

## Group 5

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### Pre-Trained CNN applied to driving-related object recognition

#### Abstract:

Given an image taken facing the direction in which a car is moving, the system shall detect road signs, cars, pedestrians and other relevant objects for a driver or autonomous system. The system would ideally work in real-time and could possibly be able to detect the position of the objects within the image.

#### Detailed description:

We will use the following technologies:

- Python 3
- Keras (<https://keras.io/>)
- TensorFlow (<https://www.tensorflow.org/>)

The idea of our project is to adapt a pre-trained CNN to recognize objects of classes specific for use in a driving scenario, such as in an autonomous vehicle.

We intend to use the VGG16 trained on the ImageNet dataset as our pre-trained CNN. We will download the trained CNN without the input and top layers, then freeze the parameters for the convolutional layers, and re-generate the top layers and input layers, and retrain them on our specific dataset.

To acquire the dataset, we will download various images from the same search in Google Images, define them as belonging to the same class, and manually filter the unwanted ones. Then we will standardize the images to the specific format used in the network. We will also write a script that takes a folder containing the images of the dataset and generates the structure used by Keras for the training, and also generates the correct labels vector.

With both the modeled CNN and the dataset in hands, we will train it on our personal computers using the Keras *fit* function for as long as possible. Then we will evaluate our success by taking a testing set, predicting the class for each image, assuming that the identified class for the image is the position of the maximum value of the output of the CNN, and comparing the predicted class with the correct one. We expect mildly successful results.

#### Stretch Goal 1:

If possible, we would want to make the final CNN efficient enough to be used in real time.

#### Stretch Goal 2:

If possible, we would want the system to be able to identify not only the object but the position in which it is in the image.