

Detection and Classification of Cracks on Transportation Infrastructure Using UAV Based Aerial Imagery

Team:
Lauren Arner, Benjamin Ferreira, Madi Jacobsen, Ian Seal, John Schnoebelen, Jack Temple

Client: Muhammad Ahmad Siddique
Advisor Dr. Halil Ceylan

Website: <http://sdmay20-13.sd.ece.iastate.edu>

Problem Statement

Due to weather fluctuations, concrete and other road surfaces are constantly being placed under duress causing cracking. This creates hazardous and, at times, undrivable road conditions.

Solution

Use machine learning to develop a software program that can output information to identify changing road safety conditions.

Requirements

Functional Requirements:

- Identify 80% of cracks accurately
- Ability to identify the difference between joints and cracks with 80% accuracy
- 80% correct classification of pavement
- Correct analyzation of cracks despite obstacles
- Ability to accept large quantities of images

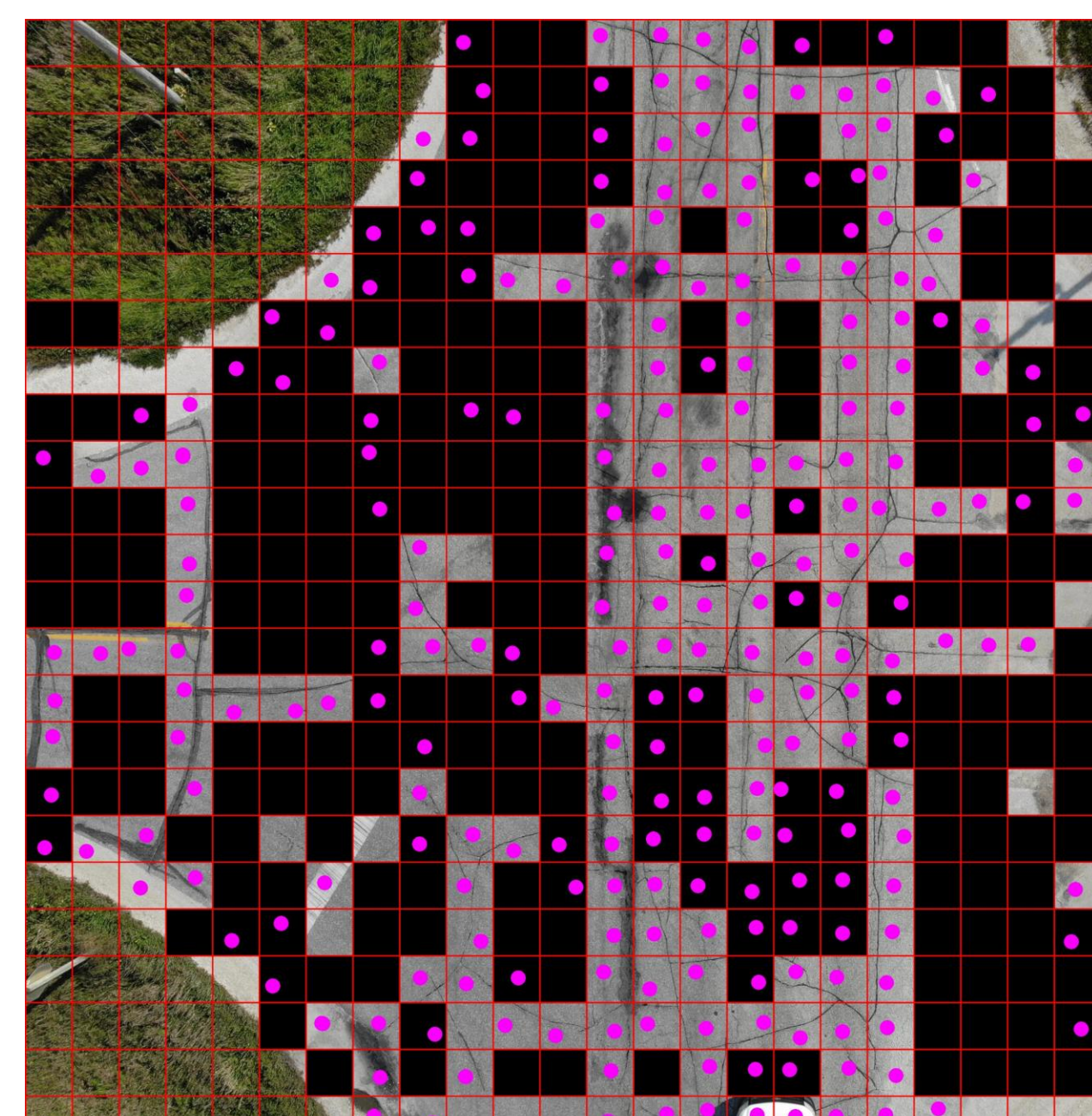
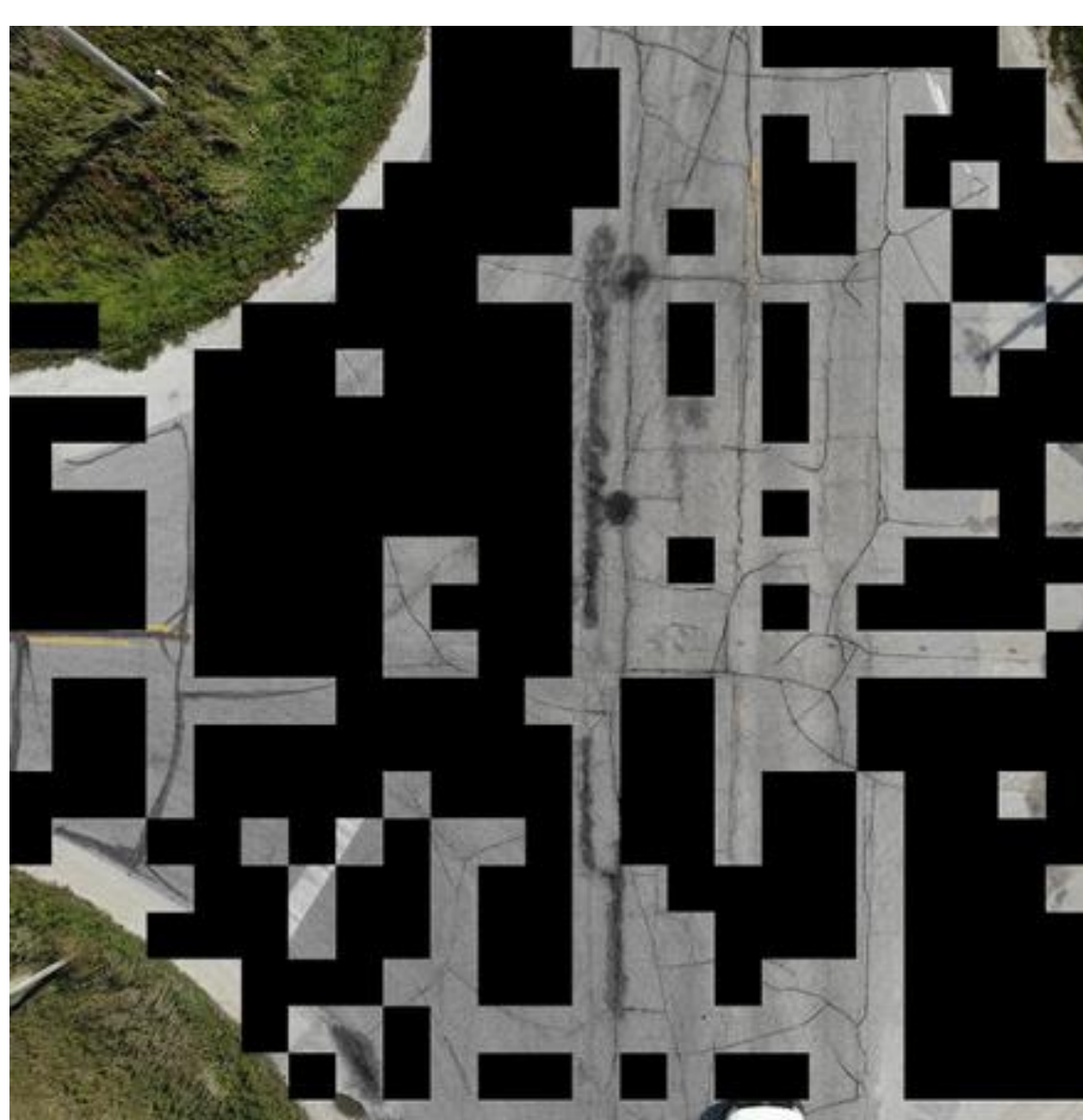
Non-Functional Requirements:

- Non-resource draining, Easy to use, Modifiable

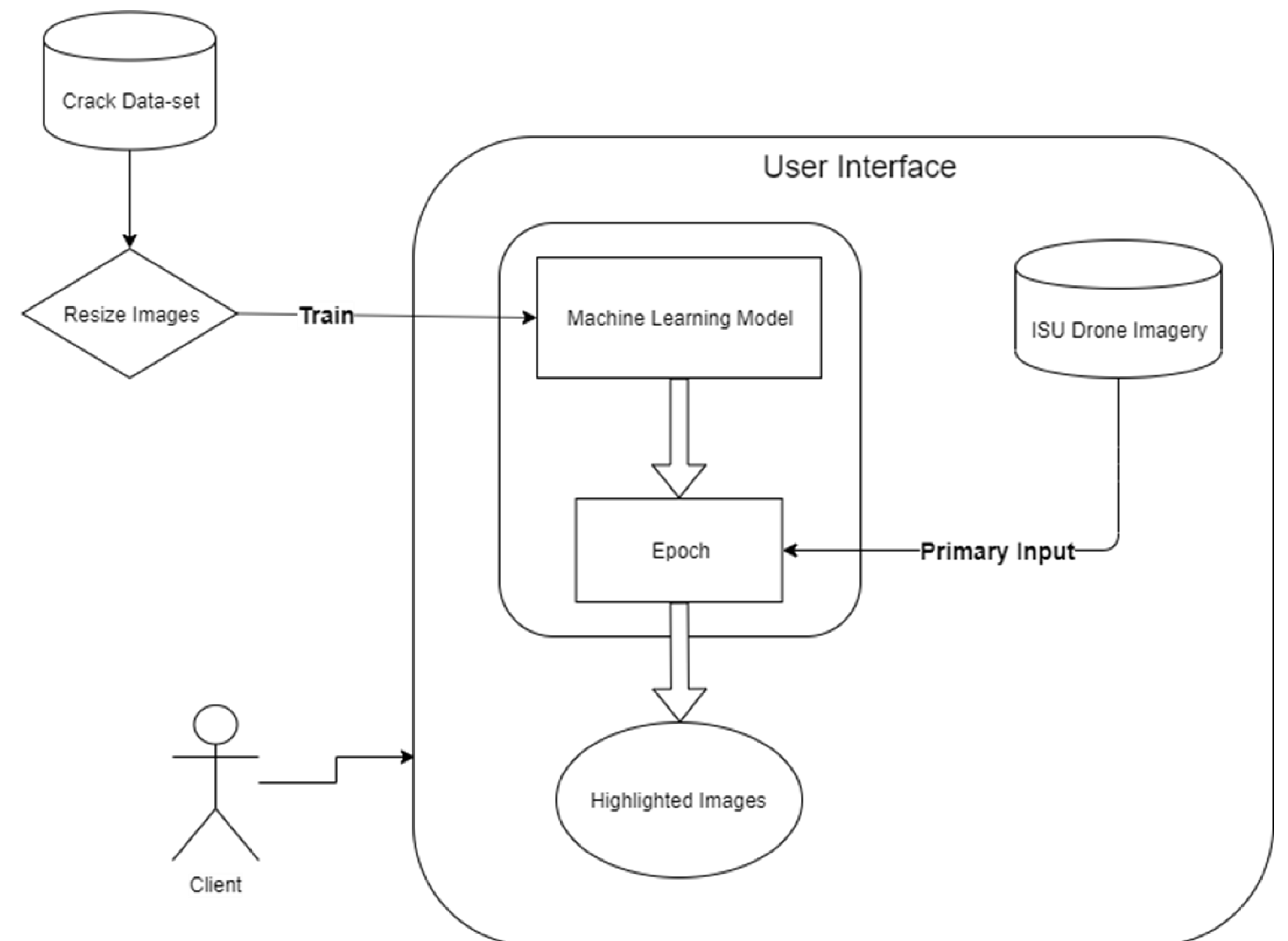
Testing

Testing Process

- Create control images where all cracks are identified by hand
- Take image processed through algorithm and compare to control image
- Calculate true accuracy by identifying all true positive/negatives and all false positives/negatives
- Compare the data between images and look for trends in angle of photo and pavement type



System Diagram



Technical Requirements

Python 3.5.x, TensorFlow/PyTorch, PyQt5

Intended Users

Construction engineers, researchers, and Department of Transportation officials will use to determine what roads to fix first.

Engineering Standards & Design Practices

- IEEE 12207 - Software life-cycle processes
- IEEE 29119-2015 - Software testing

Conclusion

The final accuracy rate of 47.74% did not meet our initial goal. Many trends that will allow us to better train the epoch in the future were noted. Overall, this program is not ready for use by the clients due to the low accuracy rate. Though, the GUI is easily learnable once the program can detect cracks, crack type, and pavement type more accurately.