Assignment #03

Introduction to Image Analysis

and Machine Learning

Development of a car detector

based on a supervised learning approach.

Group M15

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**1. Introduction**

For our final report, we developed a car detector using a binary classifier. Our goal was to develop a car detector that can reliably detect cars in videos. Our application can be split up into two major components: the car classifier and the car detector.

In the car classifier component, we train a binary classifier based on a dataset of “car” and “non-car” images. In this assignment we experimented with different machine learning algorithms and compared their performance on this task.

In the car detector component, we use different image processing steps to prepare images in the test videos for our car classifier component. We used different techniques to improve the performance of the car detector to increase the detection speed of our application.

**2. Methods**

**2.1. Car Classifier**

**2.1.1. Dataset**

**2.1.2. Data Augmentation**

**2.1.3. Histogram of oriented Gradients**

**2.1.4. Support Vector Machine**

**2.1.5. Convolutional Neural Network**

**2.2. Car Detector**

**2.2.1. Background Detector**

cv2.createBackgroundSubtractorMOG2()

**2.2.2. Image Pyramids and Sliding Window**

**2.2.3. Overlapping Bounding Box**

**(2.2.4. Predicting Car Destination)**

**3. Results**

**3.1. Model Comparison** (SVM vs. CNN)

**3.2. Car Detector Performance**

**4. Discussion**

**4.1. Improving the Car Classifier**

**4.2. Improving the Car Detector**

**5. Conclusions**

**5.1. Comparing SVM and CNN**

**5.2. Extending the Application**