

# Dissertation Research Project

Iordache Adrian-Razvan

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## 1 The subject of the dissertation project

The dissertation project represents a system for driver behaviour monitoring in the context of outside world. This system will be designed to run on embedded architectures with low hardware capabilities and a single camera source.

This project will be coordinated and supervised by associate professor Alexe Bogdan.

## 2 Description of dissertation project

The system will be able to:

- Detect vehicles, pedestrians, motorcycles, crosswalks and lanes
- Decide when one object is in front of our vehicle, invariant to the device position
- Warning the driver when it's too close to the object in front with respect to the vehicle speed
- Detecting when the driver it's crossing a continuous lane and giving a warning

In this project will use deep neural networks for object detection, machine learning for camera calibration and another computer vision techniques for different tasks.

## 3 Intermediate steps of the project

As intermediate steps until the final solution, we will:

1. Research existing approaches for similar systems
2. Analyze various methodologies compatible with our context and proposing our solution
3. Research and benchmark different deep neural networks for object detection on COCO (Common Objects in Context) dataset and on our collected dataset
4. Choosing the architectures based on optimizing the performance metric of the model and minimizing the inference time
5. Creating an active learning pipeline for semi-supervised data annotation
6. Improving our solution with various methods such as data augmentation, quantization, bayesian optimization and computer vision techniques
7. Analyzing and validating our solution in real world context

## 4 Current progress of the project

During the first semester we accomplished the following steps in the implementation:

- Collecting and verifying annotated data
- Establishing the optimal methodology for the project
- Training and evaluating deep learning models for for object detection in outside world context
- Creating an active learning pipeline for data annotation
- Training neural networks for distance estimation and camera calibration