Masters project description
Large Language Models Adaptation for Cyber-Physical System Testing

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A project description is a short description of the selected theme for your master's thesis. It should cotain the following:

1 Temporary title

The temporary title is "Large Language Models Adaptation for Cyber-Physical System Testing".

This comes from the project website.

2 Temporary thesis statement

There are existing frameworks for generating test cases, e.g. RTCM [4]. This project will apply large language models(LLMs) to test cases generated by these existing methods and review what improvements can be made. We will focus on test cases for autonomous vehicles. By applying large LLMs to test cases for self driving cars such as [1, 3], we can compare the outcome of the original test with its initial counterpart and review what effect the LLM modification has had.

3 The methodology you will be using

I will build on existing test frameworks for self driving cars utilizing large language models. This project will apply the same evaluation methodologies as the existing literature.
The simulator CARLA[2] will be used for running the test cases.

DeepScenario[3] is an existing dataset of test cases for autonomous driving system testing.

4 A progress plan for your thesis, with indicated milestones

Milestones highlighted in **bold**.

- January 2025 - Start of project.
- February 2025 - Literature overview.
- **March 2025** - Essay draft
- May 2025 - Completed essay.
- **June 2025** - Essay submission.
- **August 2025** - First draft thesis.
- October 2025 - Final draft thesis.
- **November 2025** - Thesis submission.
- **December 2025** - Thesis defence.
- December 2025 - End of project.

5 Curriculum relevant to your master's thesis

For doing this project, NLP and testing knowledge is relevant.

References

[1] Victor Crespo Rodriguez, Neelofar, and Aldeida Aleti. *Instance Space Analysis of Testing of Autonomous Vehicles in Critical Scenarios*. Version 1. Zenodo, May 2024. DOI: 10.5281/zenodo.11202385. URL: https://doi.org/10.5281/zenodo.11202385.

[2] Alexey Dosovitskiy et al. "CARLA: An Open Urban Driving Simulator". In: *Proceedings of the 1st Annual Conference on Robot Learning*. 2017, pp. 1–16.

[3] Chengjie Lu, Tao Yue, and Shaukat Ali. "DeepScenario: An Open Driving Scenario Dataset for Autonomous Driving System Testing". In: *IEEE/ACM 20th International Conference on Mining Software Repositories (MSR)* (2023), pp. 52–56.

[4]   Tao Yue, Shaukat Ali, and Man Zhang. "RTCM: a natural language based, automated, and practical test case generation framework". In: *Proceedings of the 2015 International Symposium on Software Testing and Analysis.* ISSTA 2015. Baltimore, MD, USA: Association for Computing Machinery, 2015, pp. 397–408. ISBN: 9781450336208. DOI: 10.1145/2771783.2771799. URL: https://doi.org/10.1145/2771783.2771799.