Practical Machine Learning
Final Presentation

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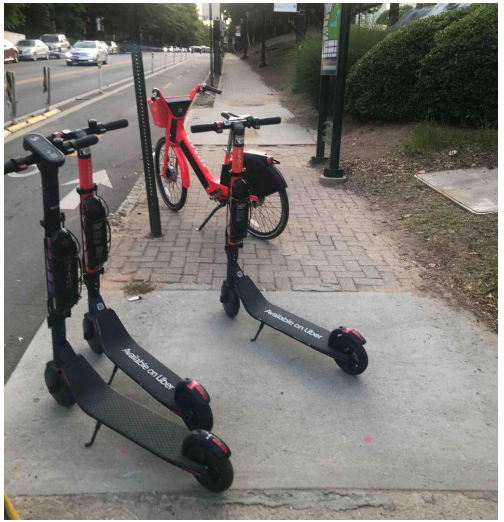
The Problem


BORDERS
BOOKS·MUSIC·CAFE
Peet's Coffee & Tea
MADE LOCALLY
great grip
no matter
how wet
you get..
#themat



The Idea - Use Case

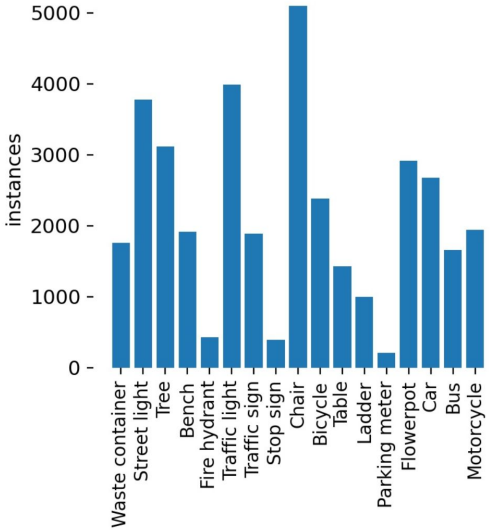
- Detect obstacles in user's path
- Estimate the distance between user & obstacle
- Alert user to obstacle

The Goal

Assisting visually impaired people in everyday scenarios through AI

OpenImageDataset

- Source to label images for desired classes
- Annotations needed for conversion to Yolo format



YOLOv5 - Possible Choices

VGG 16

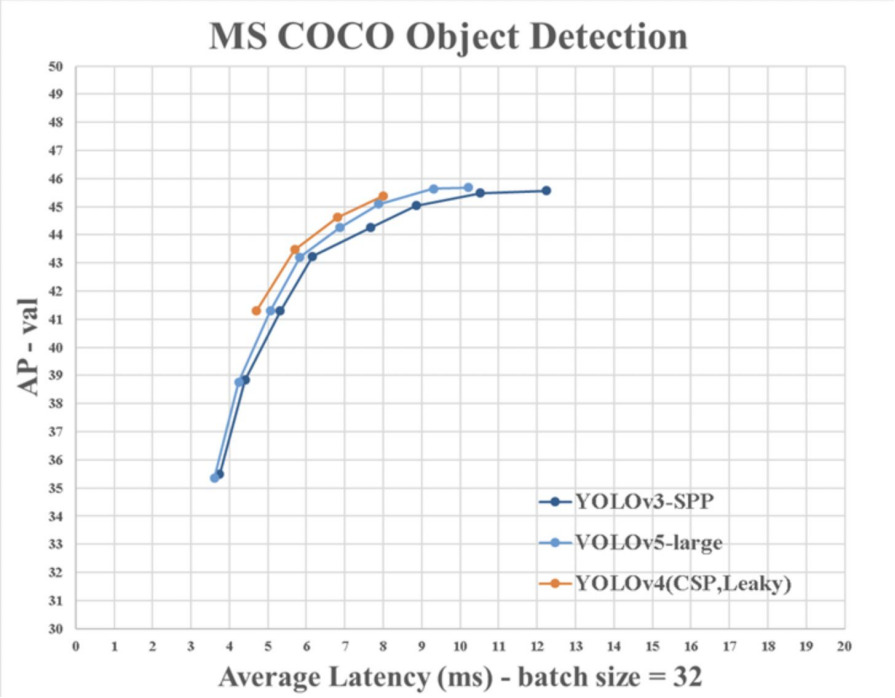
ResNet

SSD

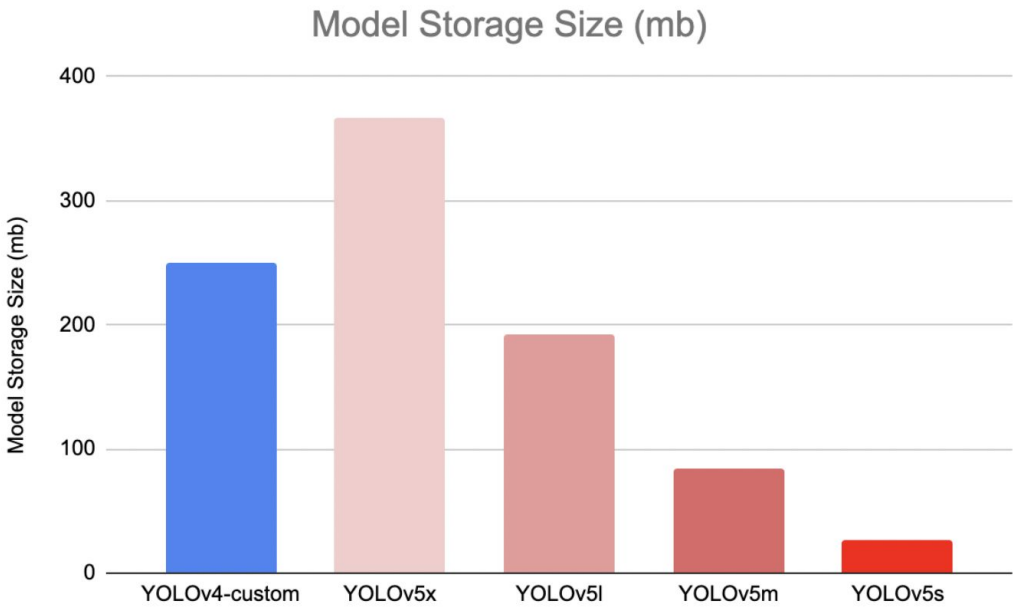
YOLO

Detection Frameworks	Train	mAP	FPS
Fast R-CNN	2007+2012	70.0	0.5
Faster R-CNN VGG-16	2007+2012	73.2	7
Faster R-CNN ResNet	2007+2012	76.4	5
YOLO	2007+2012	63.4	45
SSD500	2007+2012	76.8	19

YOLOv5 vs other YOLO



YOlOv5 size comparison



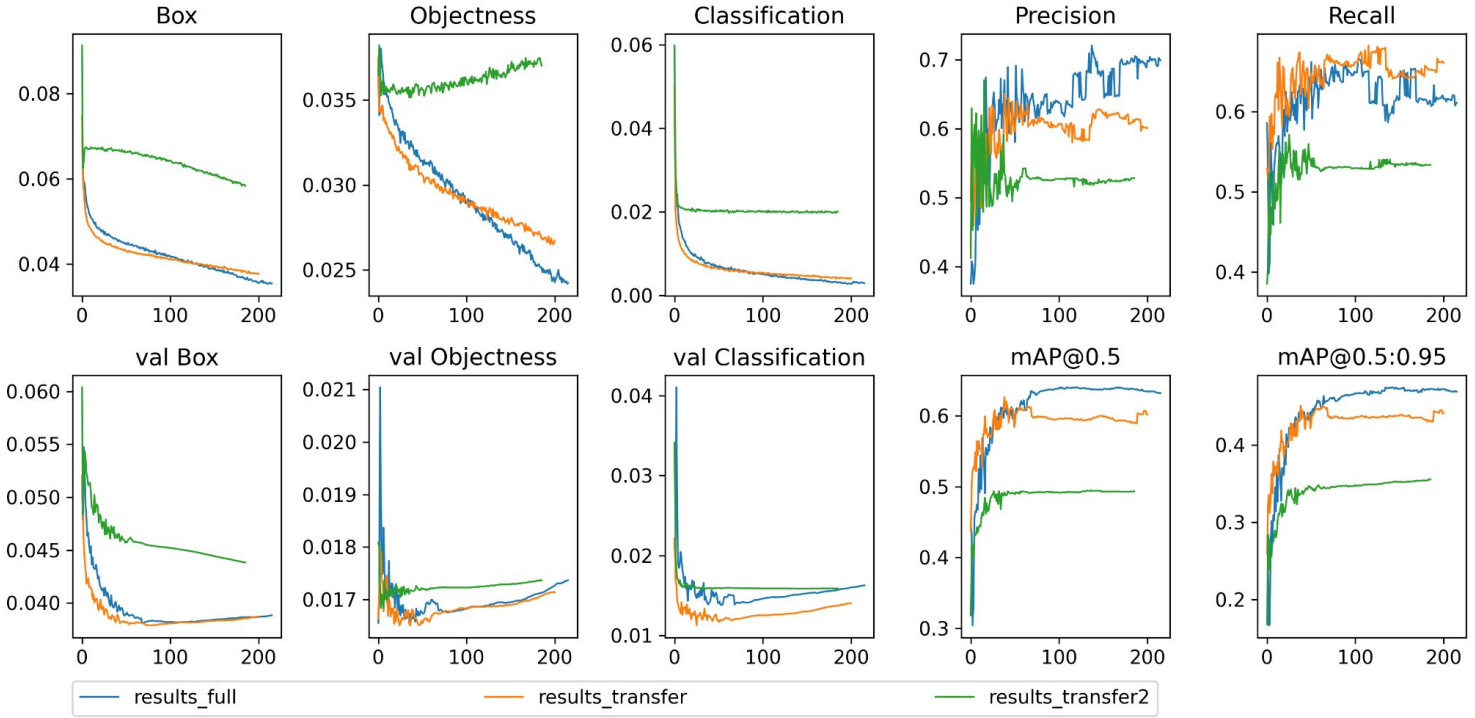
Distance calculation

- Based on bounding box size and known size of detected objects
- Calibration necessary for each device
  - *To get perceived focal length F*
  - *F = (Pixel-width x Distance) / Width*
- Distance can be estimated
  - *D' = (Width x F) / Pixel-width*

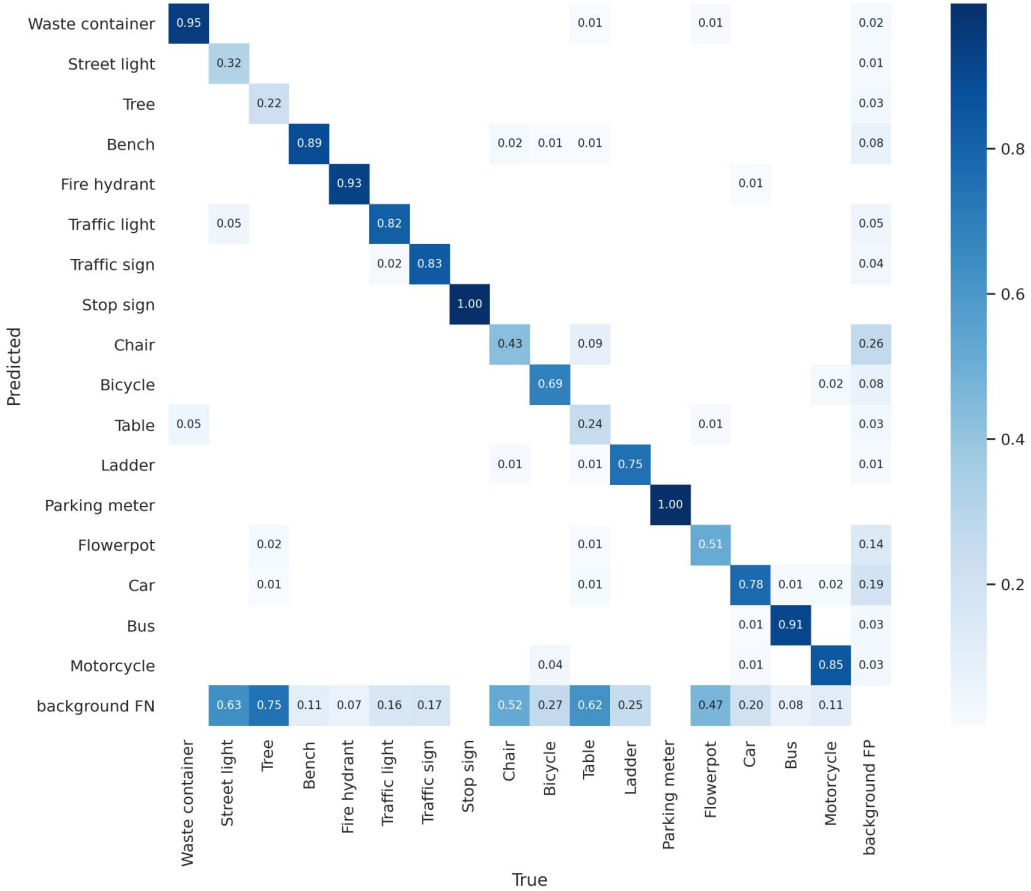
Training

- Long Training time (batch 16, img size 640)
  - Training from Scratch
  - Transfer learning (freezed Backbone)
  - Transfer learning (full freeze expect last layer)

Training


Box
Objectness
Classification
Precision
Recall
val Box
val Objectness
val Classification
mAP@0.5
mAP@0.5:0.95
results_full
results_transfer
results_transfer2

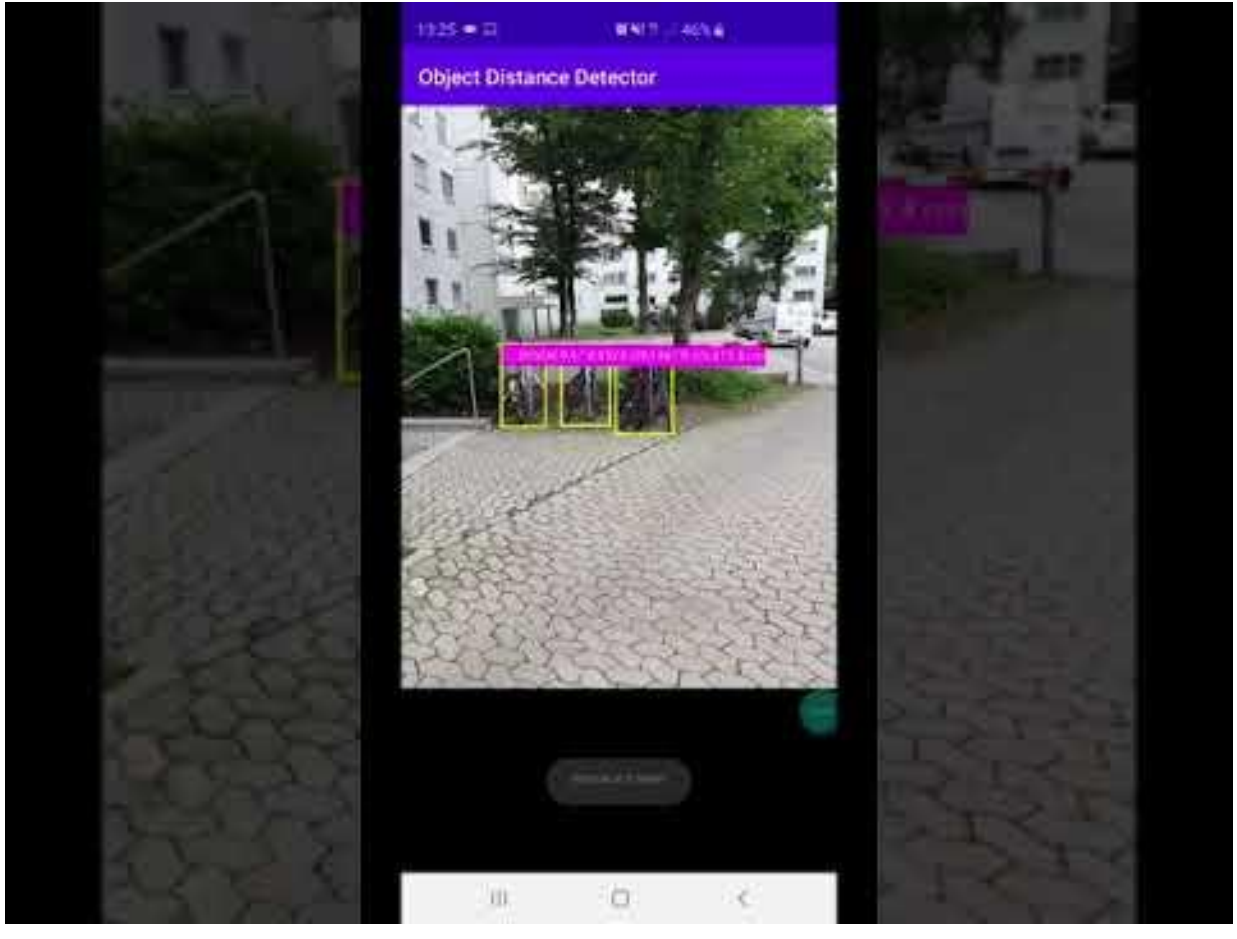
Test Correlation



Example (Labels)

Example (Predictions)

Live Demo



Thanks!

Any Questions?

References

- Object detection: Comparison of VGG16 and SSD, http://homepages.cae.wisc.edu/~ece539/project/f18/palani_rpt.pdf
- https://github.com/ultralytics/yolov5/issues/6#issuecomment-643093187
- https://github.com/AlexeyAB/darknet/issues/5920#issuecomment-642812152
- https://github.com/ultralytics/yolov5/issues/980
- https://github.com/ultralytics/yolov5/wiki/Train-Custom-Data