TechnoCognition'25

DISASTER RESPONSE DRONE

FOR REMOTE AREAS

SKY HAWK

PS CATEGORY- AEROCIRCUITRY

NOV 2025

DRONES

ROBOTICS

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Proposed Solution

DETAILED EXPLANATION OF THE PROPOSED SOLUTION

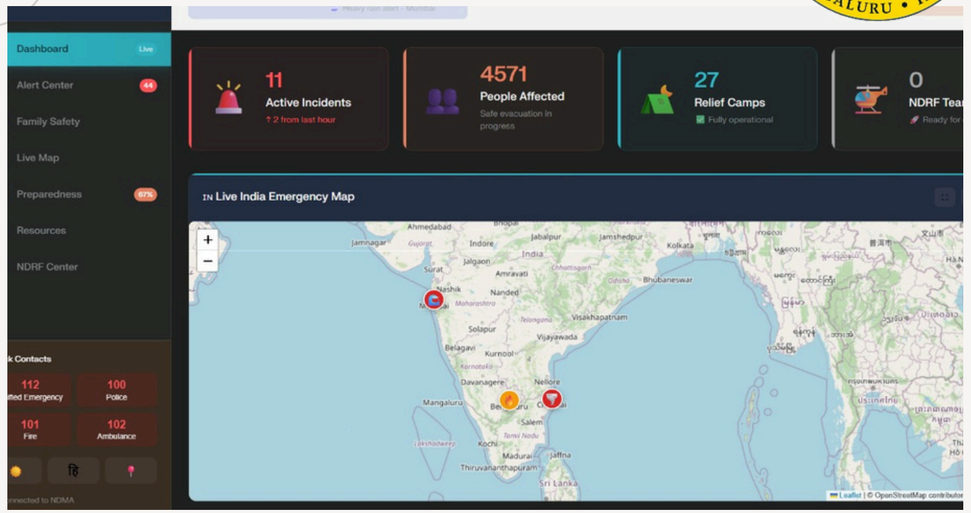
The solution uses a distributed multi-drone system where a scout drone performs real-time survivor detection and communication. In contrast, a delivery drone ensures precise payload drops, all coordinated through a centralised control system.

INNOVATION AND UNIQUENESSOF THE SOLUTION

The unique integration of thermal imaging, real-time communication, and precision delivery within a coordinated multi-drone architecture makes it both innovative and highly effective for disaster response.

HOW IT ADDRESSES THE PROBLEM

This system overcomes challenges of accessibility, communication failure, and time-critical rescue by enabling rapid area coverage, accurate survivor geotagging, and autonomous delivery in disaster-hit regions.



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detections_geotagged (2)

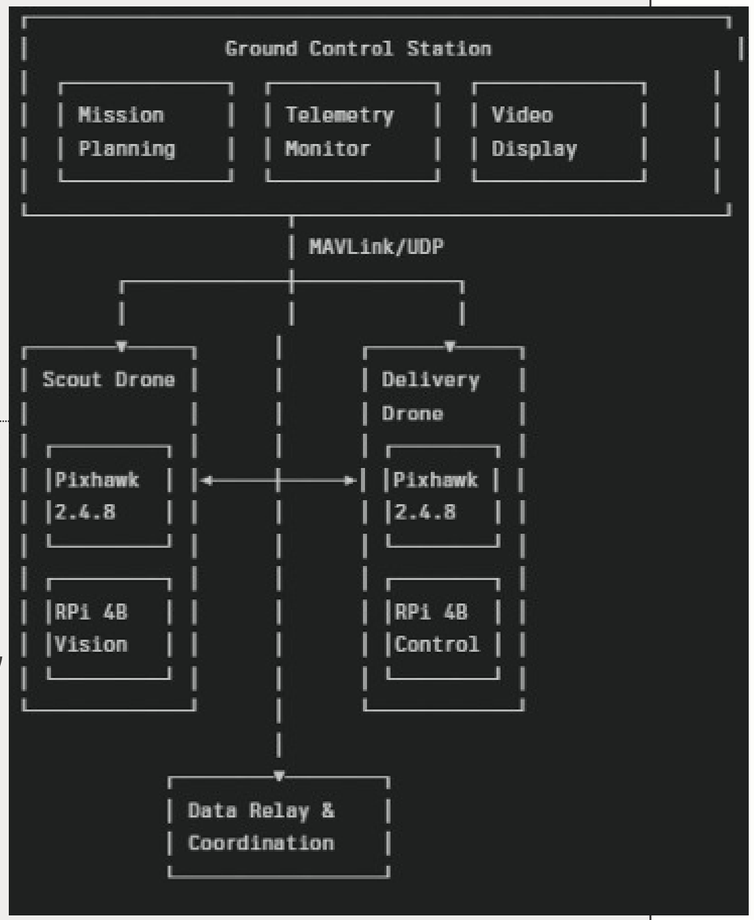
DRONES

ROBOTICS

TECHNICAL APPROACH

Technologies to be utilized (e.g., programming languages, frameworks, hardware)

The system utilizes Pixhawk 2.4.8 flight controllers, Raspberry Pi 4B companion computers, FLIR thermal cameras, GPS modules, and brushless motors, operating with ArduCopter firmware and custom Python applications for mission control, computer vision, and communication.



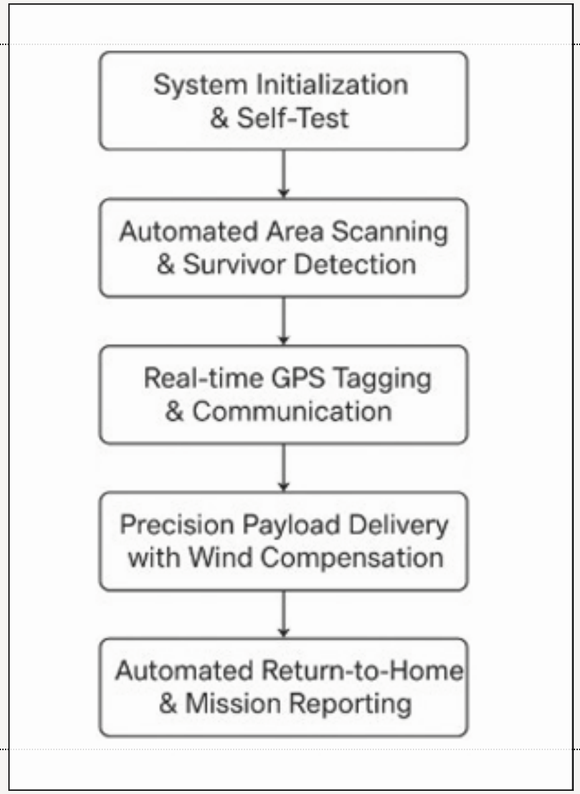
IMPORTANT INSTRUCTIONS

METHODOLOGY AND IMPLEMENTATION PROCESS (FLOW CHARTS/IMAGES/PROTOTYPE)

The implementation involves a multi-phase process, including:

- System initialization and self-tests
- Automated search with real-time survivor detection
- Precision payload delivery using wind-compensated navigation

Automated recovery with mission data reporting.



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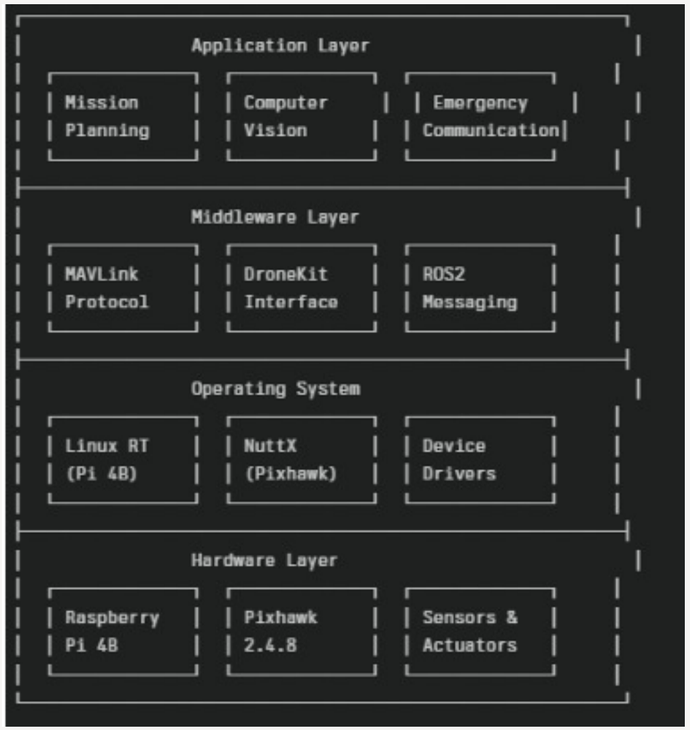
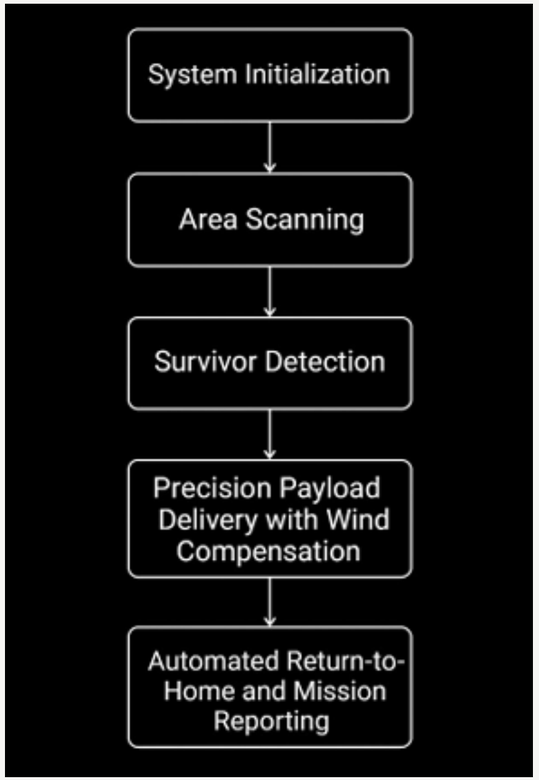
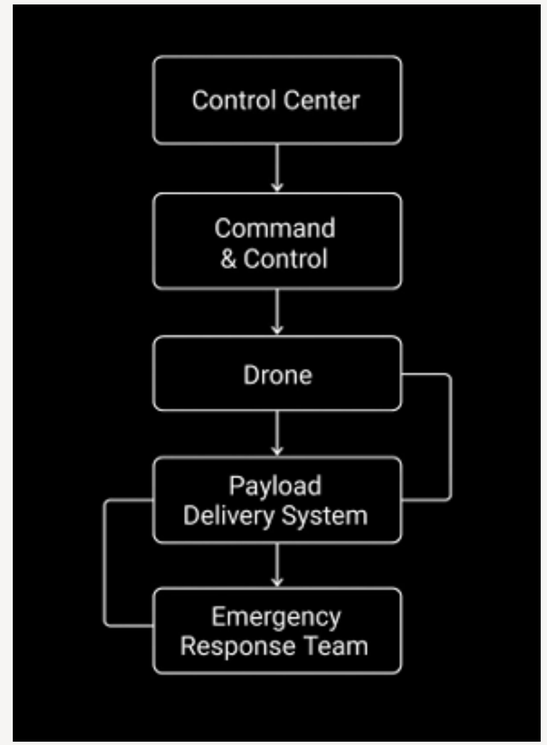
System and work flow

SYSTEM SOFTWARE STACK



EMERGENCY DRONE SYSTEM ARCHITECTURECHART





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FEASIBILITY AND VIABILITY

ANALYSIS OF THE FEASIBILITY OF THE IDEA

The multi-drone architecture is technically feasible with proven hardware, real time processing, and autonomous operation tailored to disaster management needs.

POTENTIAL CHALLENGES AND RISKS

Risks include GPS degradation, communication failures, harsh weather, and regulatory or operational integration challenges.

STRATEGIES FOR OVERCOMING THESE CHALLENGES

The system uses sensor fusion, redundant communication links, weather compensation algorithms, modular design, and intuitive operator interfaces to mitigate these issues.

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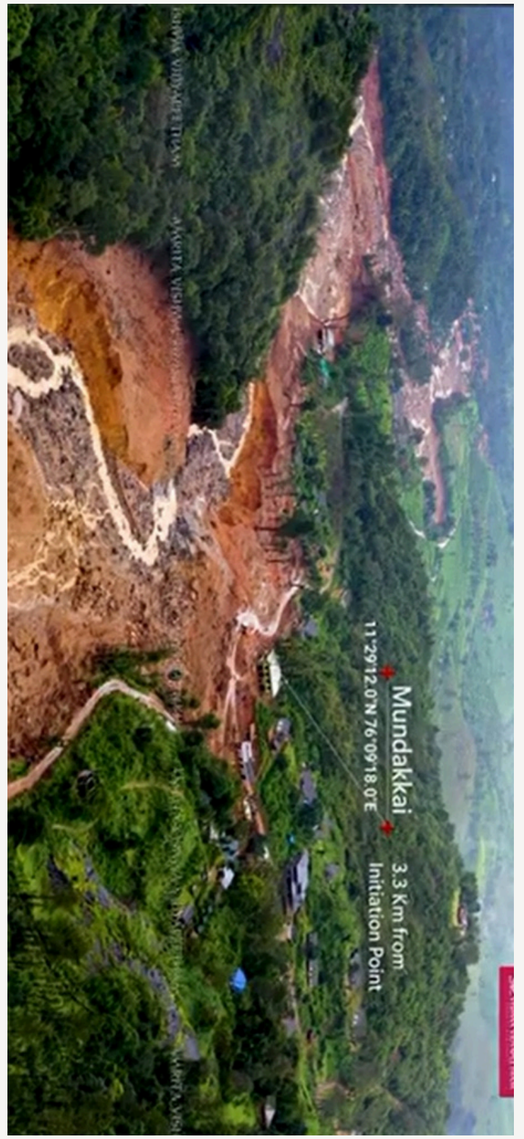
IMPACT AND BENEFITS

POTENTIAL IMPACT ON THE TARGET AUDIENCE

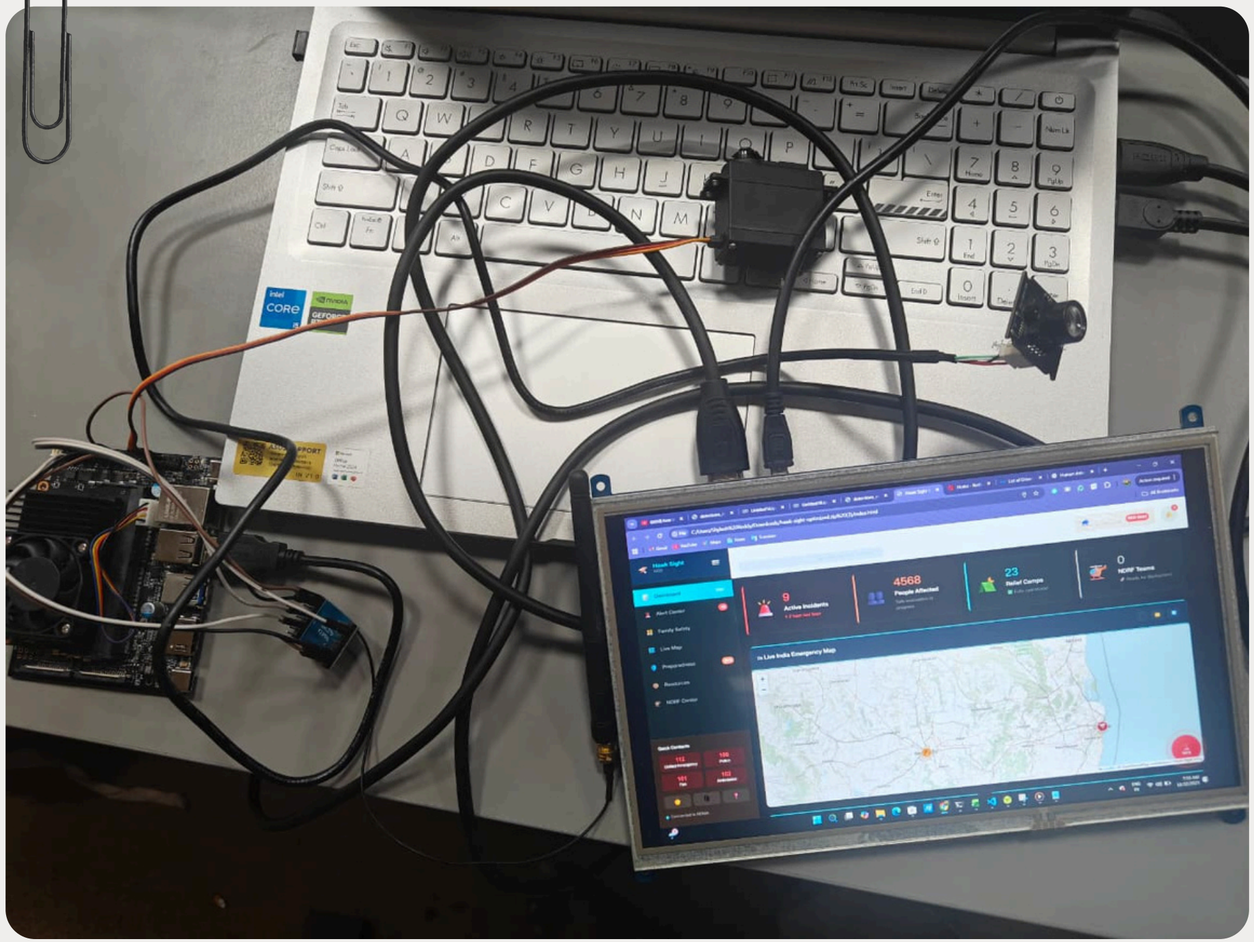
The solution supports disaster-affected populations by facilitating quick survivor detection and timely supply delivery. It improves rescue teams' efficiency through accurate geotagging and real-time situational awareness, enhancing safety and coordination for emergency responders.

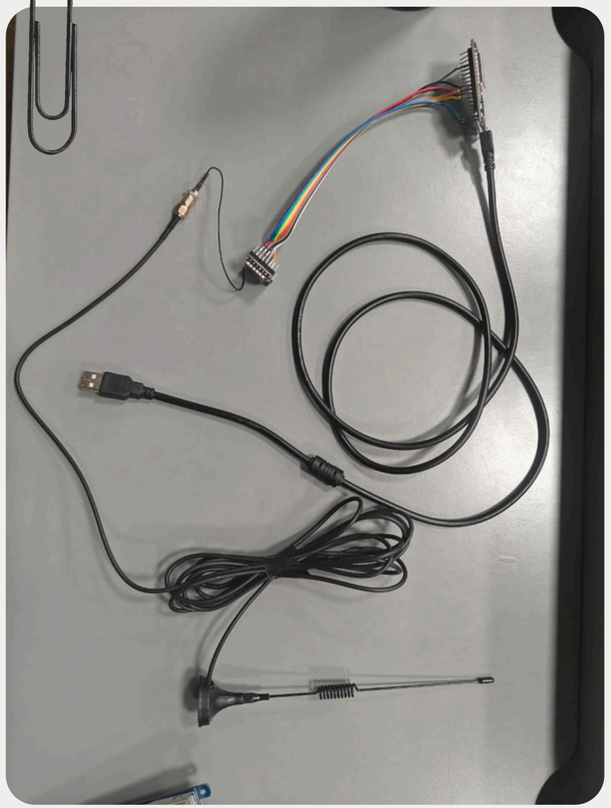
BENEFITS OF THE SOLUTION (SOCIAL, ECONOMIC, ENVIRONMENTAL, ETC.)

Drones improve disaster management by enhancing survival rates and communication with isolated victims, reducing operational costs and carbon footprints, and ensuring safer navigation in hazardous areas, thus promoting resilience and sustainability in response efforts.



Images of the prototype





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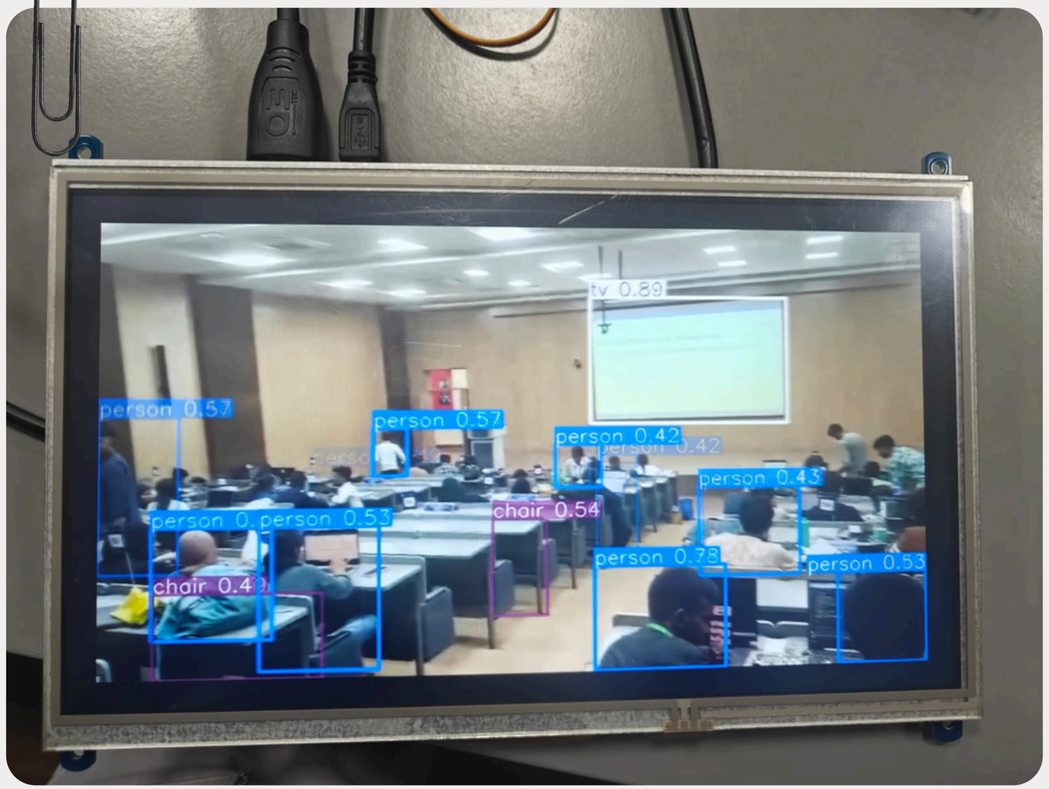
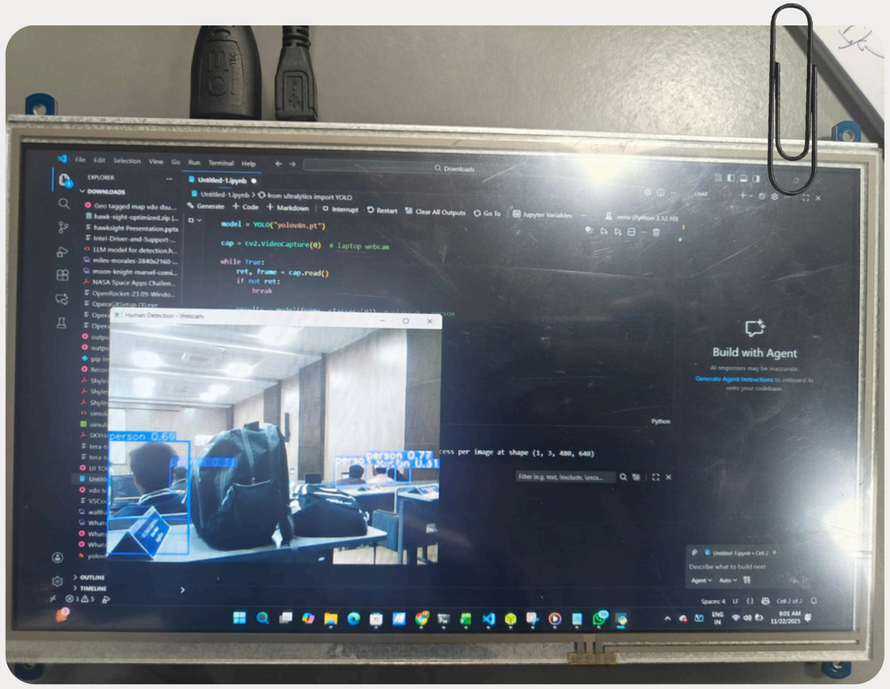
Images of the model training and testing





RESEARCH AND REFERENCES

Disaster response drone architectures: Multi-vehicle coordination and real-time survivor detection (DFI/MeitY NIDAR Guidelines, 2025)
Pixhawk-based autonomous quadcopters: System integration and flight algorithms [ArduPilot Documentation, 2025]
Thermal imaging for human detection in flood scenarios: FLIR Lepton 3.5 technical papers [FLIR Lepton Product Documentation]
GPS/INS sensor fusion and visual odometry for GNSS-challenged environments [IEEE Transactions on Navigation, 2024]
Efficient payload delivery and mechanical release accuracy: Servo integration studies [RC Servo Integration Whitepaper, 2024]
Emergency communication protocols over drone platforms for disaster zones [NIDAR Disaster Management Handbook, 2025]

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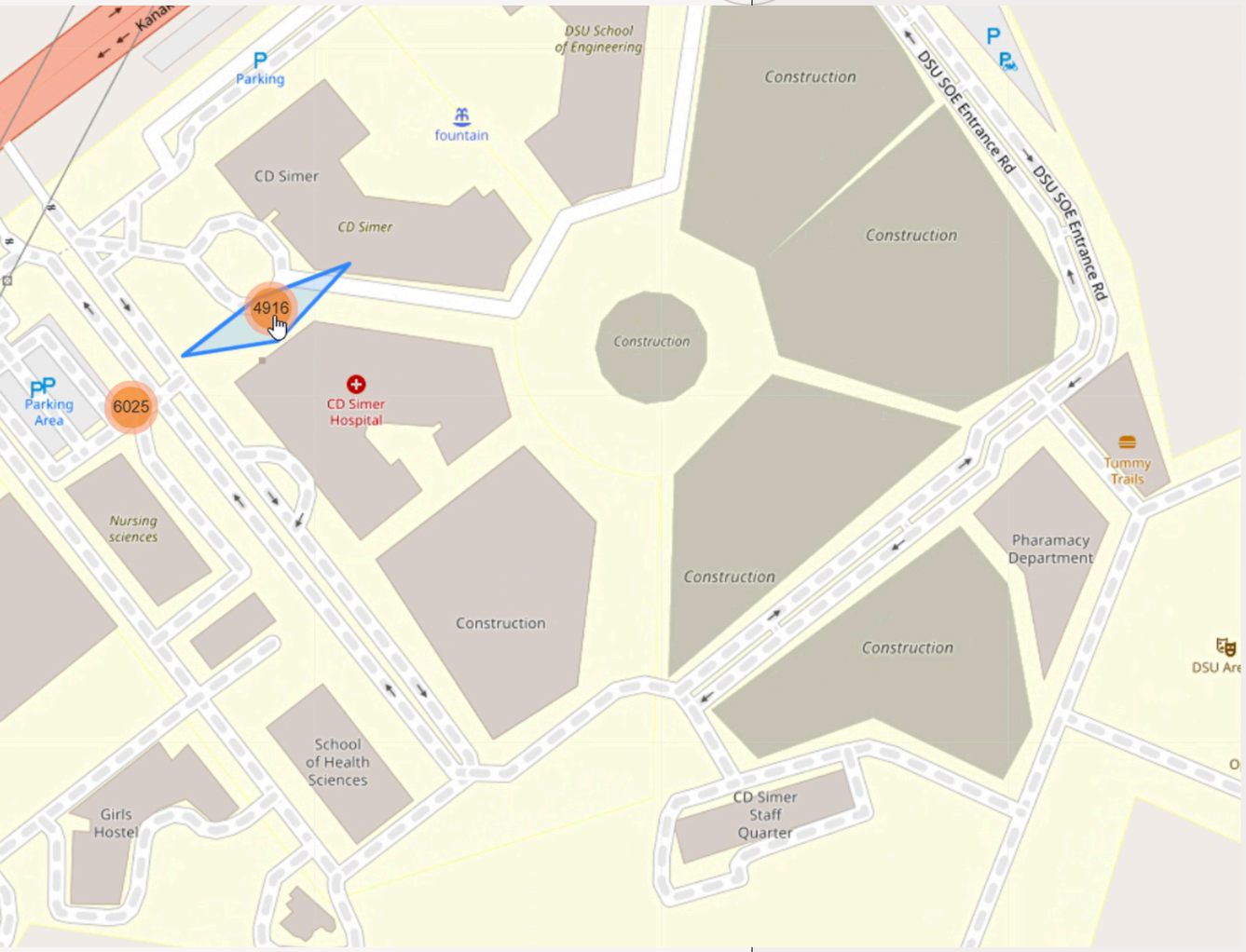

THANKYOU

CHARAN RAJ R
VRINDA KATAVKAR
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