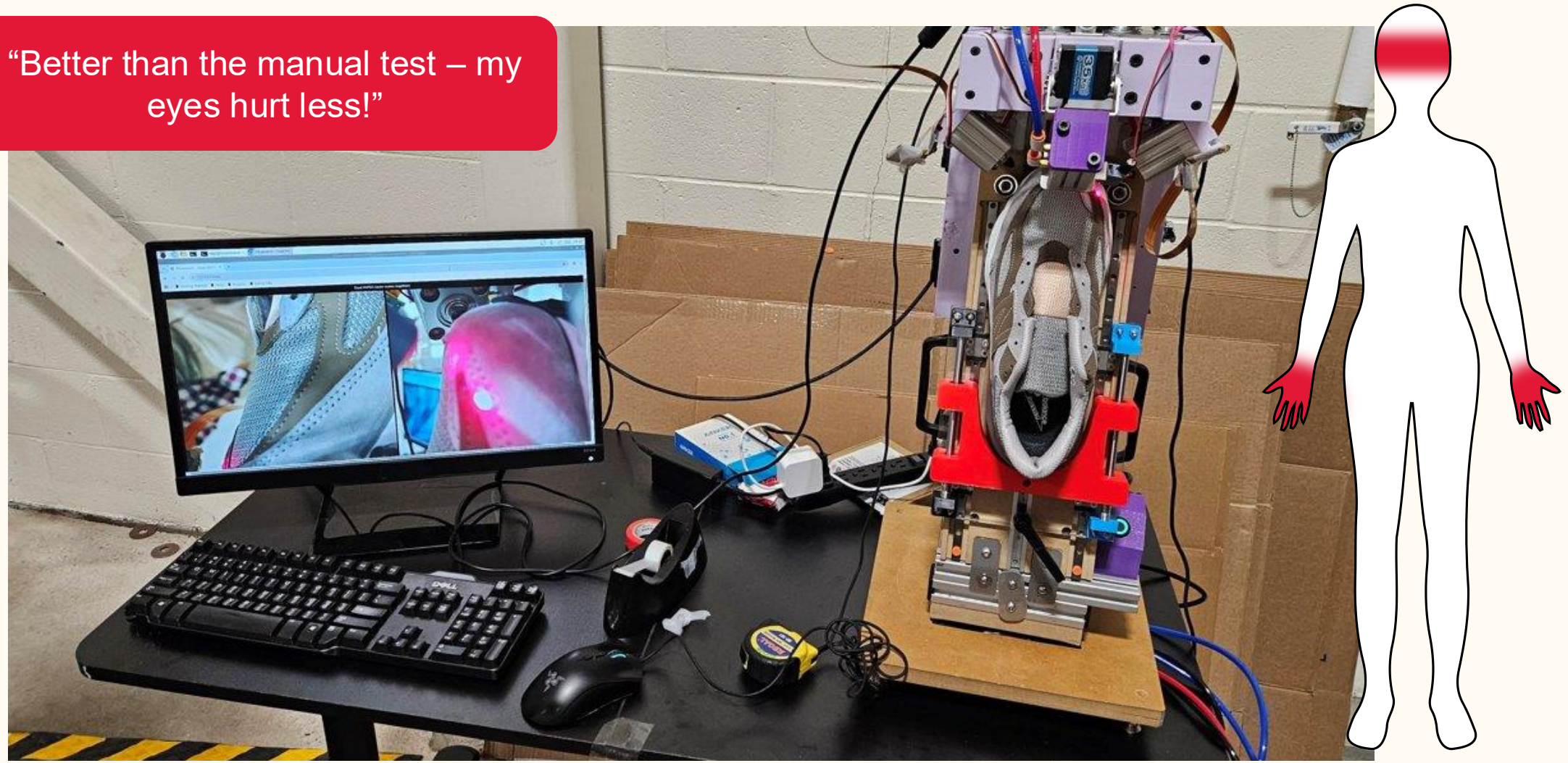
System Development

- Iterate on inherited vertical model
- Test out shoe securing and cameras with associates
  - **Wanted to easily place down shoe once**
  - **Bending and twisting to see gaps behind pistons**



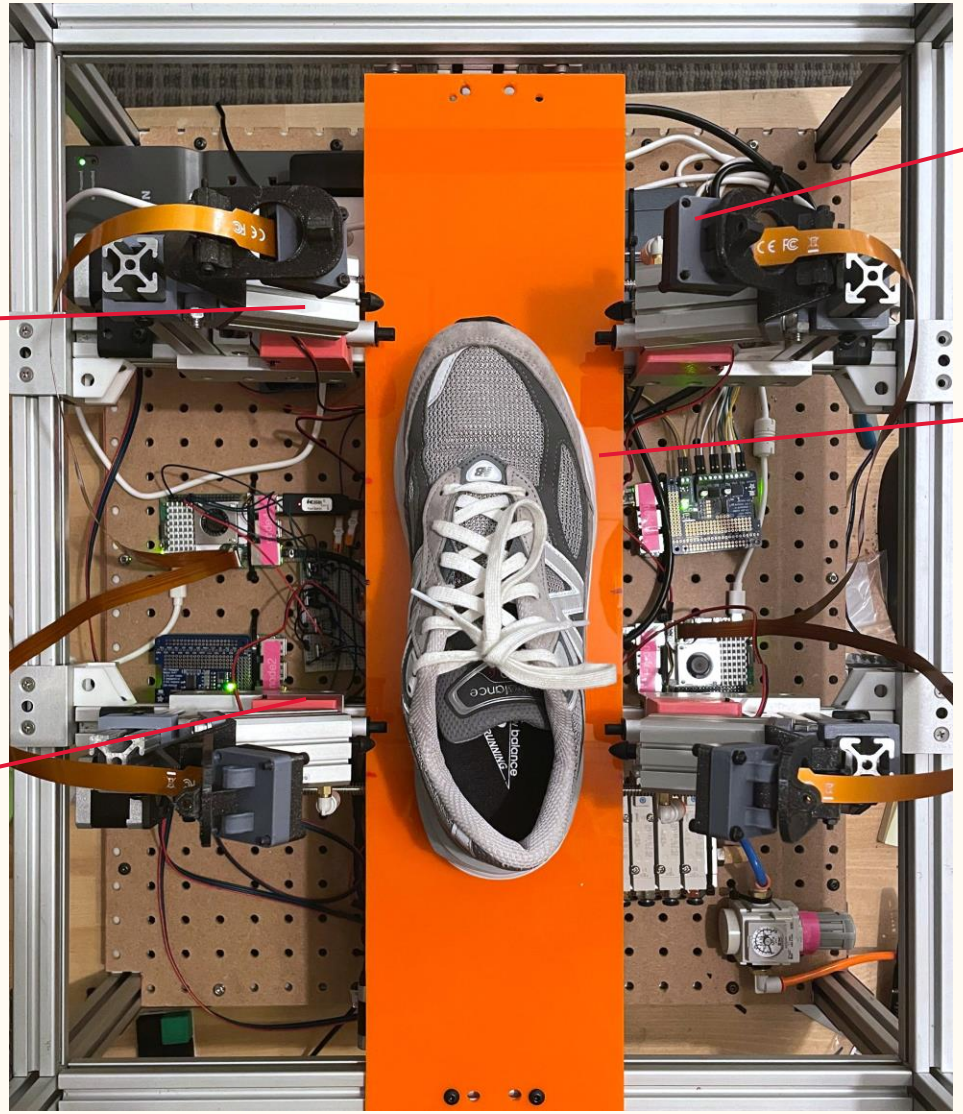
Phase 1: System Improvements

"Better than the manual test – my eyes hurt less!"



Phase 2: Horizontal System

January 2026 - May 2026



Cameras

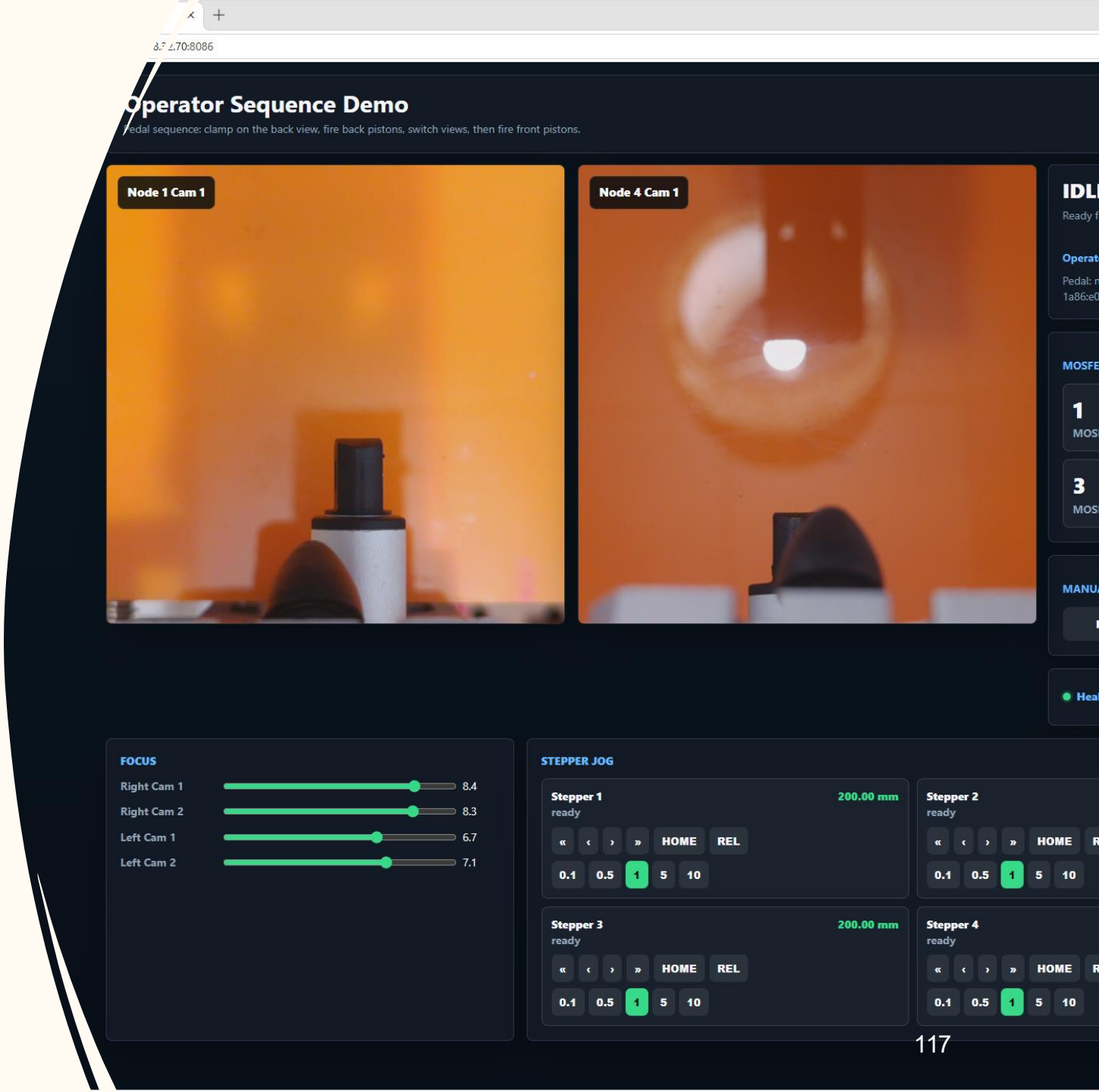
Pneumatic Pusher

Table Placement for shoe

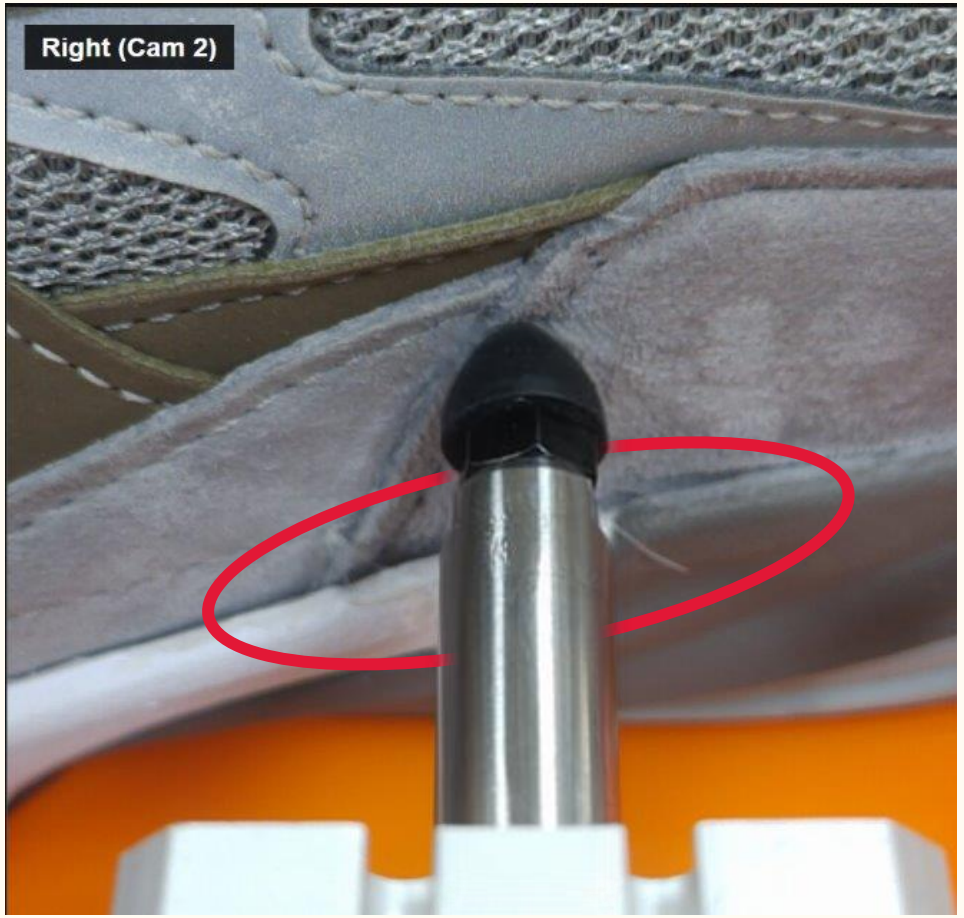
Linear Actuators

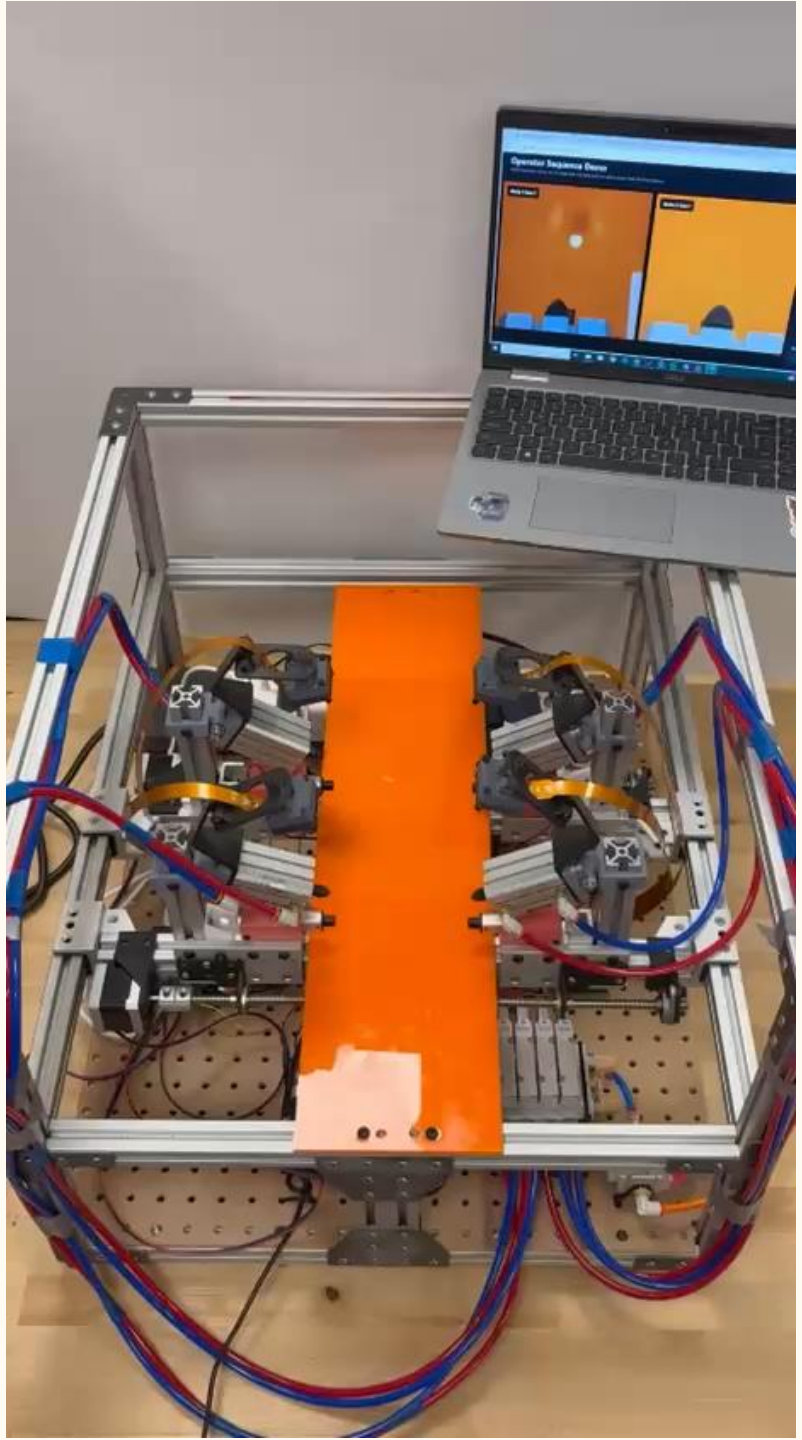
System Website

- Live camera feeds
- LLM-based inspection
- Shoe securing and tower adjustment control



Camera-based Gap Detection




Operator Sequence Demo

Future Steps

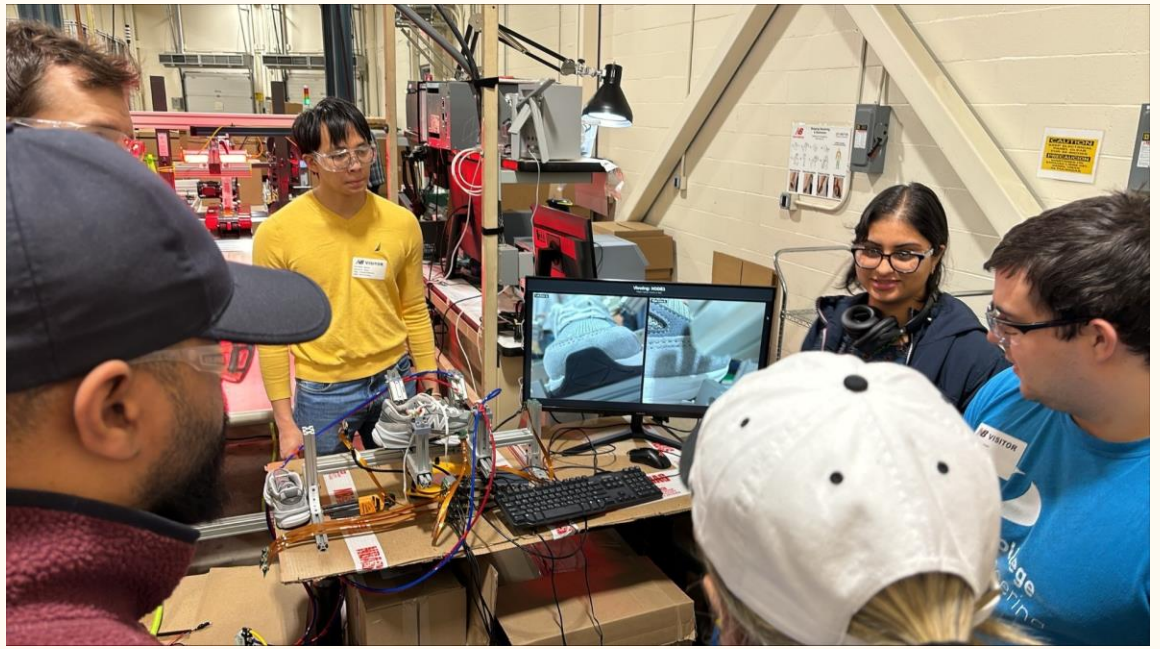
Handed to New Balance for future revisions and development

Refining the system

Modularity for many shoe sizes

Modularity for camera angles

Safety Features



THANK YOU

NEW BALANCE SCOPE

Thank you to our Liaisons and Advisor:

Patrick McCleary, Bryce Chu, and Amon Millner

Processing Fish

Olin College of Engineering
SCOPE

Automating Quality Control of Fish Fillets

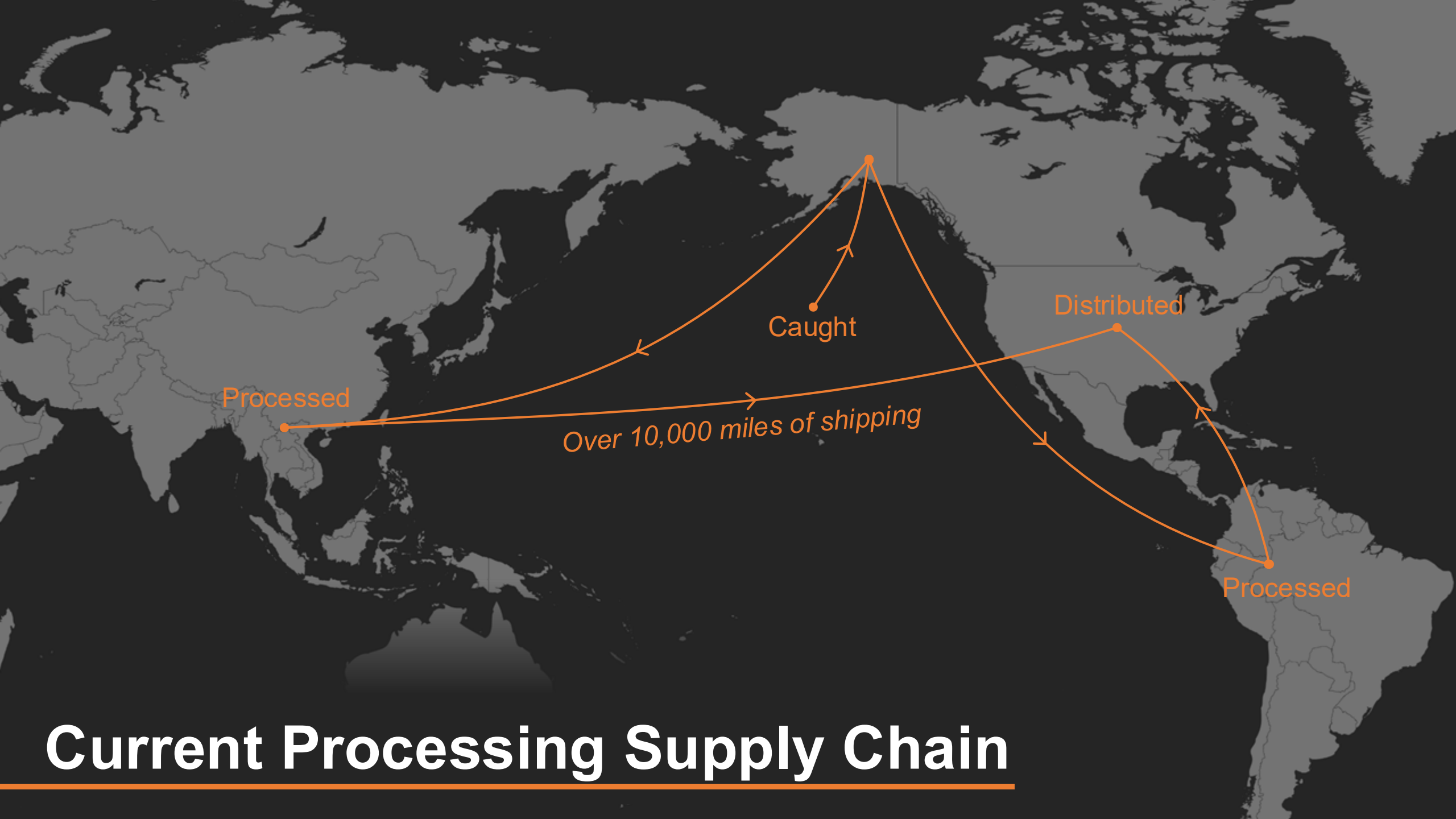
Mira Chew, Alton Coolidge, Ben Kim, Jun Park, Dominic Salmieri, Noah Woosley

Fish need thorough quality control to meet consumer standards

Image credit: Unsplash

Image credit: Unsplash

Current Removal System



Current Processing Supply Chain

Leveraging Automated Robotics

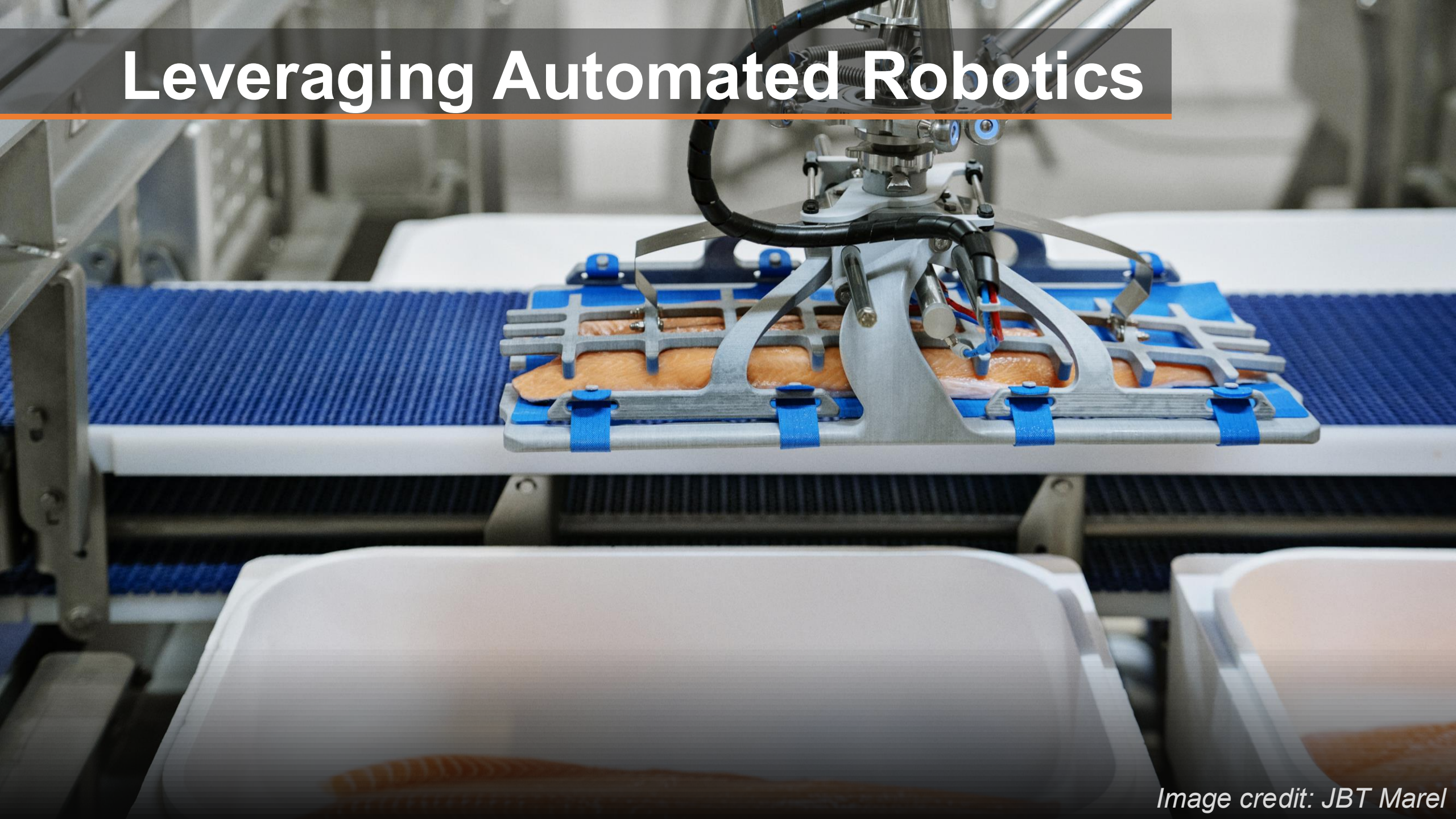
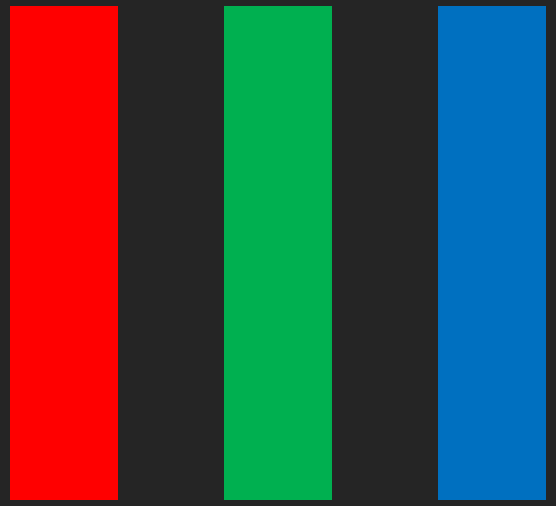


Image credit: JBT Marel

Detecting and localizing defects in fillets

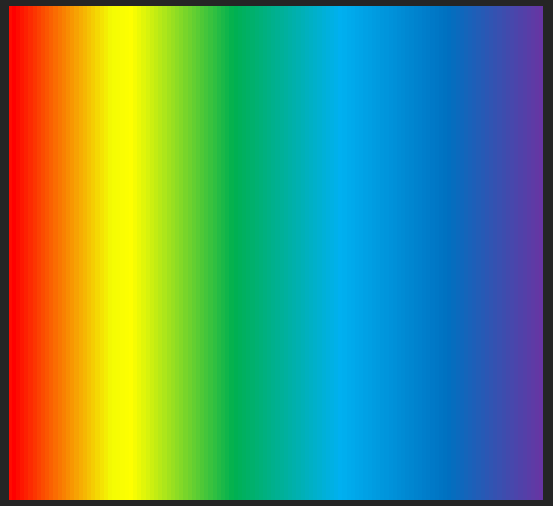
Band pass camera

Color camera



Three standard wavelengths

Hyperspectral Camera



Hundreds of wavelengths

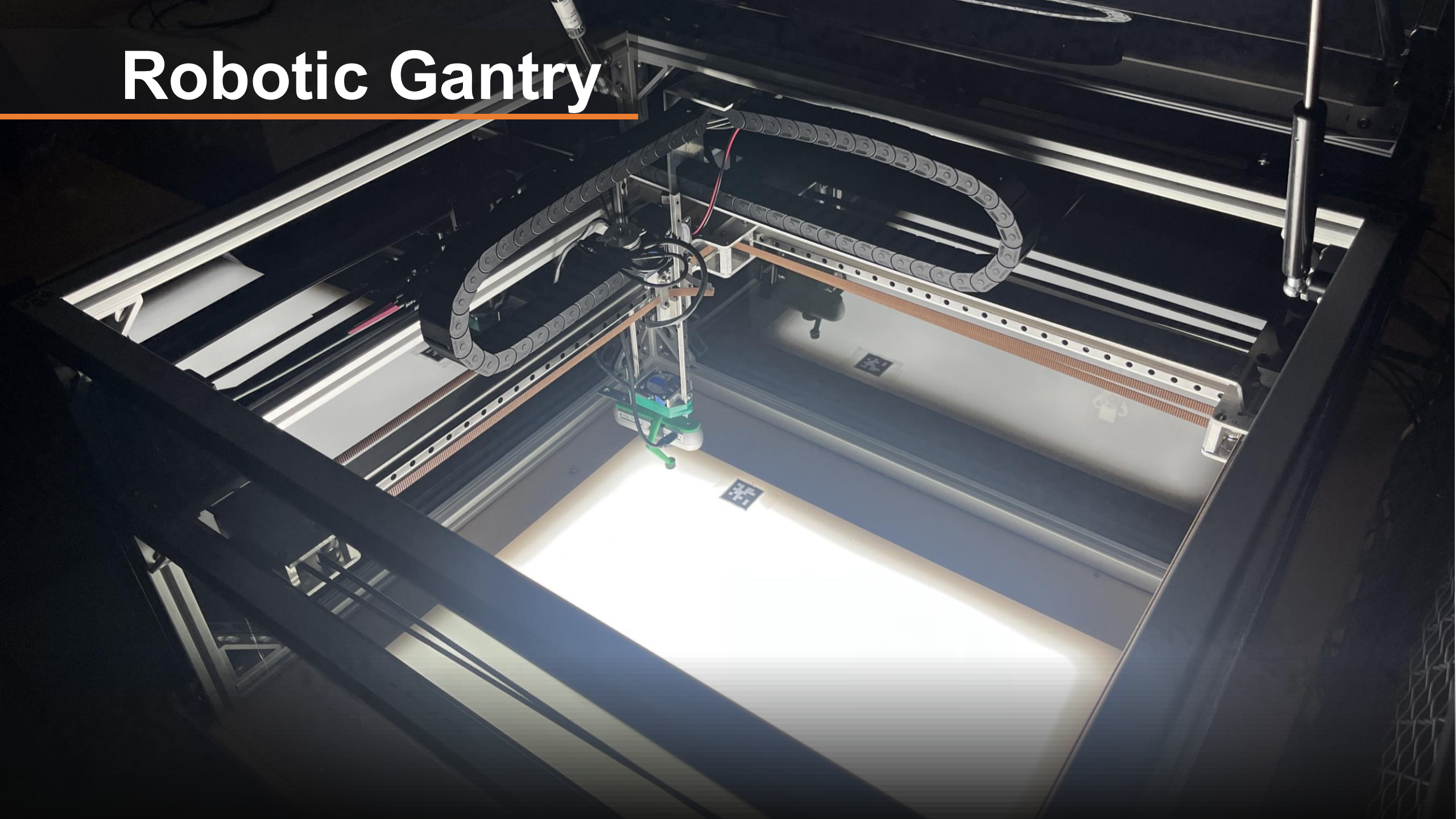
Band Pass Camera

One very specific wavelength

Detection solution

Robot Arm

Robotic Gantry



First End Effector

Takes inspiration from existing fish processing methods

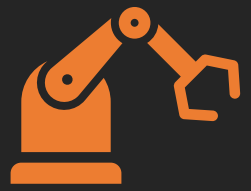
Industry proven method, heavily tested

Replicates delicate, accurate movement effectively

Very successful, doesn't affect the rest of the fillet

Second End Effector

Uses a novel process not widely used

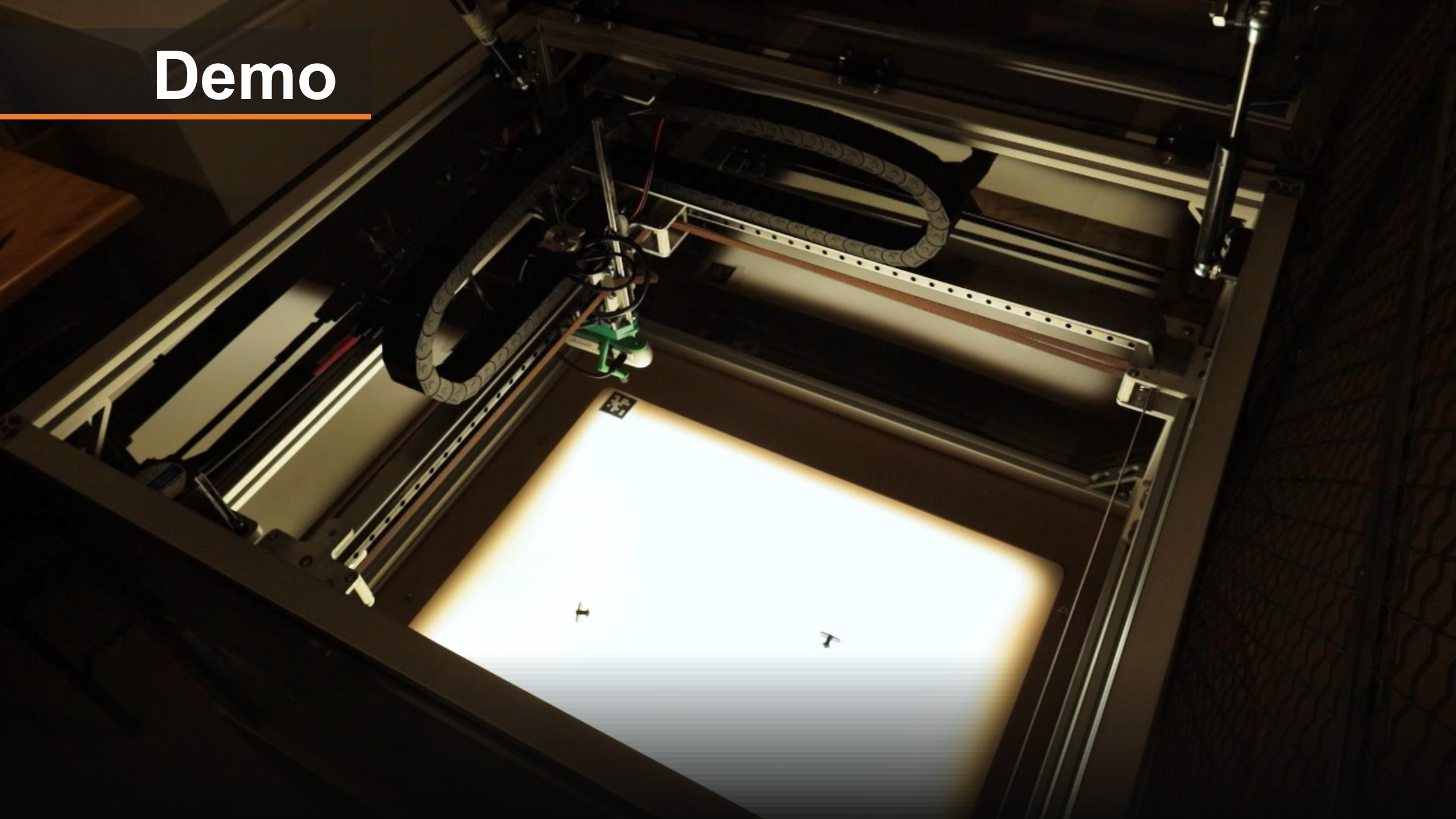


Integrates well with robotic automation

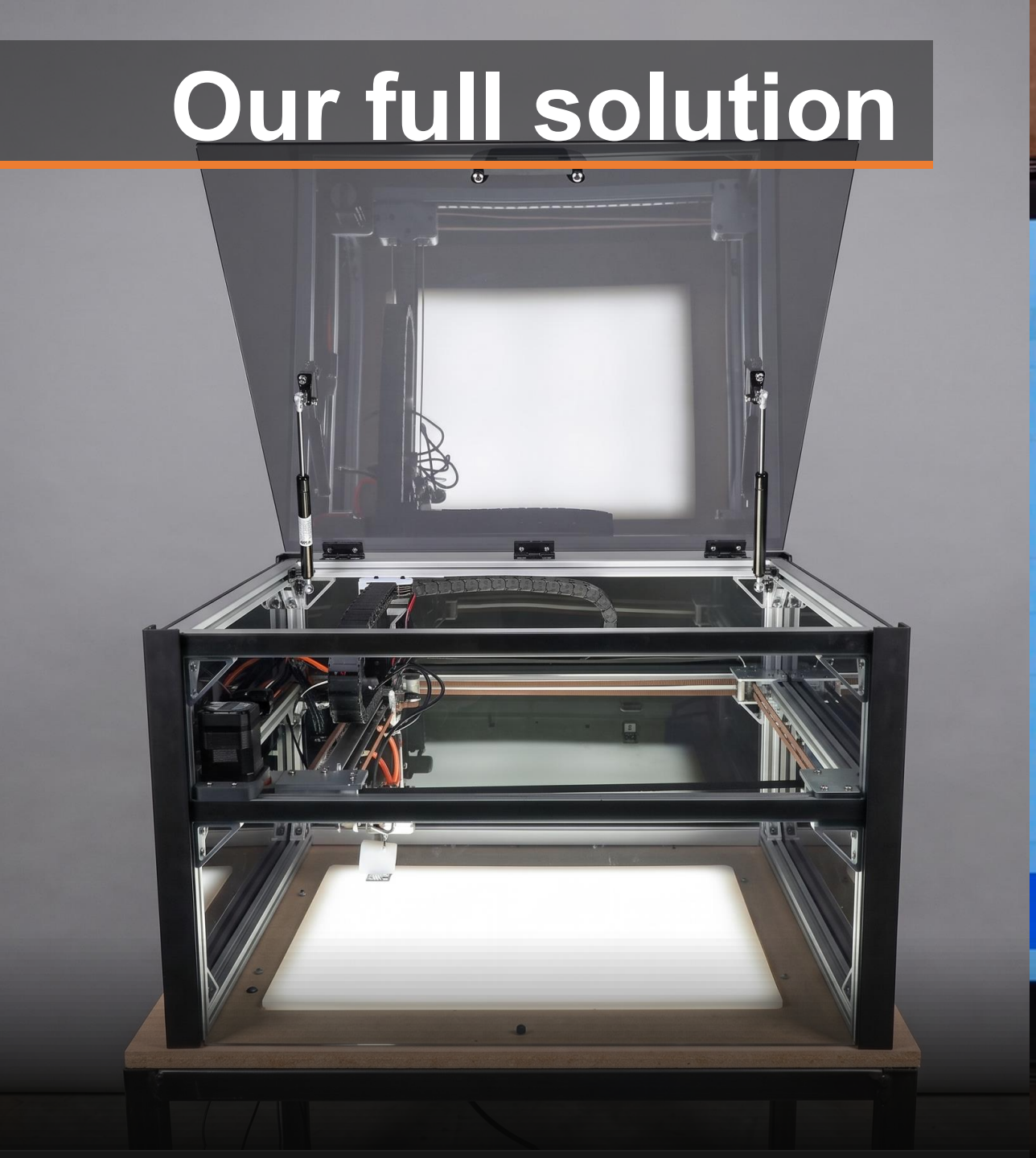
Reduces time taken to remove defects from fish

Removes complexity from manipulator design

Demo



Our full solution

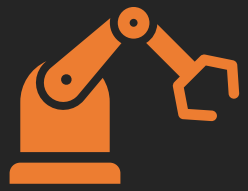


Next Steps

Improve accuracy and recall rate of vision system

Address food safety and regulatory requirements

Expand system for more types of fish



Explore more applications of robotics in fish processing

Thank you

to our sponsor and liaisons, our advisor Dr. Scott Hersey, and our subject matter experts Dr. Victoria Preston and Dr. Chhavi Goenka

Santos Volpe

Olin College of Engineering SCOPE

Computer Vision for Crosswalk Activation:
Pedestrian Detection Using AI

U.S. Department of Transportation
Volpe Center

SANTOS FAMILY FOUNDATION

Olin College of Engineering
SCOPE

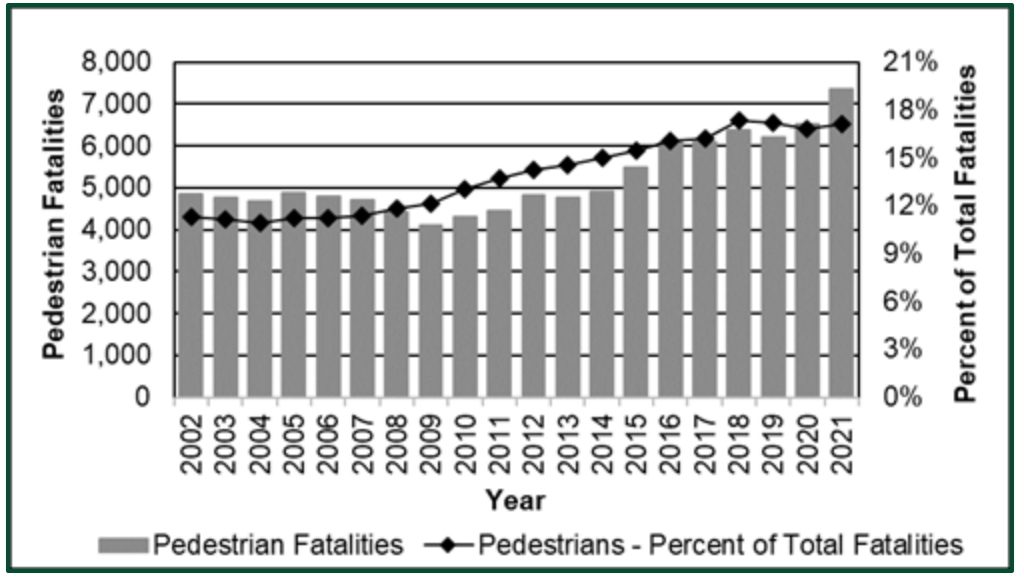
Meet The Team

From left to right: Sidney Taylor, Dexter Friis-Hecht, Carter Harris, Sucheta Sunder, Marta Chojkiewicz

Pedestrians are unsafe

- Pedestrian fatalities in the U.S. have risen 80% since 2009
- RRFBs reduce pedestrian crashes by on average 47%
- However, manual activation creates delays, and beg buttons lack user trust.

Pedestrian Fatalities in Motor Vehicle Crashes, 2002 to 2021



Sources: NCSA (2022, 2023c)

Rectangular Rapid Flashing Beacon (RRFB)

Project Objective

Develop a system for crosswalks with RRFBs that **improves pedestrian safety** through **automatic detection, intent prediction, real-time activation, and data-driven insights**.

Product Functional Requirements

In addressing these objectives, our product should be:

Able to detect **intent** to cross, not just presence

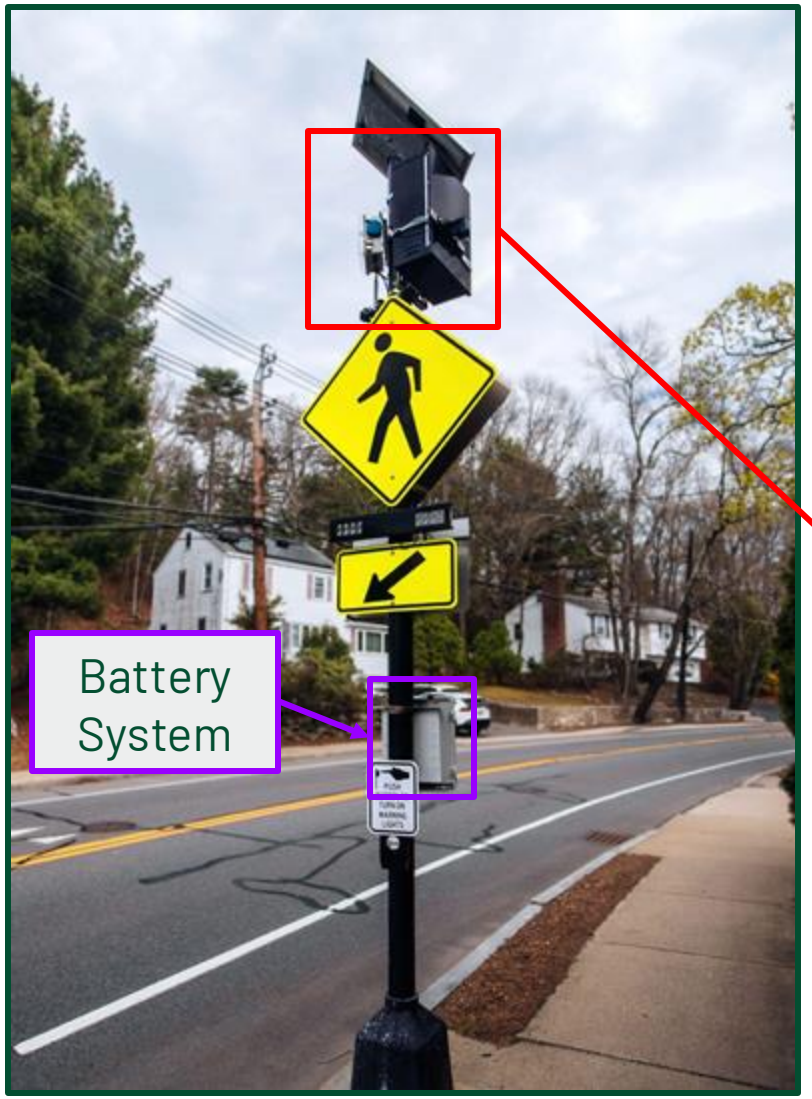
Highly **accurate** to ensure user trust

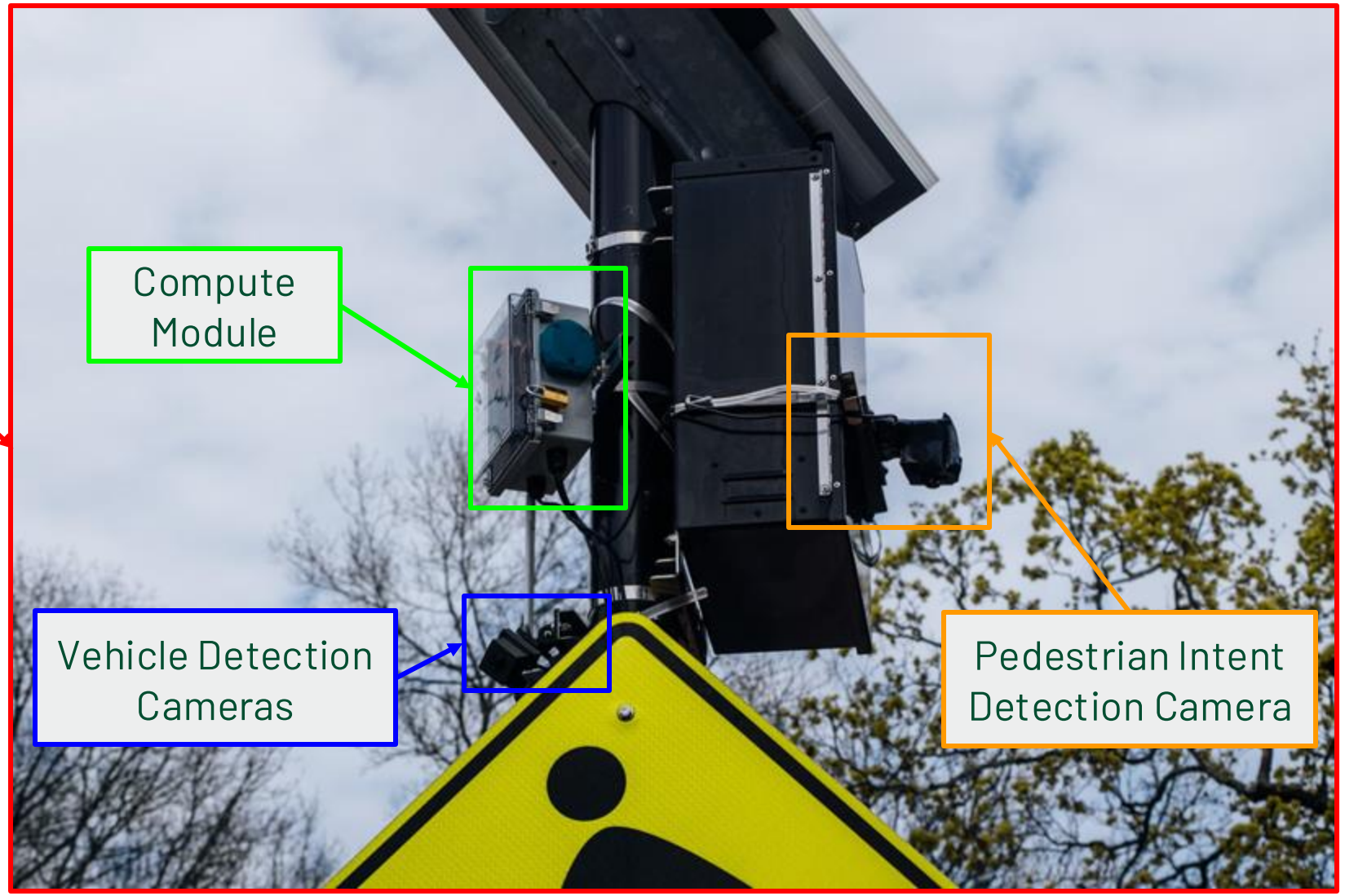
Discreet in real-world deployment

Low-cost and easily reproducible

Reliable across weather conditions

Prototype Overview



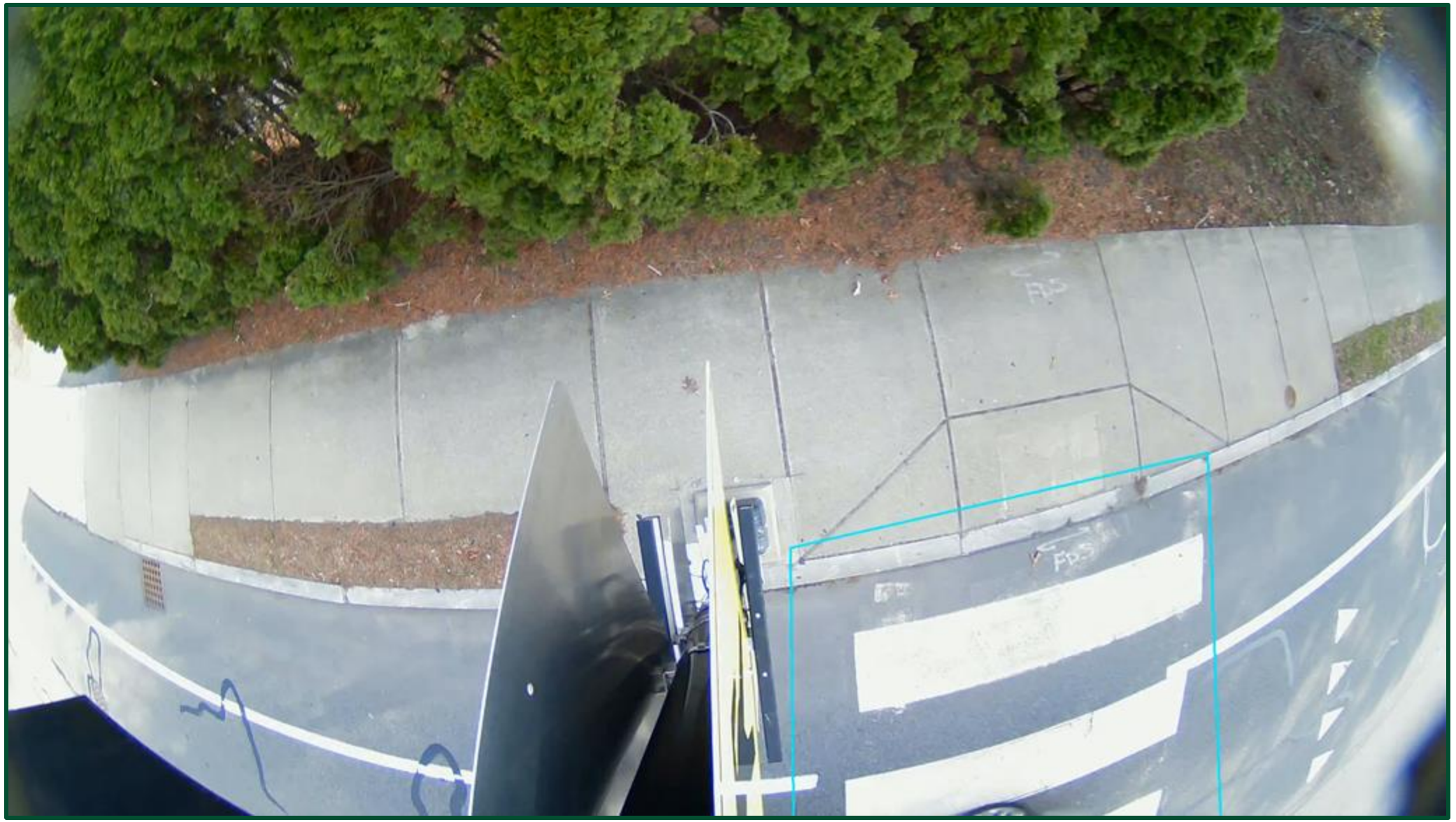


Deployment

- Deployed our prototype in partnership with the **Town of Needham**
  - Special thank you to **Tyler Gabrielski**, Director of Streets and Transportation, and **Katie King**, Town Manager

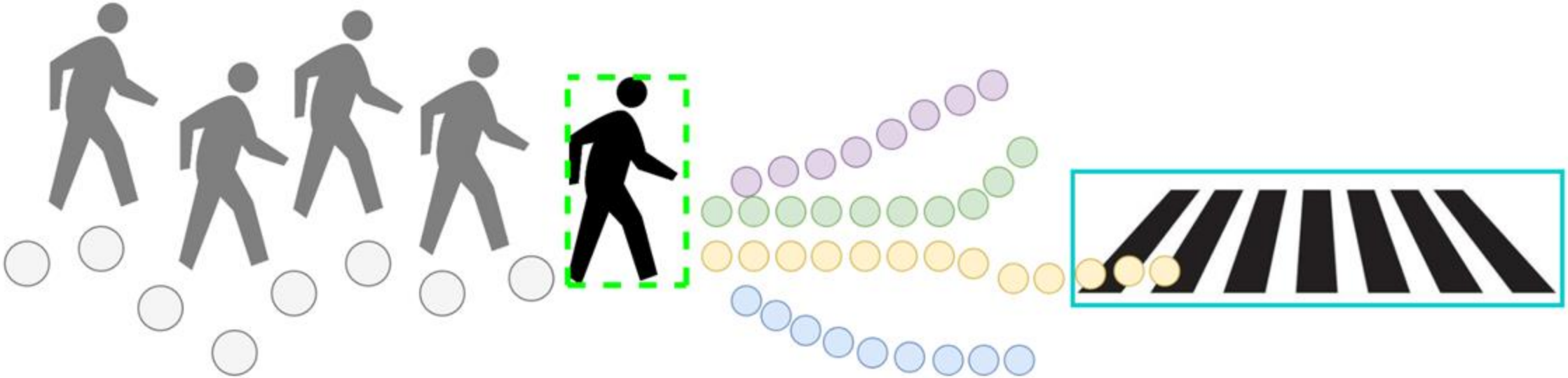
Detection Methodology

Deployment: Pedestrian Camera Point of View



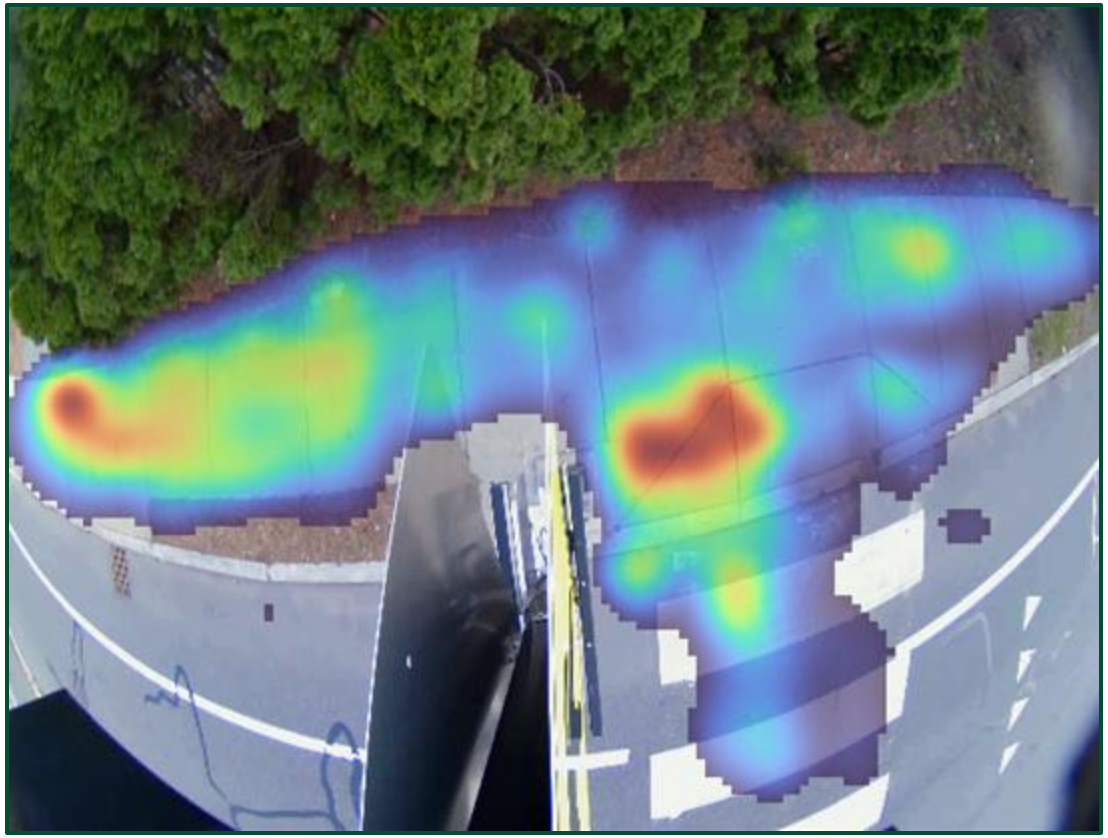
Public Transparency

Intent Detection System - Overview

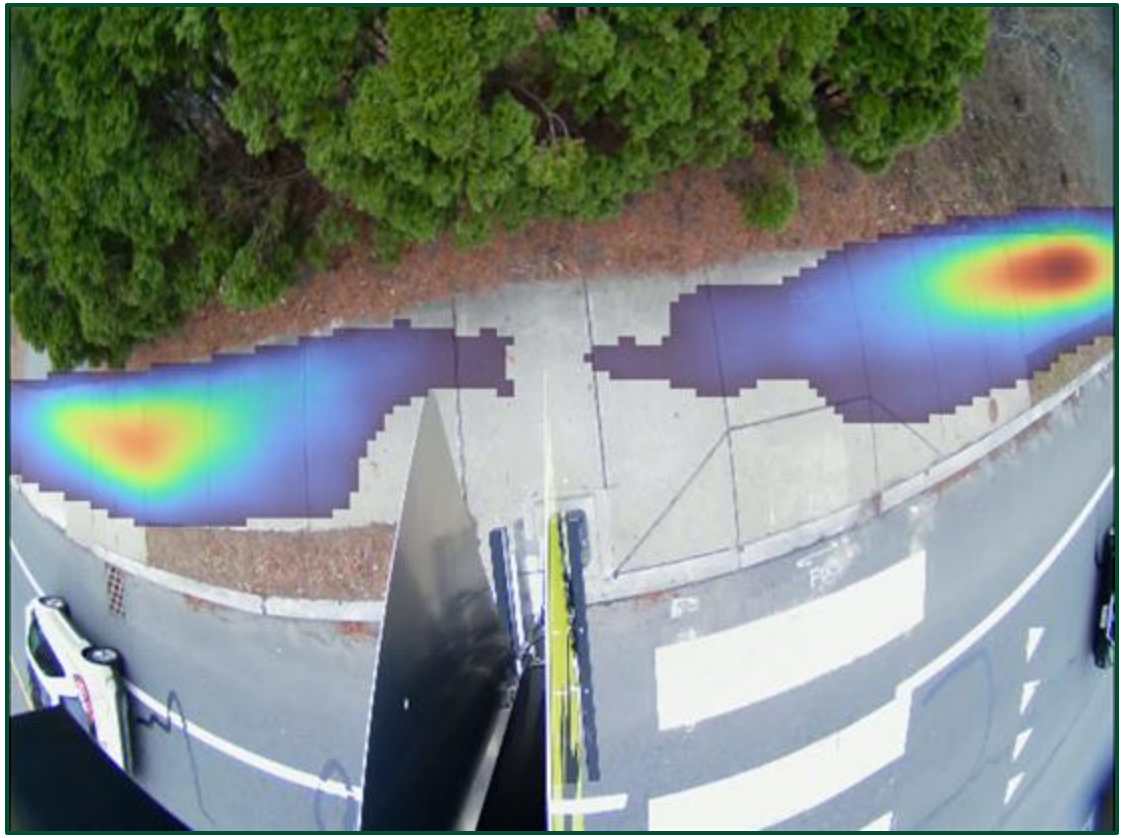


Results: Pedestrian Heatmaps

Crossing



Not Crossing

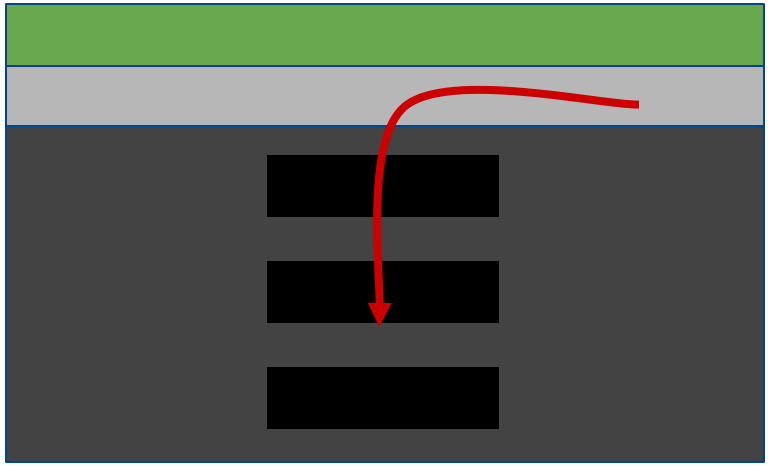


Results: Intent Detection

Results: Intent Detection

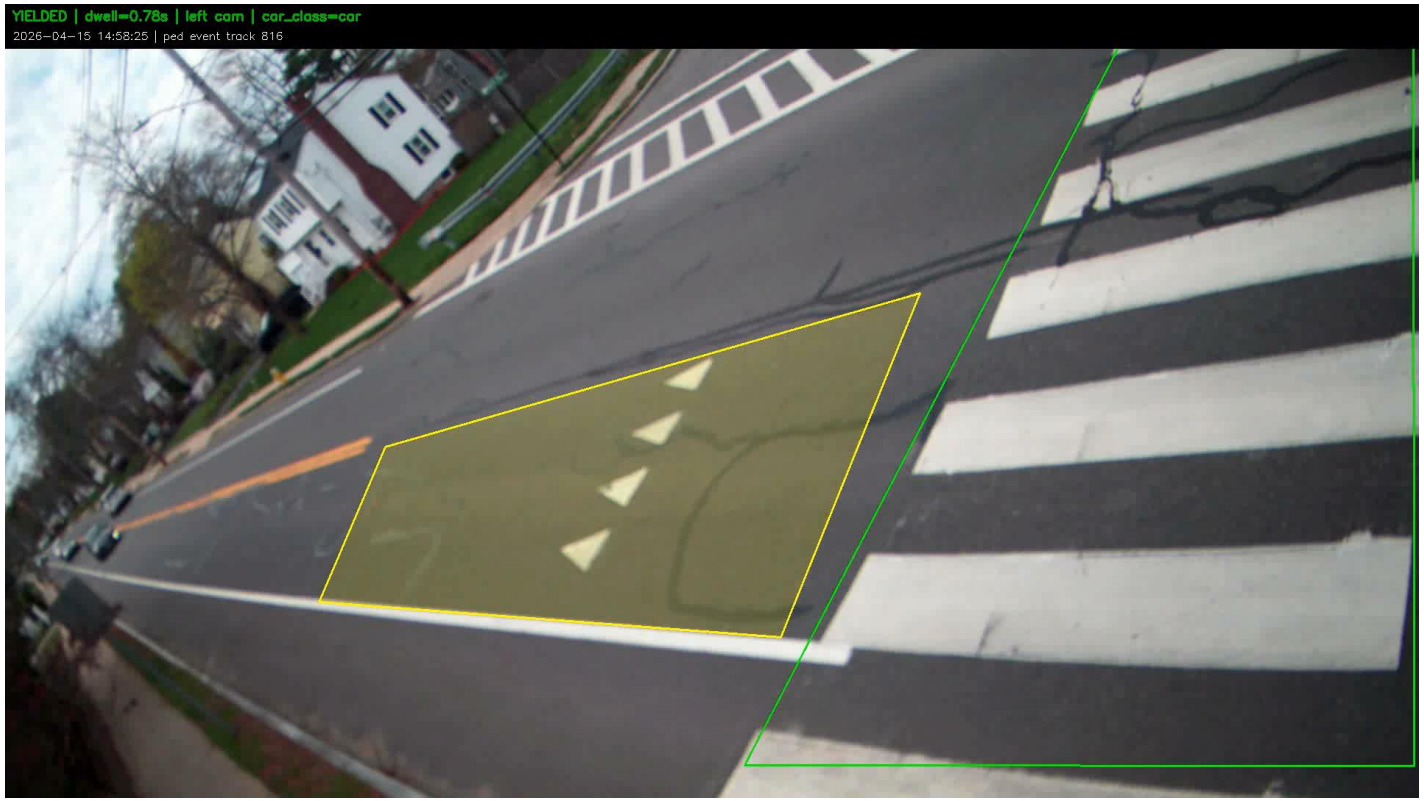
Predicted Non-Cross
90.36% Accurate

Predicted Cross
74.02% Accurate

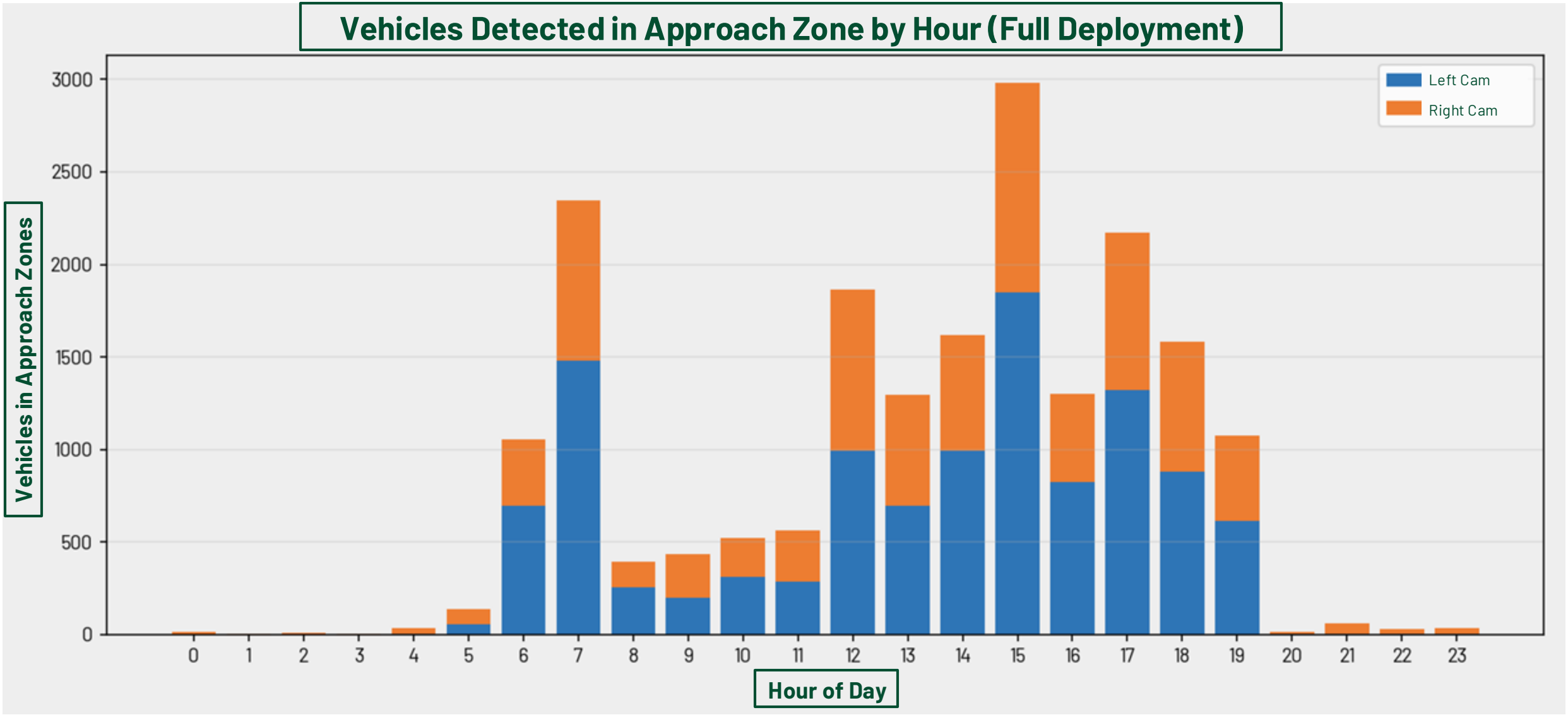


Vehicle Detection System - Overview

- System detects and tracks vehicles across user-defined approach zones
- Classification system distinguishes between yields and non-yields



Results: Vehicle Detection



Next Steps

This year's team delivered a **proof-of-concept**; next year's team will focus on **productization** by:

Technical

- Improving intent detection
- Optimizing materials and manufacturing strategy
- Address current limitations: power, weather, and low light conditions

Contextual

- Validating product-market fit
- Integrating with existing RRFB hardware

Acknowledgements

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