

Transport and Telecommunication Institute

Faculty of Engineering Science

Artificial Intelligence Group Project

Project Proposal

Student 1: Dmitrijs Giždevans

Student 2: Eden Elisha Thomas

Student 3: Gonzalo Gamez

Study Group: 4303MDA

2024

Main problem

The main problem is identifying vehicle types shown in Appendix 1 (Jackiva, Savrasovs and Pticina, 2019) automatically without manually having a person count on site. With the use of a computer vision fine-tuned model, identification could take place over a live feed camera at a given site.

Initial research on the problem domain relevant literature and existing products

From real time services in Latvia, TomTom (Riga traffic report | TomTom Traffic Index, 2024) and Traffic Index (Tudor Baștea, 2024) provide information of total traffic and not of vehicle type. A review of object detection models (Zaidi et al., 2022), a variety of models exists with metric of mean average precision used to evaluate. According to research for vehicle detection methods based on computer vision (Ma and Xue, 2024), the development of target detection algorithms followed with anchor free or one-step anchored or two-step anchored models.

Project objectives and what will be in and out of scope

Evaluating 3 fine tuned models trained with our label data from different baseline object detection models evaluated on mean average precision. The deployment of the model with counting mechanism and maintenance on live streaming cameras will be out of scope. Additionally, we are excluding objects such as humans, scooters, and motorcycles from the model.

Proposed work activities/tasks/work packages

The following roles were assigned according to table 1, since each person was well rounded with the data science competency profile due to work experience and education. Each person was given a chance to pick their focus with Gonzalo deciding to take PM since he wanted to grow one of his weaker competencies.

Name	Title	Roles
Dmitrijs	Data Engineer	Business Understanding, Data Preparation, Modelling, Test & Validate
Eden	Data Analyst	Business Understanding, Data Understanding, Modelling, Communication of Insights
Gonzalo	Project Manager	Management, support

Table 1. Team job roles

Table 2 is a proposal for an 8 week work plan broken in task

Week 1	Business Understanding & Initial Setup	
1	Define Project Scope & Requirements Deliverable: Detailed project requirements document and refined objectives. <ul style="list-style-type: none">a. Research which base-line models to useb. Which camera feeds will be usedc. How many and which type of samplesd. Labeling tool and data structure	Dmitrijs, Eden, Gonzalo
Week 2	Data Collection & Data Understanding	
2.1	Collect Sample Data Deliverable: Initial sample vehicle dataset (videos/images) from the webcams.	Dmitrijs

2.2	Initial Data Exploration Deliverable: Data report on sample images	Eden
Week 3	Data Annotation and Labeling	
3.1	Annotate Data using Labeling Tool Deliverable: Labeled dataset with vehicle types and bounding boxes.	Dmitrijs, Eden, Gonzalo
3.2	Set Up Data Structures Deliverable: Data organized in the formats	Dmitrijs
Week 4	Model Training	
4.1	Train Initial Models Deliverable: Trained models using annotated data.	Dmitrijs
4.2	Model Performance Evaluation Deliverable: Evaluation report on model with mean average precision.	Eden
Week 5	Model Iteration & Improvement	
5.1	Hyperparameter Tuning & Retraining Deliverable: Improved model performance via tuning	Dmitrijs
5.2	Review Model Results and Provide Insights Deliverable: Insights on model performance with specific recommendations for improvement.	Eden
Week 6	Testing with Unseen Data	
6.1	Apply Model to New Data Deliverable: Test model on new live feeds or unseen images.	Dmitrijs
6.2	Performance Review & Validation Deliverable: Validation report including comparison of predictions on new data.	Eden
Week 7	Final Testing & Model Finalization	
7.1	Final Model Adjustments Deliverable: Finalized models ready for evaluation.	Dmitrijs

7.2	Validation of Final Model Deliverable: Report on final validation results and readiness for deployment.	Eden
Week 8		
8.1	Final Presentation Preparation Deliverable: Presentation summarizing project work and results.	Dmitrijs, Eden, Gonzalo

Table 2. Table for task

Project management methodology

[Github](#) for version control with [kanban board](#) for the task to be assigned and tracked.

General implementation plan/timeline

Week	Task/Deliverable	Responsible
1	Project requirements	Dmitrijs, Eden, Gonzalo
2	Data collection, data exploration	Dmitrijs, Eden
3	Data annotation, data formatting	Dmitrijs, Eden
4	Model training and evaluation	Dmitrijs, Eden
5	Model improvement and tuning	Dmitrijs, Eden
6	Model testing with new data	Dmitrijs, Eden
7	Final Model adjustments and validation	Dmitrijs, Eden
8	Final presentation	Dmitrijs, Eden, Gonzalo

Table 3. Table for general timeline

Reference list

Jackiva, I., Savrasovs, M. and Pticina, I. (2019). *Methodology for household travel survey and traffic counts for SUMBA project 1 st PART. The results of traffic counts survey*. p.13.

Ma, C. and Xue, F. (2024). A Review of Vehicle Detection Methods Based on Computer Vision. *Journal of Intelligent and Connected Vehicles*, 7(1), pp.1–18.

doi:<https://doi.org/10.26599/jicv.2023.9210019>.


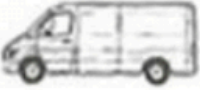




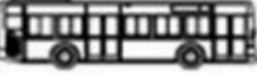
Riga traffic report | TomTom Traffic Index. (2024). *Riga traffic report | TomTom Traffic Index*. [online] Available at: <https://www.tomtom.com/traffic-index/riga-traffic/> [Accessed 21 Oct. 2024].

Tudor Baștea (2024). *Riga traffic congestion report | Traffic Index*. [online] Trafficindex.org. Available at: <https://trafficindex.org/riga/> [Accessed 21 Oct. 2024].

Zaidi, S.S.A., Ansari, M.S., Aslam, A., Kanwal, N., Asghar, M. and Lee, B. (2022). A survey of modern deep learning based object detection models. *Digital Signal Processing*, 126, p.103514. doi:<https://doi.org/10.1016/j.dsp.2022.103514>.

Appendix

Types of vehicles

Graphical representation	Code	Description
	V	Passenger vehicles
	C1	Light cargo vehicles
	C2	Mid cargo vehicles
	C3	Cargo vehicles
	C4	Cargo vehicles with trailer
	M	Motorbikes
	S	Buses

Appendix 1. Types of vehicles (Jackiva, Savrasovs and Pticina, 2019)