**DESCRIPTION OF WORK**

**for**

**BLG 506E**

**COMPUTER VISION**

**COURSE PROJECT**

**Project Title**

**Name and number of the Student**

Date

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# EXECUTIVE SUMMARY

In this project, the aim is to classify vehicles in an image. There are two main objectives in this project which will be represented by CV (computer vision) models. Transfer learning methods will be used; therefore, pre-trained models will be evaluated. In summary, Ali Şentaş will be responsible for training the model that detects the vehicle in an image, draws bounding boxes around them and provide these images to the classifier model. Classifier model will be the responsibility of Melik Buğra Özçelik. This model will be trained to classify vehicles based on their types (car, truck, bus etc.).

# INTRODUCTION

In the domain of autonomous driving, the aim is to train vehicles to learn driving without need of a human driver. To do that, an autonomous vehicle should make decisions itself based on the information that it gathers by observing the environment. Without other actors in traffic, it is a relatively easy task to gather information of surrounding structural objects using sensors. However, considering the road line markings and the other moving traffic actors, sensor capabilities themselves are not sufficient. In this case, CV plays an important role to handle this type of a task [ref]. To detect road line markings and the traffic actors, state-of-the-art deep learning-based CV techniques might be useful [ref]. Focusing on detecting the traffic actors -vehicles in the scope of this project- there are two sub tasks. Firstly, the vehicles around should be detected by a CV model and stored in bounding boxes that draws the borders of the vehicle. Secondly, the detected bounding boxes should be fed into another model that classifies the vehicle in it based on its type. For an autonomous vehicle, having the knowledge about the vehicle types around it is very crucial. Because, these vehicles are also moving and making their own decisions, and these decisions also can be clustered depending on their types. Namely, the autonomous vehicle can predict the next actions of the vehicles around. For instance, if the vehicle in front of it is a heavy truck, the autonomous vehicle should always be cautious. In this project, it is aimed to detect the vehicles in an image and classify them based on their types.

# PROJECT DESCRIPTION

In this project, transfer learning methods will be used. To achieve better results in an as short as possible time, pre-trained CV models will be evaluated [ref]. To “transfer” these pre-trained models in the problem of classifying vehicles, the dataset that will be used in training is very crucial. Luckily, there are plenty of open-source datasets are available in this field and they are easy to access via several platforms like Kaggle [ref], HuggingFace [ref] Open Research Europe [ref].

## Goals of Project

The main goal of the project is to implement a robust and efficient vehicle detection and classification system that can be used in several types of vehicles. This detection and classification can be used in several advanced driver-assistance systems (ADAS) and autonomous driving systems, enabling vehicles to be safer.

## Impact of Solution

There are millions of vehicles driven every day, transporting billions of people. Any additional improvement in this ecosystem will have substantial effects on safety of millions of people, potentially saving thousands of people from serious injury or death. The proposed project aims to help driver assistance systems on improving the general safety of the vehicles by detecting surrounding vehicles and helping the emergency braking and lane change assistance systems.

## SOTA

Provide a brief overview of the similar works worldwide and state of the art.

### Novel contributions

State key differences of your contribution from already available solutions.

## Risk Assessment

|  |  |  |
| --- | --- | --- |
| Possible Risk | Risk Reason | Contingency Plans |
| Limited data | Dataset | Augment the available data by means such as rotating images or adding noise. |
| Low quality dataset | Dataset | Find better datasets |
| Low model accuracy | Model training | Tune hyperparameters, find best performing ones |
| Overfitting | Model training | Add regularization such as dropout layers and/or simplify model |
| Underfitting | Model training | Increase the amount of data, tune hyperparameters |
| Slow performance | Model evaluation | Use simpler, less resource hungry models or use stronger GPUs |

# PROJECT SCOPE

This SOW shall apply to the tasks, services and terms detailed below:

## Work Breakdown Structure (WBS)

ekran görüntüsü, metin, diyagram, tasarım içeren bir resim

Açıklama otomatik olarak oluşturuldu

## Work Packages

[From Wikipedia] Similar to a WBS, a WP is part of a Plan Breakdown Structure, representing a collection of work actions necessary to create a specific result. The work package is the lowest level of the WBS where the duration can be reliably estimated.

Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **WP 1** | **<WP Name>** | | |
| Start Date | <e.g. kickoff, M3> | End Date | <e.g. M5> |
| **Objectives:** This work package will cover ... | | | |
| **Tasks**   * *...* * *...* * *...* | | | |
| **Deliverables and Milestones:**  D1.1: ..  D1.2: ...  D1.3: ... | | | |

## Out of Scope

The following are considered OUT OF SCOPE for this contract:

Indicate any related topics out of scope.

# ASSUMPTIONS

Indicate if the project depends on any external material, e.g. certain data/hardware from some other company is needed to progress in the project.

# MILESTONES and DELIVERABLES

Tabulate milestones and deliverables from all work packages.

## Deliverables and Milestone Tables

Example:

|  |  |  |
| --- | --- | --- |
| **Deliverable (D)** | **Description** | **Date** |
| D1.1 | ... | M2 |
| D1.2 | ... | M2 |
| D1.3 | ... | M3 |
| … | … | … |

Table 2 Deliverable Table

|  |  |  |
| --- | --- | --- |
| **Milestone (MS)** | **Date** | **Deliverables** |
| MS1 | M1 | … |
| MS1 | M5 | … |
| … | … | … |

## Project Schedule (Gantt Chart)

Example:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M7 | M8 | M9 | M10 | M11 | M12 |
| WP 1 |  |  | D1.1 | D1.2 |  |  |  |  |  |  |  |  |  |  |
| WP 2 |  |  | D2.1 |  |  |  |  |  |  |  |  |  |  |  |
| WP 3 |  |  |  | D3.1 |  |  |  |  |  |  |  | D3.2 |  |  |
| WP 4 |  |  |  |  |  |  |  | D4.1 | D4.2 | D4.3 |  |  |  |  |
| WP 5 |  |  |  |  |  |  |  |  |  |  |  | D5.1 |  | D5.2 |

Figure 1 Gantt chart

# 