E2.03 Fire-Bot Enhancements
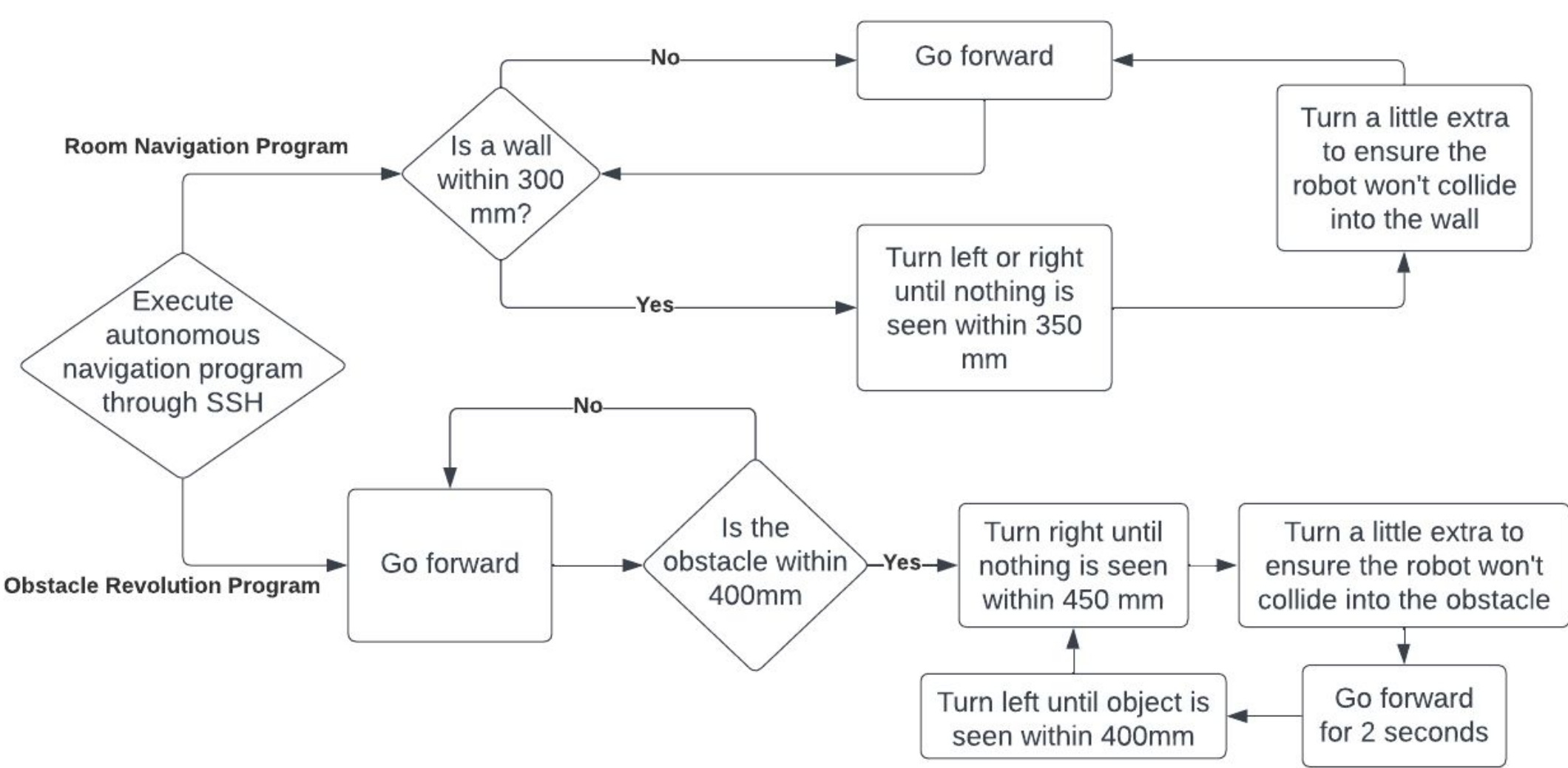
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TEXAS STATE — INGRAM SCHOOL OF ENGINEERING

HiPE

Project Background

❖ Ongoing research project - We are the second team to contribute to its development.
❖ According to NFPA[1], "Over sixty-eight firefighters died in operations pertaining to fires, explosions, overexertion, or medical issues relating to the job"
❖ Designed to autonomously enter burning buildings and find survivors within
❖ Made to reduce or eliminate firefighter injuries and deaths in the line of duty

[1] Fahy, Rita F., and Jay T. Petrillo. "Firefighter Fatalities in the United States." NFPA, August 2022.
https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/Firefighter-fatalities-in-the-United-States
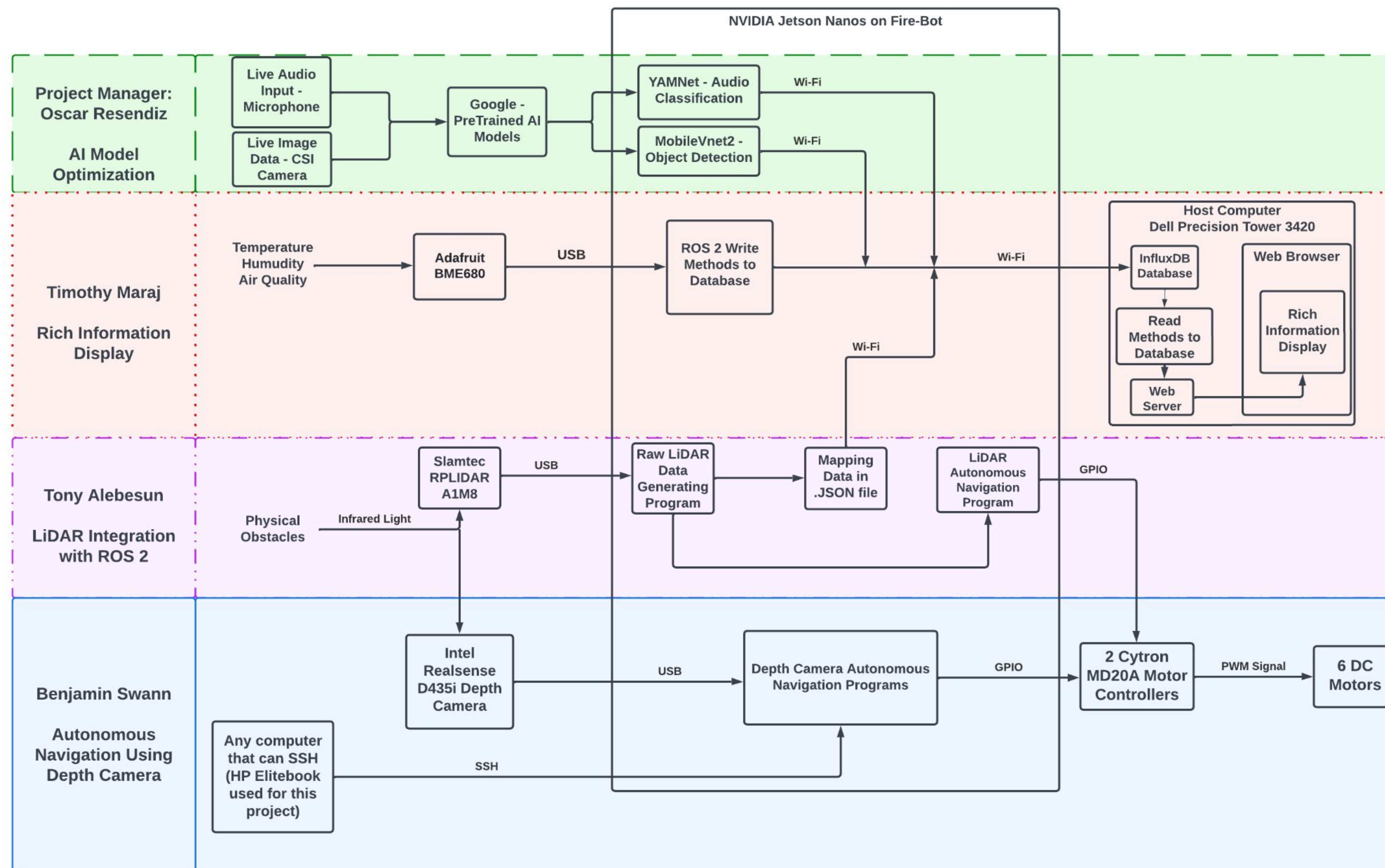
Autonomous Programs Flowchart

Meet the Team

Oscar Resendiz (PM)   Timothy Maraj   Benjamin Swann   Tony Alebesun

Block Diagram

Rich Information Display

Enhancements

❖ AI ML Optimization- Optimize the machine learning models to run efficiently on Jetson Nano hardware
❖ Rich Information Display- Develop an interface to display results of machine learning decisions, LiDAR mapping, and live environmental data
❖ Autonomous Navigation Using Depth Camera- Use the depth camera to design autonomous navigation that utilizes ROS 2 for the rover
❖ 2-D Room Mapping Using LiDAR- Implement LiDAR capabilities to the rover and use ROS 2 to transmit data

Results

Test	Expected	Actual
Person Detection	GPU Usage; 10,000x faster	Pass: GPU Usage; over 300,000x faster.
Scream Detection	GPU Usage; 50x faster	Pass: CPU Only; over 75x faster
10 Minute Room Mapping	< 5 collisions, get stuck 0 times	Pass: 0 collisions, got stuck 0 times
10 Minute Obstacle Revolution	< 5 collisions, stray from path 0 times	Pass: ≈ 1 collision, strayed from path 0 times
LiDAR Data Point Clarity	> 90% of data points are clearly visible and read	Pass: ≈ 98% of data points are clearly visible and read
Website Latency	< 300ms Latency	Pass: ≈ 154ms Latency
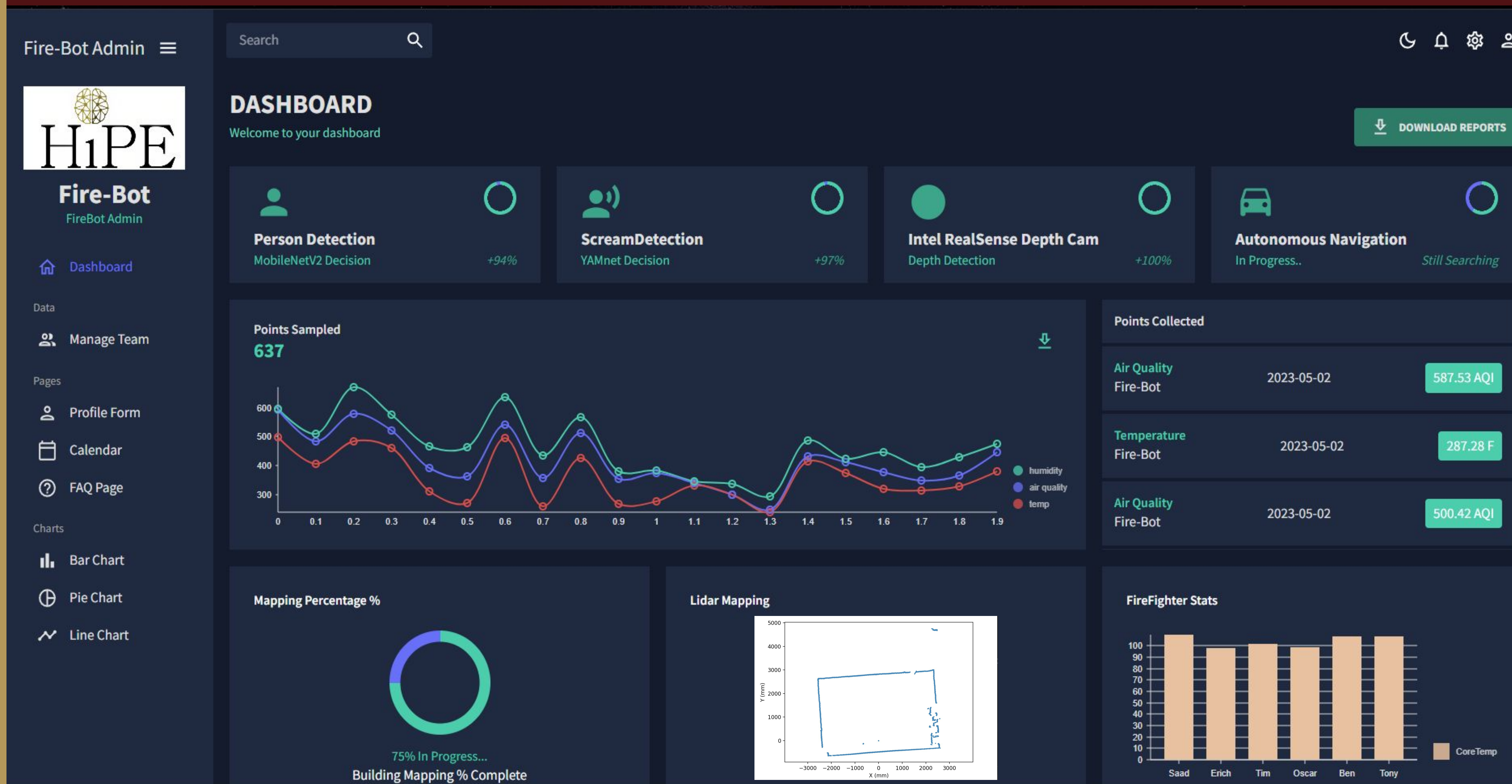
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