

# Using Deep Learning to Identify Cyclists' Risk Factors in London

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# Introduction

Cycling Benefits

Road Safety Indicators

Risk Factors

Imagery Dataset

Object Detection

Image Segmentation

Safety

Economy

Health

Environment

Equity

2010

2011

2016

2017

1. Cycle Lane

2. Vehicle Speed

3. Street Light

4. Road Pavement Quality

5. Water Drainers

6. Train/Train Rails

7. Number Intersections

8. Intersection Visibility

9. Bend Visibility

10. Truck Circulation

11. Parked Cars

12. Road Width

13. Advanced Stop Line

14. Pedestrians

1. Street Light

2. Road Pavement Quality

3. Water Drainers

4. Number Intersections

5. Intersection Visibility

6. Bend Visibility

7. Pedestrians

1. Street Light

2. Cycle Lane Pavement Qualit

3. Number Intersections

4. Intersection Visibility

5. Bend Visibility

6. Pedestrians

Object Detection

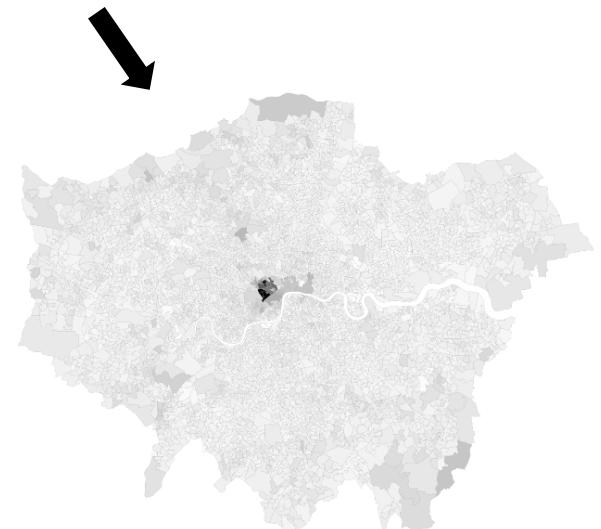
Image Segmentation

# Imagery Dataset

## Methods & Results

- Source was Google API and London Datastore
- Storage in Imperial RDS
- N. Datapoints is 119 681
- N. Images is 478 724
- N. LSOAs is 4 832
- Average of 108 Images/LSOA
- Minimum of 4 Images
- Maximum of 844 Images

Google Street View

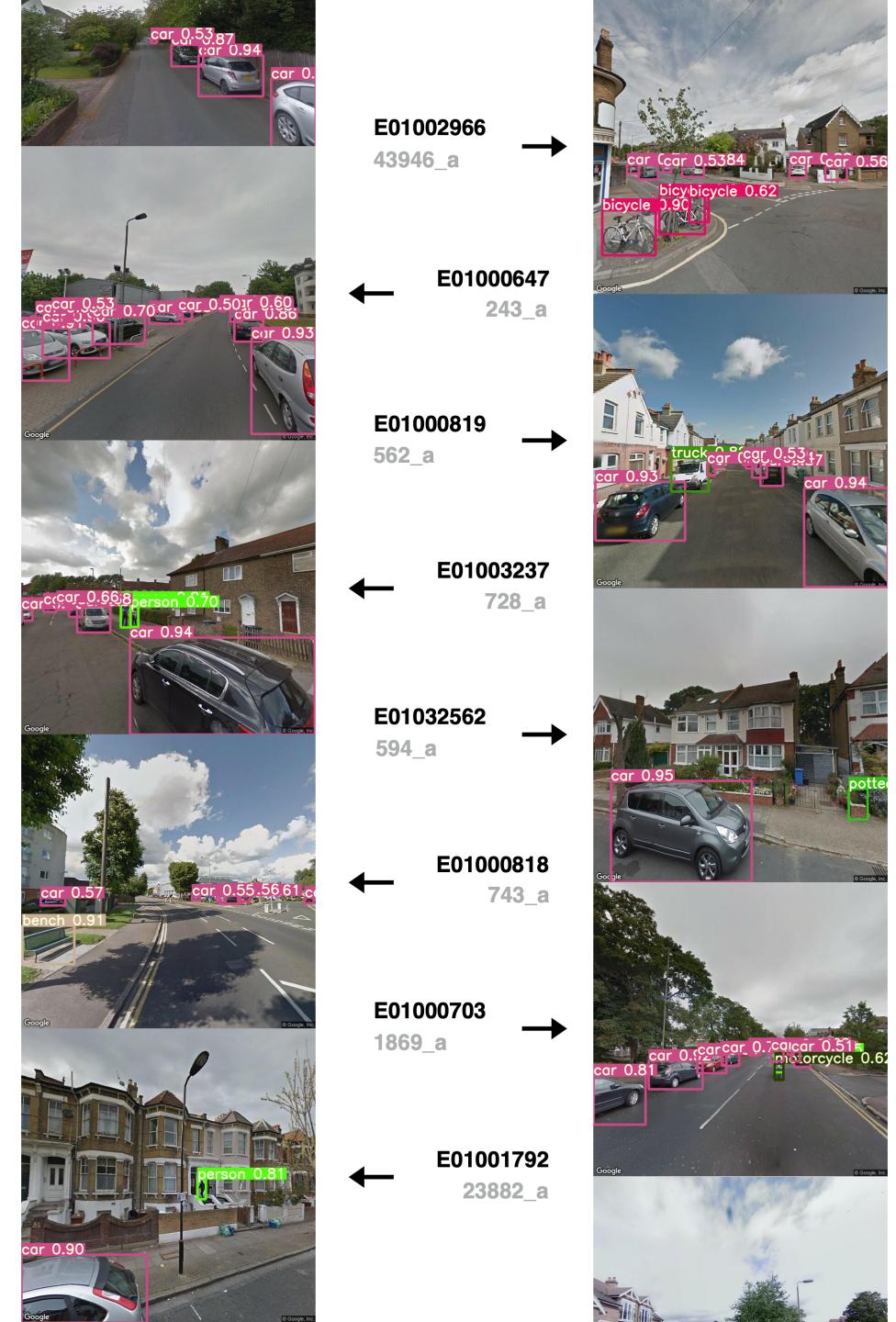
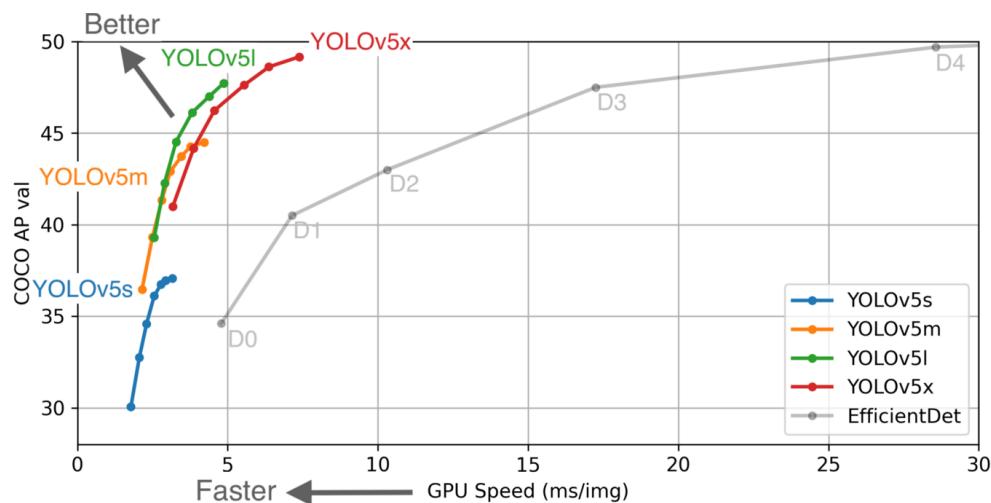


# Object Detection

YOLOv5

## Methods

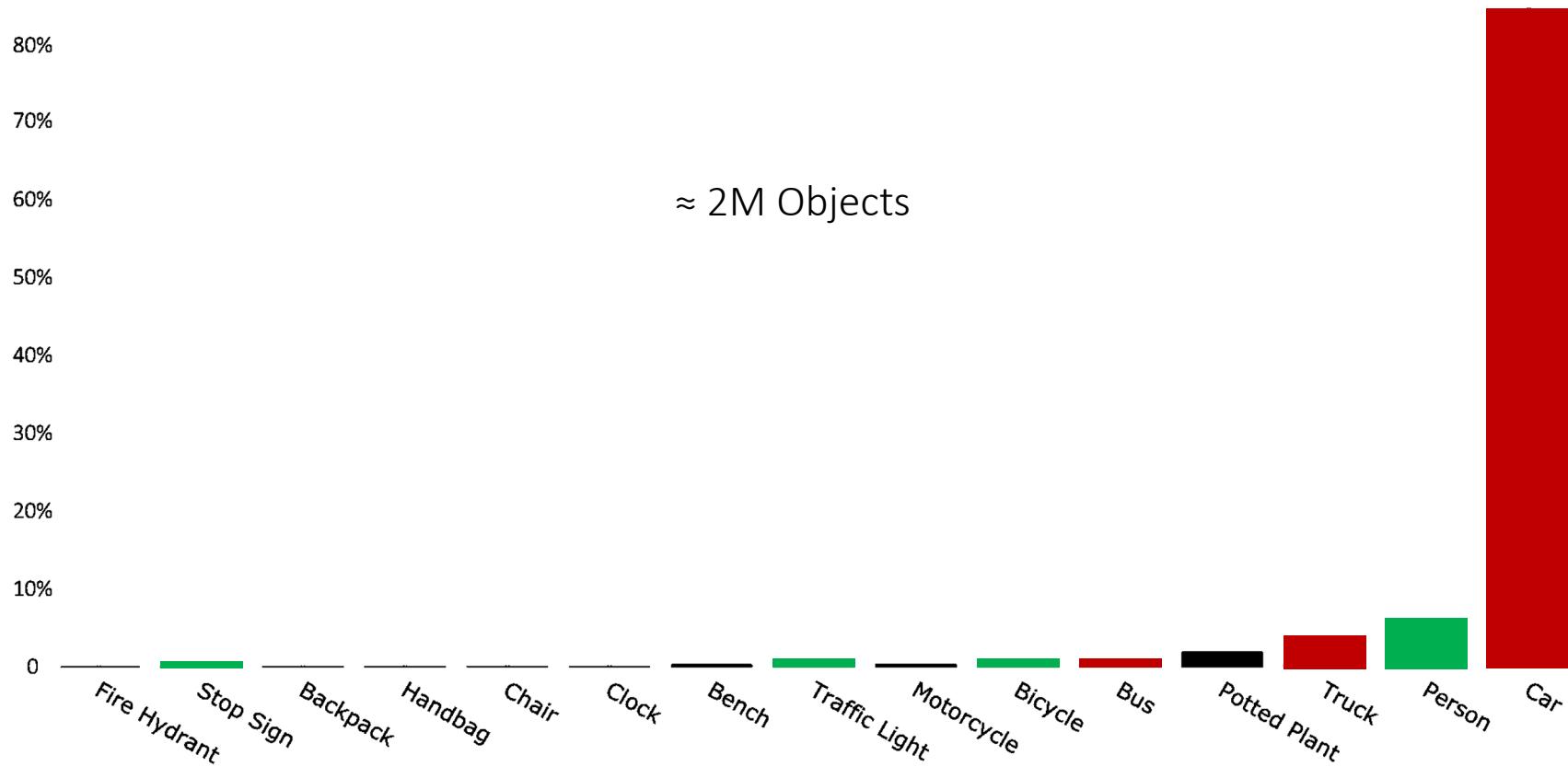
- You Only Look Once (YOLOv5)
- Released July 2020
- Weights used were YOLOv5x
- Executed with P1000 Nvidia GPU from HPC
- Accuracy threshold set 0.5



# Object Detection

YOLOv5

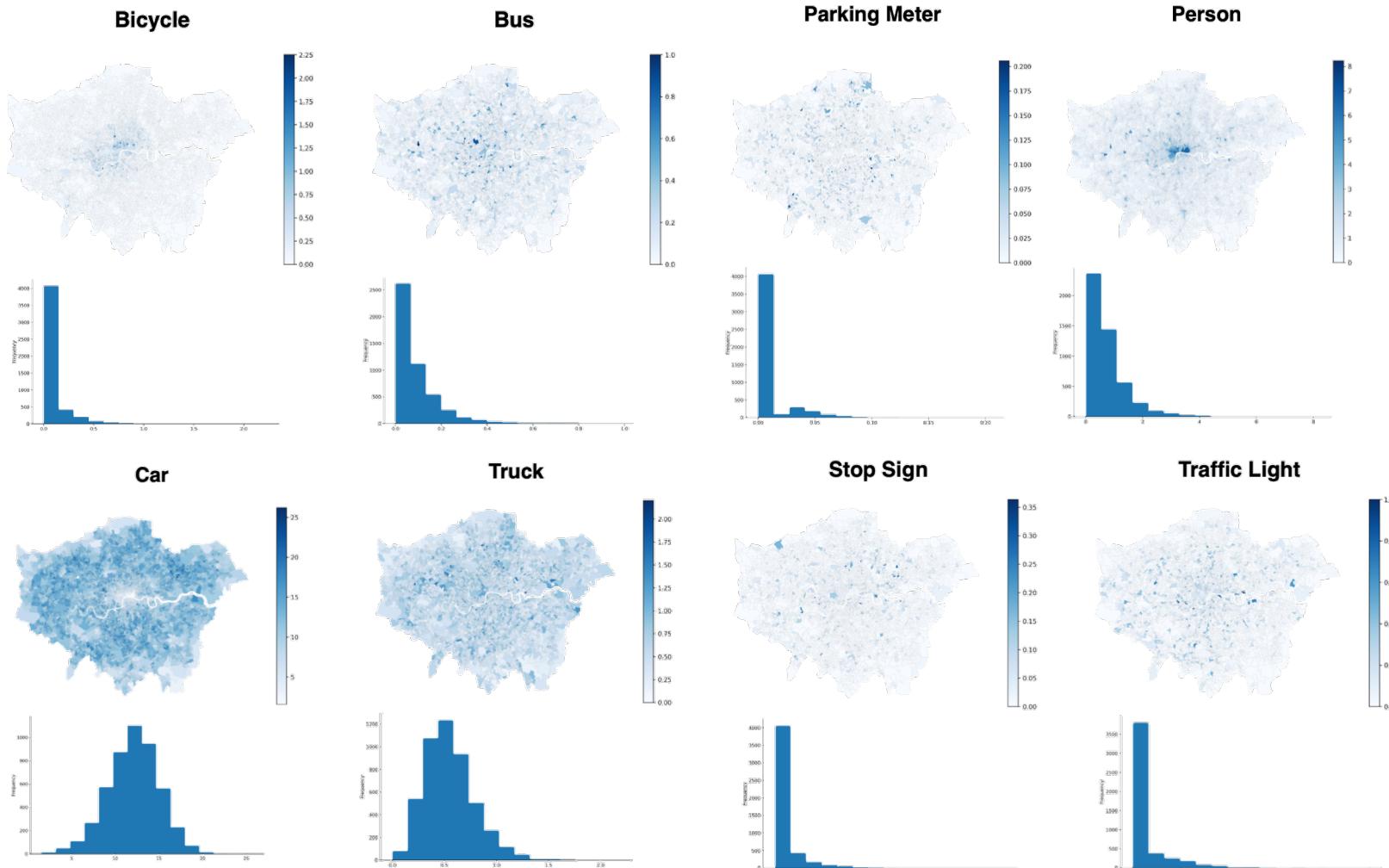
## Dataset Distribution



# Object Detection

YOLOv5

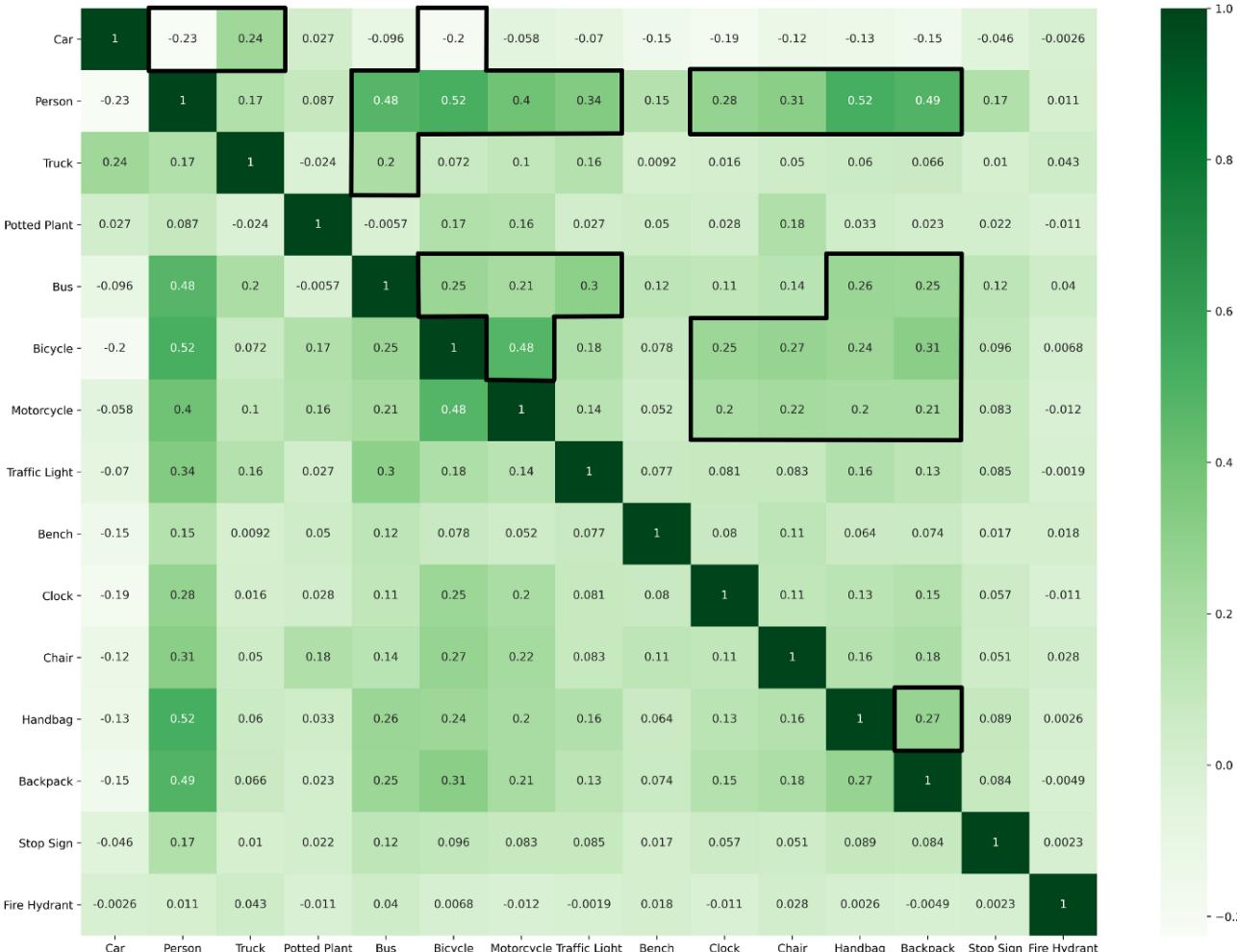
## LSOA Distribution



# Object Detection

YOLOv5

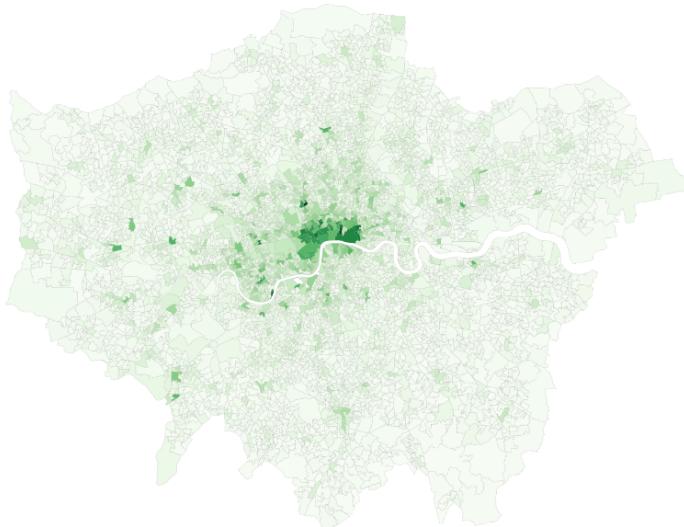
## Correlation Matrix



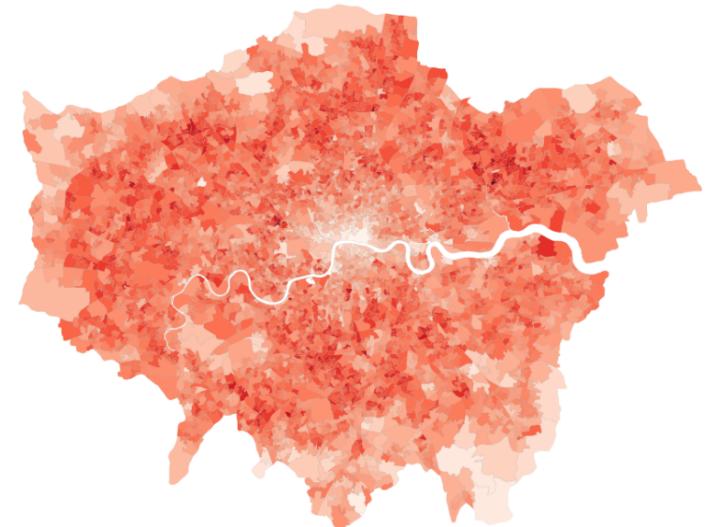
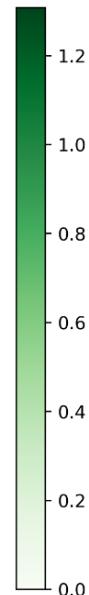
# Object Detection

YOLOv5

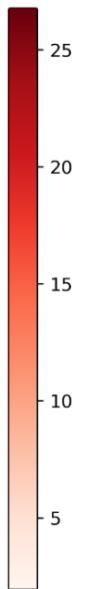
Combined Safety Metric



Bicycle + Person



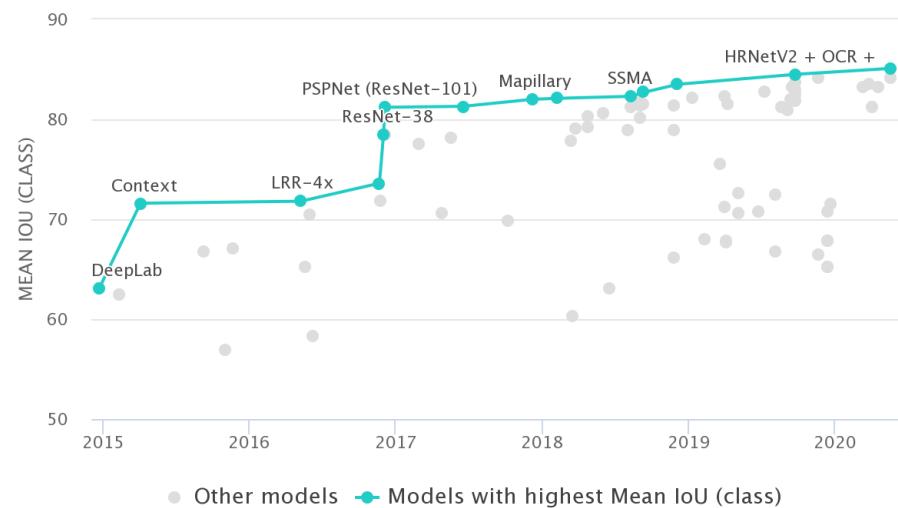
Bus + Car + Truck



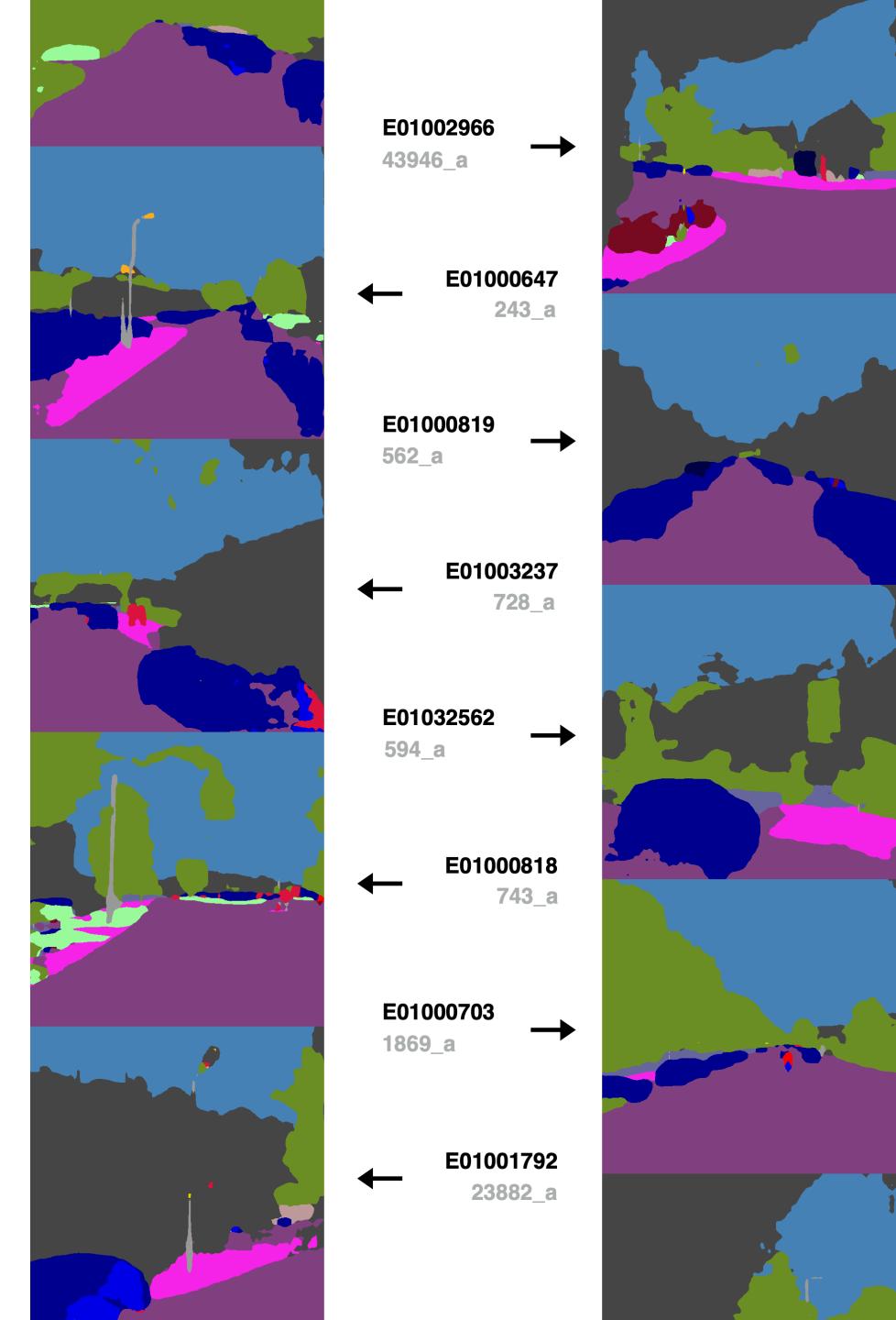
# Image Segmentation

## Methods

- Pyramid Scene Parsing Network (PSPNet101)
- Released 2017
- GSV divided in 13 batches
- P100 Nvidia GPU



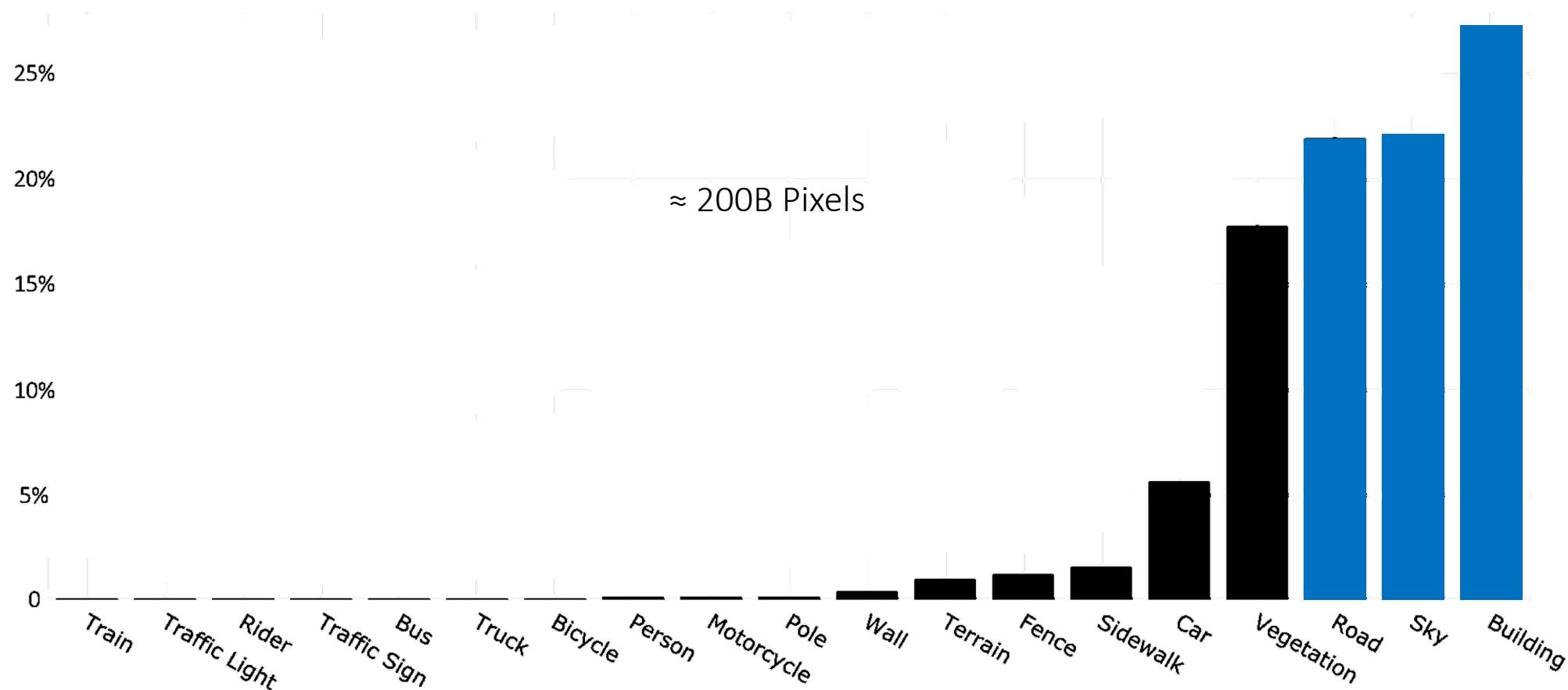
PSPNet101



# Image Segmentation

PSPNet101

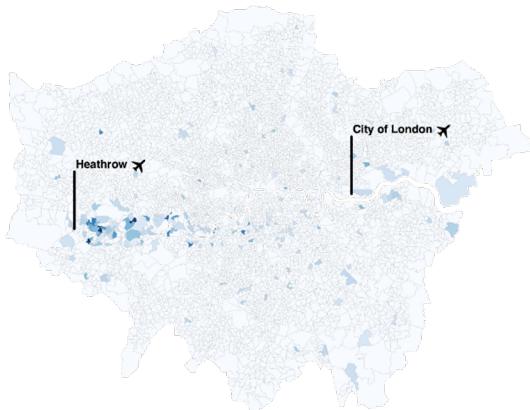
## Dataset Distribution



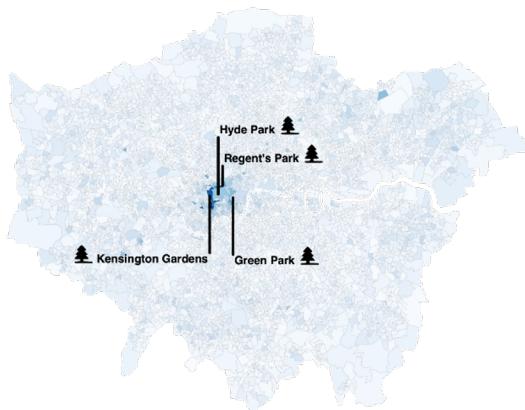
# Future Directions

## Object Detection & Image Segmentation

Airplane



Potted Plant



Road Width



Sidewalk Width



Streetlight