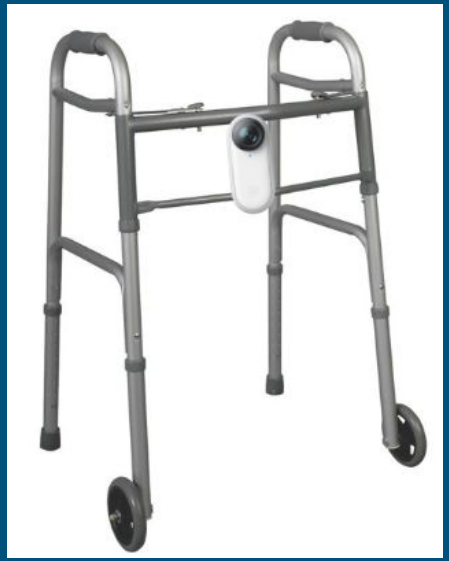
Pothole Detection

Kyril Panfilov, Kooha Kwon

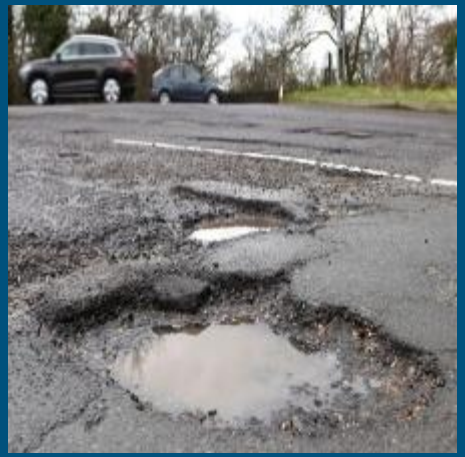
Goals

- Train a neural network model that can alert drivers, cyclists, and pedestrians of road irregularities.
- One third of traffic fatalities are due to poor road conditions and potholes are one of the main culprits.
- Model would be used with a mounted camera on a vehicle, bicycle, or walker.



Baseline Testing

- Started with a small data set of ~750 images (balanced).
- Trained a number of baseline models including a vanilla CNN and VGG16 (partially frozen, fine-tuned, and from scratch).
- Accuracy score of 55% on the test set.



Improvements

- Increase data to ~1,350 images.
- Data augmentation: rotations, horizontal flip, brightness, and contrast.
- Model and hyperparameter testing
  - Vanilla CNN
  - CNN w/ dropout
  - VGG
  - AlexNet
  - ResNet

Performance

Model	Training Accuracy	Training Recall	Valid Accuracy	Valid Recall
Vanilla CNN	58%	54%	50%	53%
CNN	98%	98%	82%	90%
CNN (dropout)*	98%	99%	85%	100%
AlexNet	72%	100%	62%	100%
VGG16	91.6%	100%	77%	100%
ResNet*	93%	93%	83%	90%

*hyperparameter tuned

Successes and Failures

- High classification rates
- Major improvement from baseline model
- Poor data quality outside of Kaggle
- Frequent crashes during training in colab
- Only works with potholes
- Translating to real time video classification will be difficult