SIGHT:
Systematic Imaging for Ground Human Tracking

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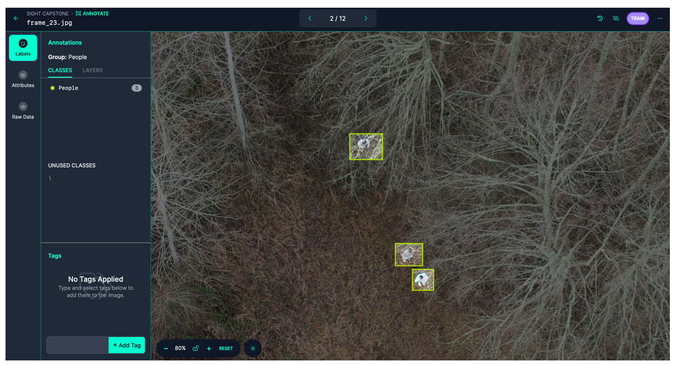
Introduction

Need: With one in five US wilderness search and rescue missions ending fatally [3], To address this our project leverages advanced drone image processing to better navigate and perform in diverse terrains and improve survival outcomes.

Data Labelling/Collection

- Collected 4K drone video footage, processed into 2000+ frames to train and validate detection model under wilderness conditions
- Manual annotations on extracted frames to improve model validation process/detection accuracy

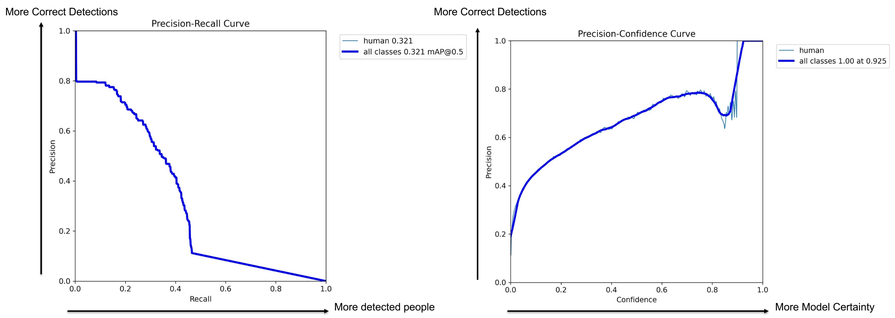


Manual labelling process for collected frames of ourselves in the forest.

Our Human Detection Results

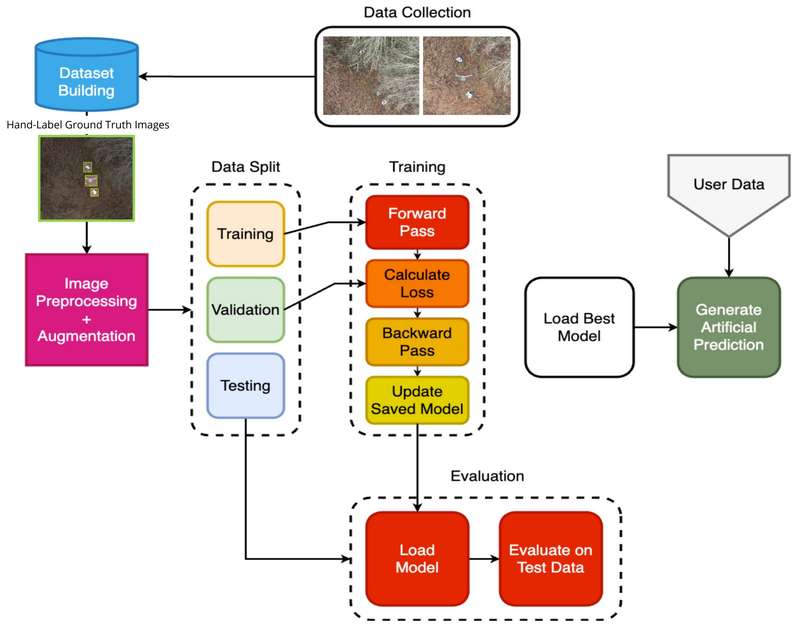
- Overall model precision value of 63%
- Identification time of 105 ms
- Our model detects people; however, it does so with low confidence, possibly due to factors such as occlusion or poor visibility (e.g., people under cover), resulting in lower performance metrics like precision and recall.

Examples of our human detection results with confidence scores: High confidence detection on the left (0.9 and 0.8), and lower confidence detection on the right (0.58), highlighting the variability in detection confidence due to factors such as occlusion and visibility.



- These graphs show our model's ability to detect humans in search and rescue missions. The Precision-Recall Curve (left) indicates that the model correctly identifies humans 32.1% of the time, with precision decreasing as it tries to detect more humans.
- The Precision-Confidence Curve (right) shows that at a high confidence level of 0.925, the model's precision reaches 100%, meaning it's almost always correct when very sure. This suggests the model is reliable for highly confident detections but needs improvement in overall accuracy. To get around this we created flags for lower confidence predictions so fewer people would be missed.

ML Pipeline



Future Work, References, and Acknowledgments

Future Work
- Continue training in a diverse range of environments and seasons
- Implementation of thermal imagery
- Modify for additional applications (Animal tracking, aquatic search and rescue missions, etc.)

Acknowledgments:
- Capstone Mentors: Professor Blake Hannaford, and Eli Patten

References:

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