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Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Aleksei Postnikov

PhD Program: Computational and Data Science and Engineering

Title of Thesis: Towards seamless autonomous navigation in dense urban environments

Supervisor: Associate Professor Gonzalo Ferrer

Name of the Reviewer: Ivan Oseledets

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 12-09-2024**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the

Reviewer's Report

The thesis has 116 pages, 9 chapters: Introduction, Literature Review, Conclusion and 6 chapters related to the main results. It is very logically structured, and each chapter ends with conclusion and sometimes discussion. It is good and readable. It is also good that the author provided a systematic description of the used models and datasets in the literature review.

The results have been published in 2020 ICRA workshop paper, 2021 IROS paper, 2021 Neurips workshop paper, 2022 ICRA paper, 2022 IROS workshop paper, 2023 ECMR paper, 2021 ICARA paper and 1 one patent. Main results included more efficient algorithms for trajectory prediction (several methods with attention-based architectures, hybrid models, generative models and compared on many different datasets and tasks. The results of the thesis is are important and constitute a coherent work. Below are some comments how the thesis could be improved.

Comments:

The text (especially in the beginning) has a nice flavor of ChatGPT, for example: in the introduction «The thesis commences with HSFM-ΣNN», «CovarianceNet Postnikov et al. [2021] pioneers», «Gamayunov et al. [2023] introduces an innovative term», «This Ph.D. thesis transcends disciplinary boundaries, promising safer roads and adept robot navigation». This is easily detectable, and it is not typical to academic thesis ('pioneers', 'trascends'). Nothing bad, but small after-editing or better prompt will be helpful. The word 'delve' (beginning of Chapter 5) is a characteristic of ChatGPT that is now classical.

The wording is one problem, but it is also leads to some parts that could be rewritten. Lets look at the 'objective and questions part'. I suspect it is also generated, so some of the objectives and questions make very little sense. For example, the objective 'Handling local minima in Trajectory optimization' and Question 'What innovative approaches can handle..' Is clearly generated from the corresponding part of the thesis. The objective 5 'Seamless Human-Robot interaction' is not connected to any other part. I also did not find any chapters that could be related to this topic. The question about 'local minima' is also not described well, given in the questions, not addressed in the text. Seems to be an artifact of generation and could be safely removed. In is mentioned that it is a term related to subgoal generation (Section 8.2.3), but why it is related to local minima? Objective 1 is ok, but it should be preceded by a problem: current algorithms are not enough… (accuracy of the current ones, why we need higher), and so on. To my opinion, the motivation for the research is an open problem and inadequacy of the todays state of the art.

Some of the chapters are short, like Chapter 3. It seems, the result of Chapter 3 can be incorporated into Chapter 4, although I am not sure 100%

The results of Chapter 4 and approach are very interesting.

Chapter 5: You model output distribution is a mixture of Gaussians, and it is known that it is difficult to train. Did you encounter such difficulties?

Chapter 8: How the additional term is related to local minima?
Provisional Recommendation
I recommend that the candidate should defend the thesis by means of a formal thesis defense
I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report
The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense