Road Marking Quality Assessment System Through Semantic Segmentation

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Introduction

Detecting road markings' quality is an important task to maintain drivers' safety.

Given the rise of autonomous vehicles it is important for such systems to be able to detect all road markings.

Problem Formulation

Current methods to detect lane marks are done manually.

Our goal is to build an automated system that can assess the quality of the roads using cellphone images.

Figure 1 - Example of road marking segmentation

Related Work

Previous attempts use convolutional neural networks (R-CNN) to perform object detection on skyview images.

Other attempts try to perform inverse perspective mapping on images to later perform semantic segmentation.
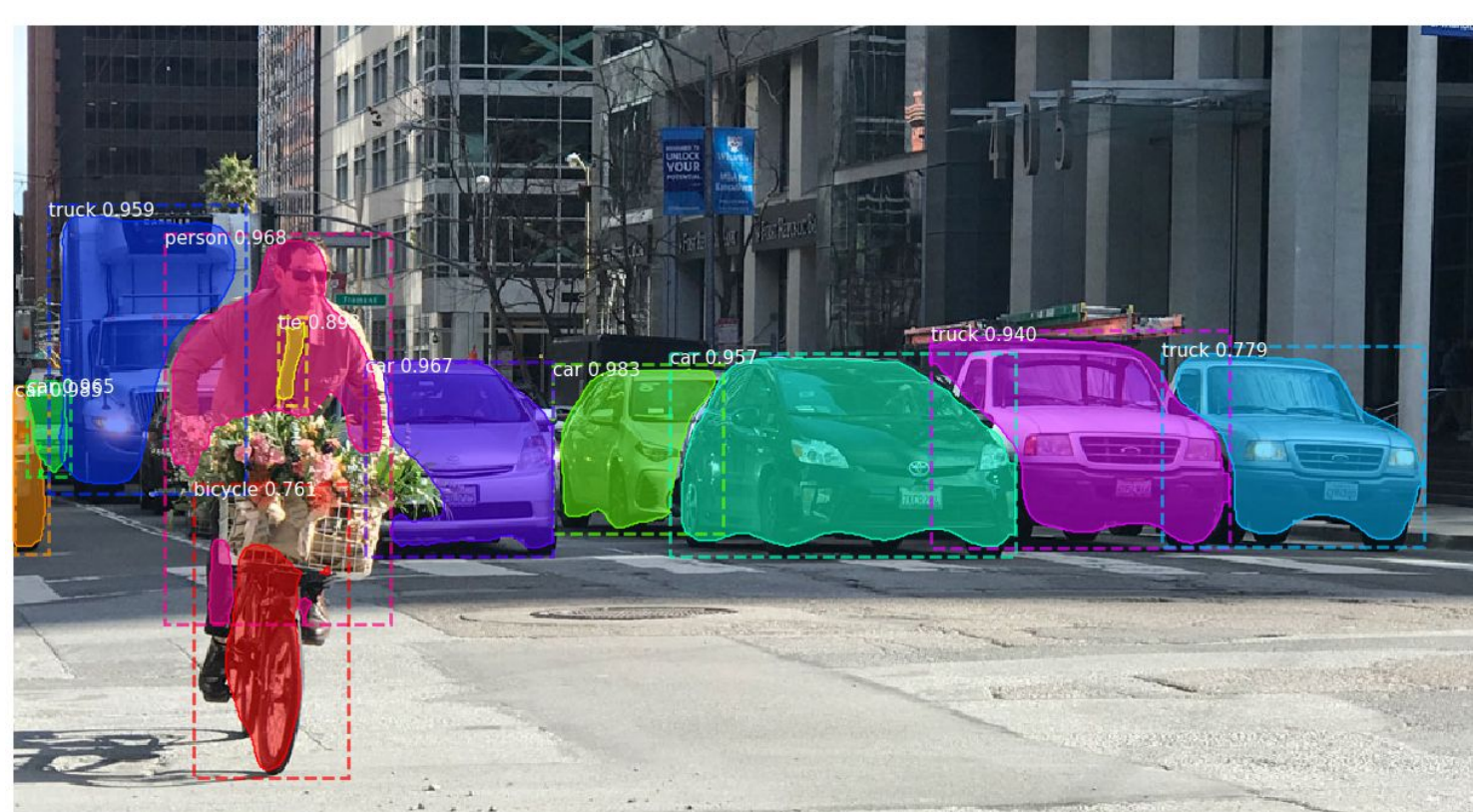

Figure 2 - Masked RCNN Semantic segmentation

Our Approach

We used transfer learning to detect lane markings and roads. We fine tuned Fully Convolutional Networks (FCN-8s) to detect lane markings.
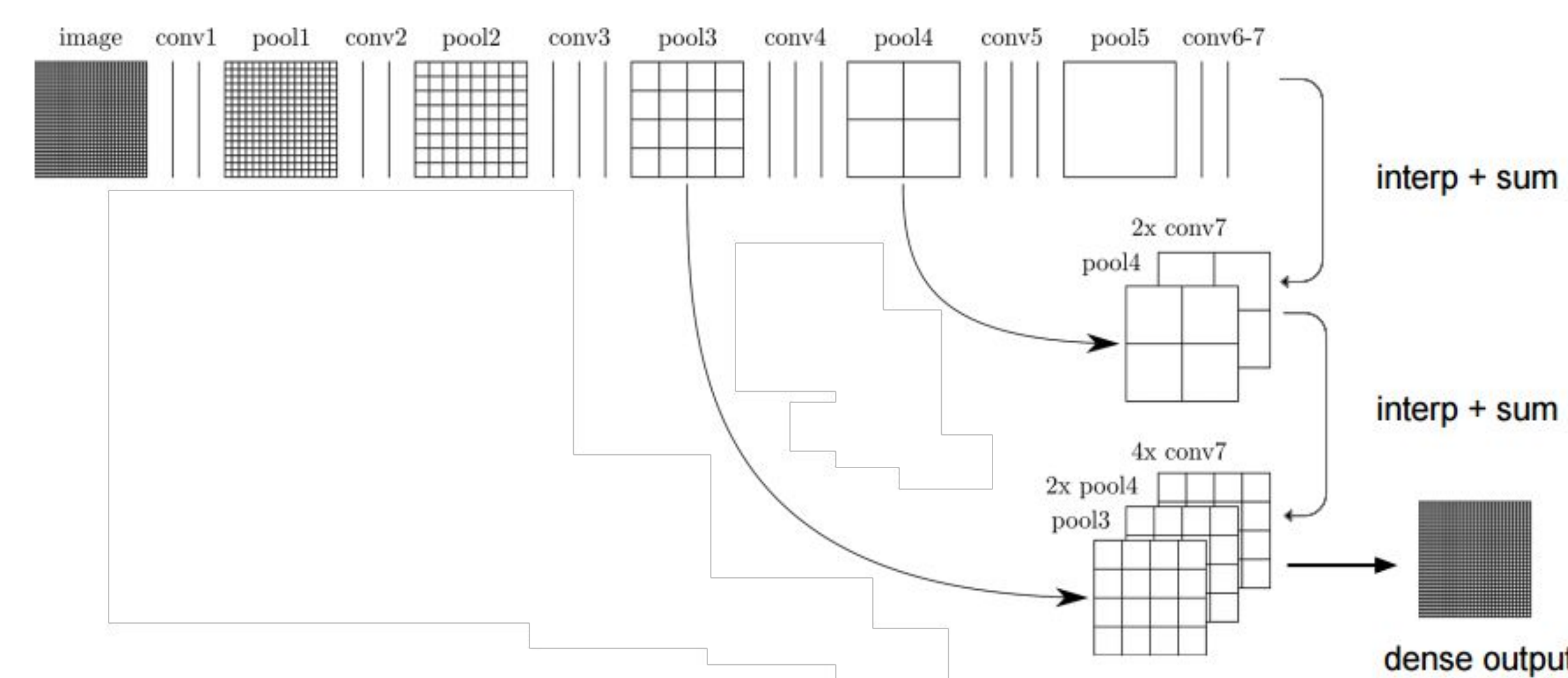

Figure 3 - Fully Convolutional Layer FCN-8s

We used the Mapillary road dataset. It has 66 classes of street objects, such as crosswalk, car, road, etc. We trained the model on 3 different classes.
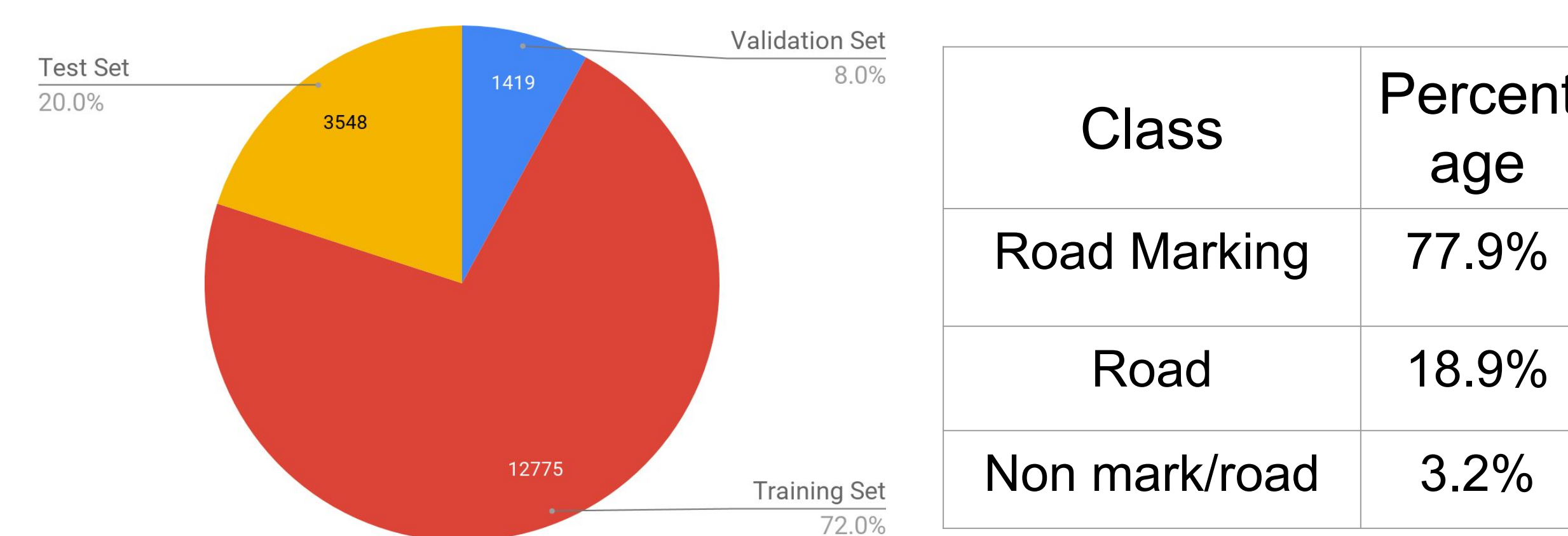

Class	Percentage
Road Marking	77.9%
Road	18.9%
Non mark/road	3.2%

Figure 4 - Dataset Split and the percentage of each class in the entire dataset

Figure 5 - Examples of training instances

Experiment and Results

We downsized the images to learn the parameters faster. We classify each pixel as one of the three classes. We pretrained the model on small subset then trained again on the full dataset.

The achieved meanIOU was 68.7% with an IOU of:

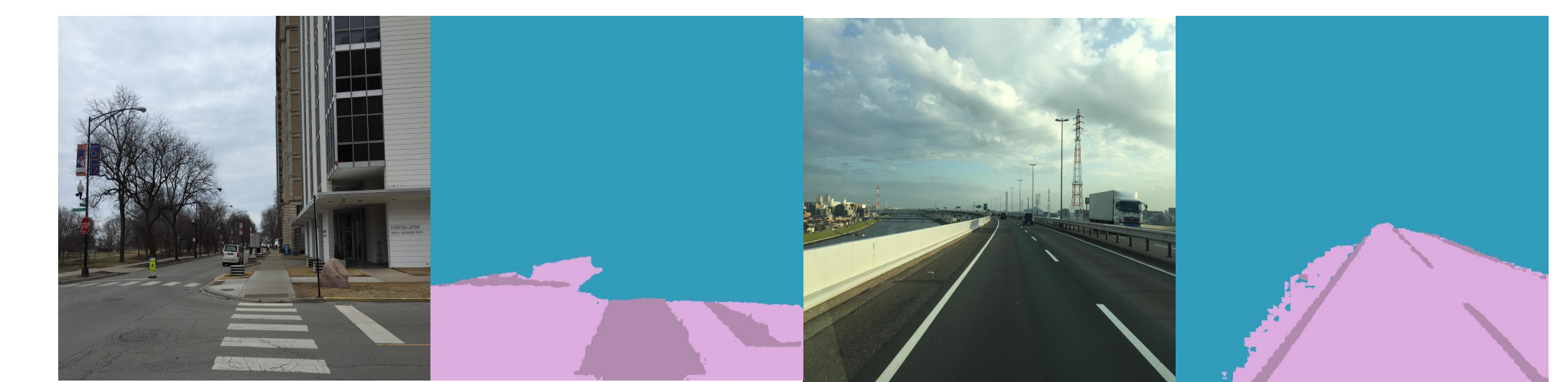| Non Marking/Road	Road	Road Marking
94.45%	74.5%	37.22%

Figure 6 - Results of the FCN-8s

Conclusion and Future Work

We found that using transfer learning with fine tuning on a small dataset can give very good initialization to the network. We also found that downsizing the training image causes faster training.

We would like to perform quality identification using stratified active learning.

Acknowledgment