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INSTITUTION'S  
INNOVATION  
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(Ministry of Education Initiative)

## IDEA SUBMISSION FOR SIH 2023 - INTERNAL HACKATHON

**Domain Bucket : DISASTER MANAGEMENT**

**Category : SOFTWARE**

**Organization : MINISTRY OF DEFENCE**

**Problem Title: DEVISE THE METHOD FOR IDENTIFICATION OF VICTIMS BURIED UNDER AVALANCHES**

**Problem Statement (PS) Number: 1422**

# OBJECTIVE

To locate Avalanche Burial Victims under the following novel constraints:

- Victim search duration under 60 minute time window
- Usage of Thermal Imaging and Beacon Transceivers to identify victims
- Utilizing Deep Learning models - YoloV8, ResNet and Fast R-CNN
- Providing nearby debris landmark for faster localization of victims
- Spotting victims with latitude and longitude data
- Dashboard with real-time logs of remarks



# ISSUES AND CHALLENGES

## ISSUES

- Extreme conditions
- Large snow floor
- Hypothermia for victims
- Remote topography
- Wind resistance (>13 m/s)

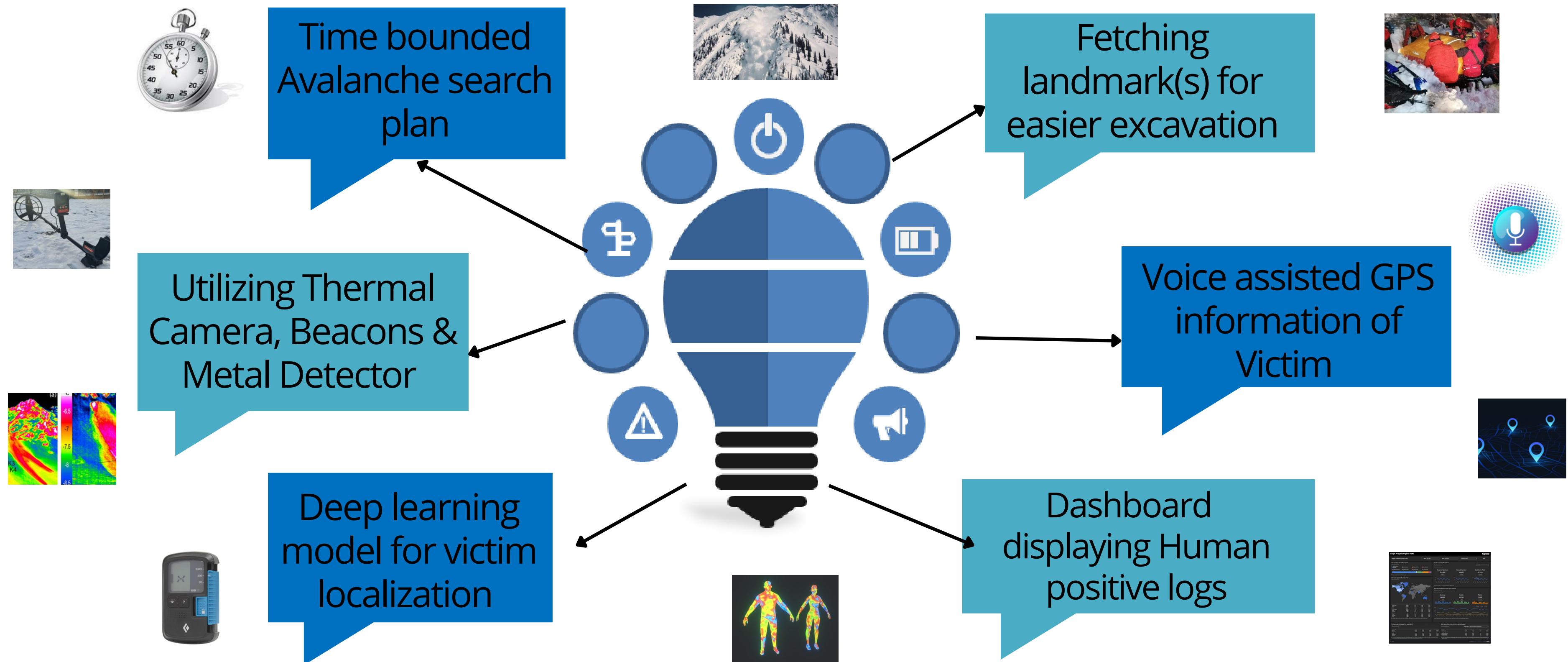


## CHALLENGES

- 60-minute search time
- Victim's depth under snow
- Thermal sensitivity range
- Obstacle normalization (Fog)
- Precise location of victim



# SOLUTION



# ARCHITECTURE/WORKFLOW DIAGRAM



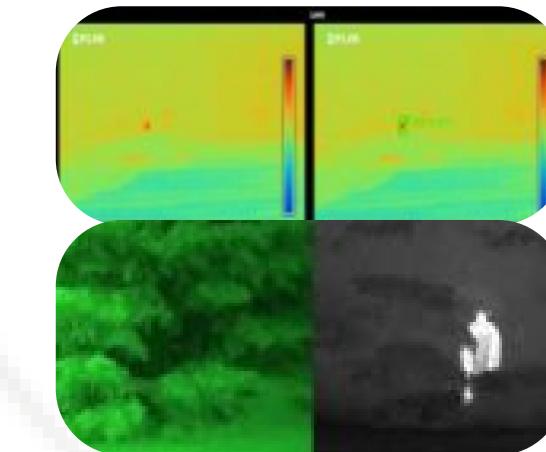
Occurrence of Avalanche from High Elevation regions



Drone surveillance - DJI Matrice 300 RTK known for its resilience



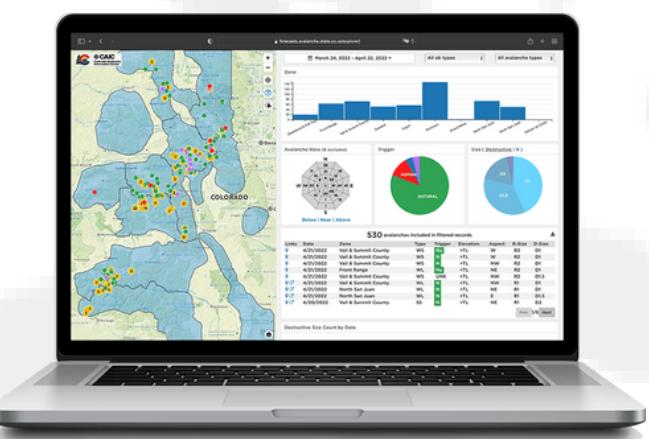
Proposed multisensory - Thermal Camera, Beacon Transceiver and Metal Detector



Debris Localization from higher altitude - Snow Floor Scanning



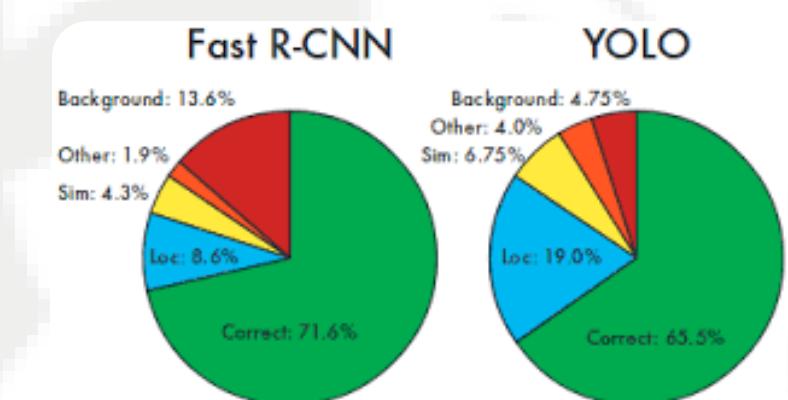
Expedited rescue efforts with the help of our proposed solution



Real-time debris class log on dashboard with Human Positive logs in voice note

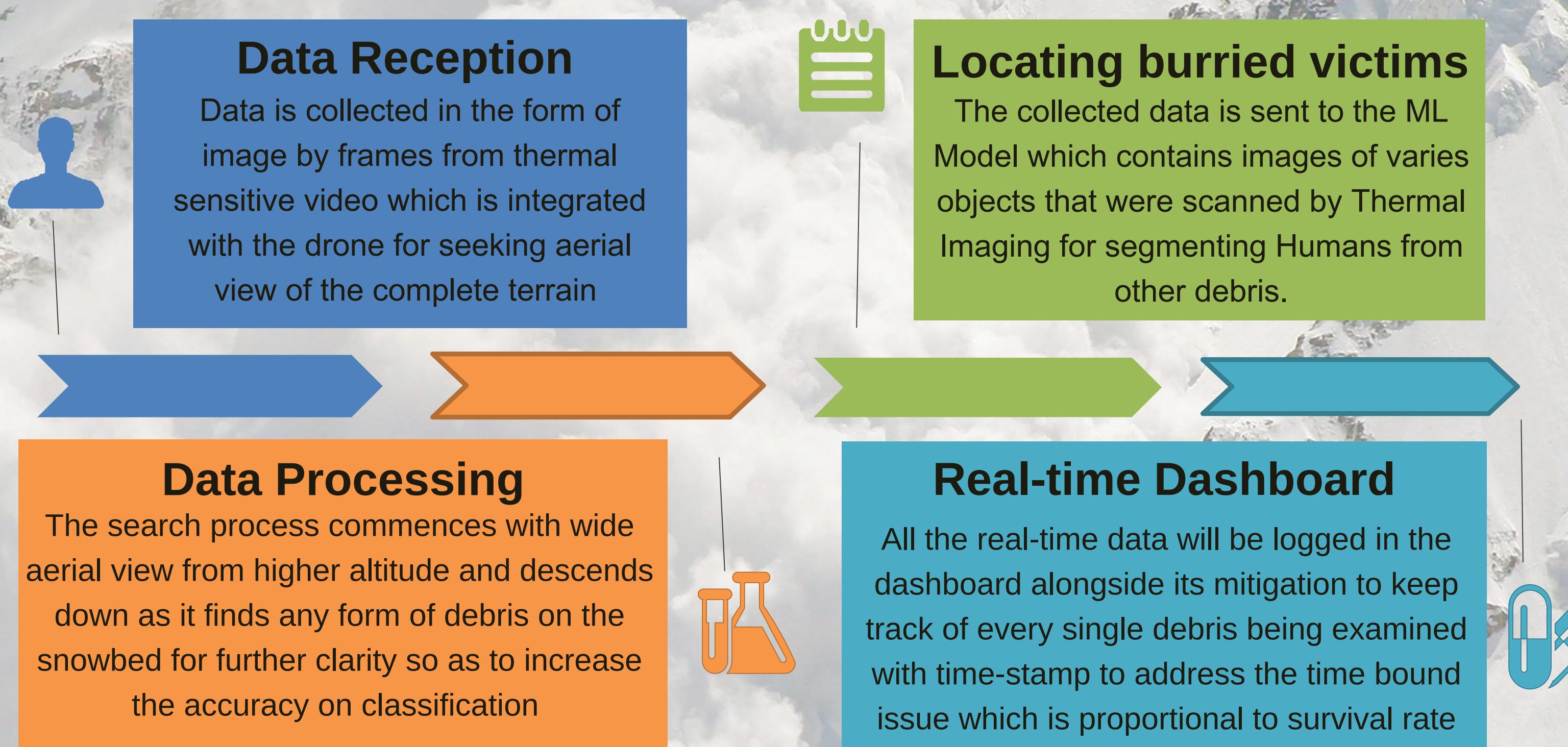


Classifying Debris as Human Positive and Human Negative

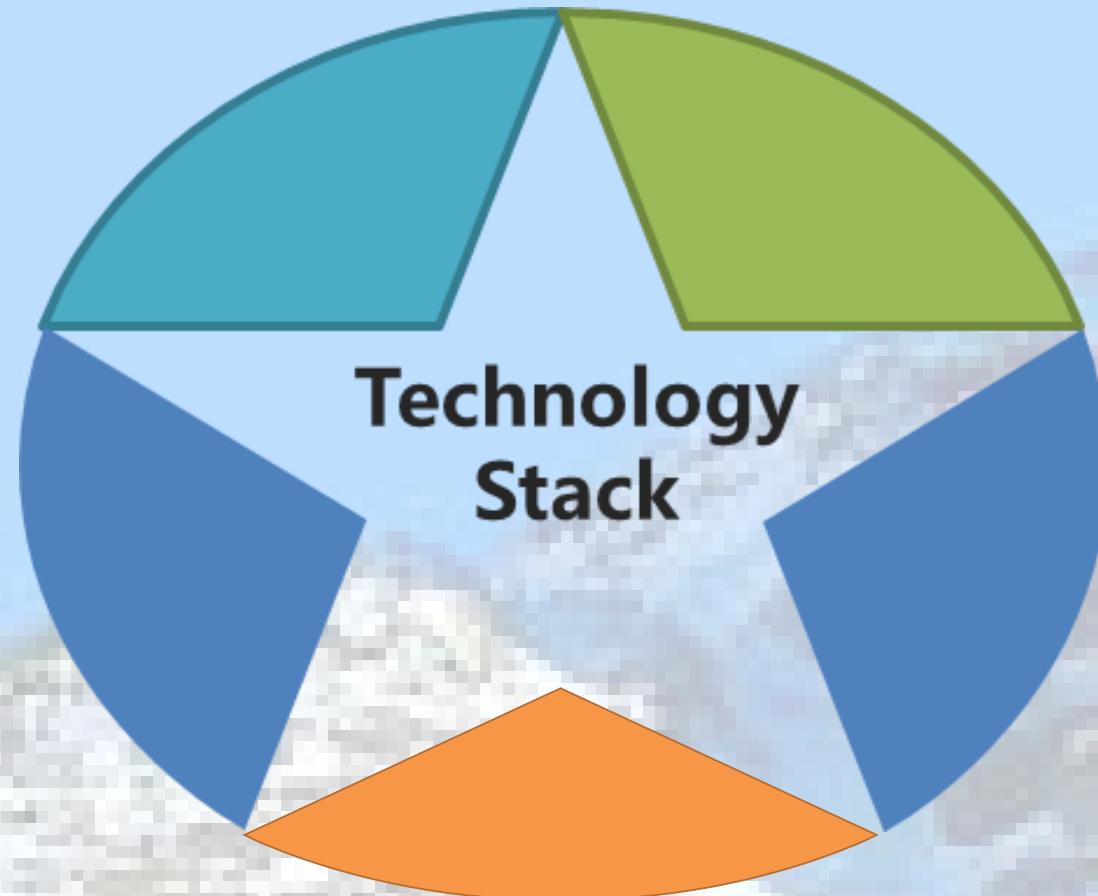


Deep Learning Model integrated with Computer Vision techniques

# MODULES / DEVELOPMENT PIPELINE



# TECHNOLOGY STACK



## Multisensory

- Drone - DJI Matrice 300 RTK
- Thermal Camera
- Beacon Transceiver
- Metal Detector

## Dashboard

- MongoDB for Database
- ExpressJS for connectivity
- ReactJS for Front End
- NodeJS for Backend
- Retool (Low Code Platform)

## Computer Vision

- Multiple Object Tracking
- Detection
- Classification
- Segmentation

## Deep Learning

- Ensemble Learning
- Yolo V8
- ResNet 50
- Fast R-CNN

## Audio Processing

- Google TextToSpeech
- PYTTSX3
- NLTK
- Amazon Polly
- PyDub

# Metrics

Novelty

- Aerial Surveillance using Drones/UAVs - DJI Matrice 300 RTK with multisensory.
- AI Solution for localizing and classifying victims from debris.

Use cases

- Expediting rescue efforts to excavate the victims which reduces mortality rate.
- Time bounded search process with 60-minute window constraint.

Scale of Impact

- Leveraging survival rate by reducing the victim localization duration.
- Resilience towards harsh climatic conditions unlike existing detection methods.

User Experience

- Voice note for Human positive logs to alert explicitly over others debris.
- Map with latitude and longitude markings of the victims.