

# CSC2515 Project Proposal

## Autonomous Driving: Road-Estimation

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### 1 Project Overview

The project we propose consists of a comparison of classification algorithms in their ability to accurately classify what is road and non-road in the suggested autonomous driving: road estimation topic. The dataset is the base kit of the road/lane detection evaluation of the KITTI dataset, described in further detail below. The training data will be split into 60% for training, 10% for validation, and 30% for testing, and preprocessed to conduct the classification on superpixels. The algorithms used for comparison are listed below, and will be compared in false-positive and false-negative error rates.

### 2 Dataset

The data used in this project is provided by the KITTI Vision Benchmarking Suite<sup>1</sup> which is widely used in robotics for testing machine learning algorithms. The Road/Lane Detection Evaluation (2013) dataset contains images (pixel color intensity) of urban scenes taken from the top of a vehicle, which ground truth labels for roads. There are three different scene categories, as seen in figure 1:

- urban unmarked roads (uu),
- urban marked roads (um),
- urban roads with multiple marked lanes (umm),

each with roughly 100 training images and 100 test images. The main dataset used will be the urban

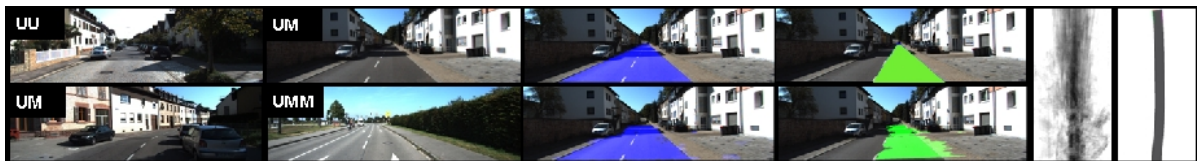


Figure 1: Example of the different scenes in this KITTI dataset with road labels.

marked road dataset as project focuses road estimation and not individual lanes. A possible extension to this project would be to analyze the impact of scene type by evaluating performance on all datasets individually, then combining them.

### 3 Algorithms

This project will compare three supervised learning algorithms and potentially a state-of-the-art technique. The three benchmarking algorithms are:

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<sup>1</sup><http://www.cvlibs.net/datasets/kitti/>

**Regression:** relates input and output based on a function. Several different functions will be tested (linear, logistic, polynomial, etc.).

**$k$ NN:** classifies based on the majority vote of its  $k$  Nearest Neighbours in feature space.

**Support Vector Machines:** attempts to learn a map from the input to a seperable feature space used for classification.

There are several possibilities for state-of-the-art techniques to test for this task. An obvious choice would be Convolutud Neural Networks which, according to the KITTI leaderboard, perform very well on this task<sup>[1]</sup>. Further research will be required to find a complex algorithm that remains within the scope of this course.

## 4 References