How to control autonomous taxi fleets?

**Keywords:** Traffic modelling and simulation, predictive assignment, rebalancing, reinforcement learning

**Background:** Transportation of people is an important part of today's society and there is a high demand for travel. The customer wants the travel journey to be convenient (travel time and price) and environmental friendly.

The problem we are facing is how we can improve the way people travel, both in an energy efficiency aspect as well as from a convenience aspect. Autonomous vehicles can be used to create new and coordinated mobility services, i.e., optimal ride sharing.

But how energy efficient and convenient is an autonomous taxi fleet? A good estimation of the impact of the autonomous taxi fleet can be done by simulation. In this project we create a combined analytic and simulation-based platform to answer the above question.

**Research question:** which factors influence Predictive Efficiency's fuel saving potential, and how?

**Project Description:** This project consists of two parts. The first part is about traffic modelling and simulation. Here we first create a traffic scenario to mimic the behaviour of a fleet. This will be done by the duality of mathematical abstraction as well as with high fidelity simulator, such as MATSim. We will simulate a city, for example San Francisco, where the taxi fleet will be operating in.

The second part is the optimization/controlling of the taxi fleet. Controlling an autonomous taxi fleet can be divided into 3 parts: routing, dispatching and rebalancing. In this project the focus is on the dispatching and rebalancing part. The goal is to find the optimal dispatching and rebalancing algorithm that minimizes the energy consumption in a predictive manner. We would like to predict the demand in different areas of the city and optimize the dispatching and rebalancing for a time horizon.

Throughout the project, documentation and communication of the process in a well understood manner is a must.

**Prerequisites:** Good knowledge in dynamic modelling, some control, optimization, model predictive control, data science and statistics, experience with programming and data analysis in Python/MATLAB.

**Contact and application**

Application deadline: asap (we continuously evaluate applications) but not later than January 15th 2021.

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