

Unreliability in Ridesharing On-Demand Mobility Systems

MSc. Project Proposal at the Autonomous Multi-Robots Lab, Cognitive Robotics, in cooperation with the Smart Public Transport Lab, TU Delft.

The emergence of on-demand mobility systems, that coordinate users with vehicles using apps, have had a huge impact worldwide. So far, most of these systems work as taxis, carrying only one person per trip. Nevertheless, pooled systems in which different requests can share a vehicle if their origins and destinations can be efficiently matched are expected to arise, as they would make a better use of the vehicles and public space, reducing costs, congestion and pollution.

These shared on-demand systems present some novelties in comparison with any other previous transport system. A very relevant one is related with the reliability offered by the system, as the duration of the trips now depend on the passengers that you are matched with, affecting the expected time before requesting a trip, and also allowing for changes if the vehicle is re-routed once you are traveling in it.

Algorithms that match requests and that assign them to vehicles are complex, as the number of potential groups of requests can be extremely large. The students are expected to understand, apply and possibly modify existing algorithms to study emerging topics that deal with unreliability in on-demand shared systems. The objective of the thesis would be to obtain a better understanding of this issue, providing a detailed description of the different new sources of unreliability, explaining how do they affect to users and to the supply, measuring them over current models, and updating existing algorithms in order to reduce the uncertainty for the users in efficient ways.



Desired qualities

- Motivated and independent
- Good programming skills
- Interested in applying optimization techniques to transportation problems

For further questions or to apply, please contact Dr. A. Fielbaum (A.S.FielbaumSchnitzler@tudelft.nl), Asst. Prof. Dr. J. Alonso-Mora (j.alonsomora@tudelft.nl), Dr. Rafal Kucharski (r.m.kucharski@tudelft.nl) or Assoc. Prof. Dr. Oded Cats (o.cats@tudelft.nl). When applying, please provide a short motivation, up to date CV, a transcript of your current degree program and intended start date.

Group information: www.autonomousrobots.nl, <http://smartptlab.tudelft.nl/>

References:

- [1] Alonso-Mora, J., Samaranayake, S., Wallar, A., Frazzoli, E., & Rus, D. (2017). On-demand high-capacity ride-sharing via dynamic trip-vehicle assignment. *Proceedings of the National Academy of Sciences*, 114(3), 462-467.
- [2] Cats, O., & Gkioulou, Z. (2017). Modeling the impacts of public transport reliability and travel information on passengers' waiting-time uncertainty. *EURO Journal on Transportation and Logistics*, 6(3), 247-270.