

Master Thesis Topic

Mode choice modeling to and from Munich Airport: case study on Urban Air Mobility

Background

Urban Air Mobility (UAM) is a recent concept aiming to improve accessibility to and from traffic hotspots in and around the metropolitan area of Munich. Prior to the introduction of UAM, a thorough analysis of the demand should be conducted, to quantify the potential of this novel transportation mode as well as its ability to compete with other existing modes of transport system.

In the framework of the project “AMI-AirShuttle”, the Chair of Transportations Systems Engineering (TSE) and its partners are analyzing and evaluating the necessary requirements and solutions for the integration of electric vertical take-off and landing aircraft (eVTOL) into the infrastructure of commercial airports, focusing on the airport of Munich. The partners are aiming for a seamless travel chain in which eVTOL shuttles are involved in, while at the same time catering to user requirements and public acceptance.

The goal of this master thesis would be to explore the transportation mode preferences of travelers between traffic hotspots in Bavaria (or in the metropolitan area of Munich) and the airport of Munich. The student will possibly be involved in all steps, from designing a survey, to collecting and analyzing data and finally, developing mode choice models.

Methodology

To survey the preferences of travelers, multiple factors such as the travel cost, travel time, safety, comfort, number of transfers, waiting time, availability, etc. of eVTOL vehicles and conventional modes of transport should be considered. The prospective student is expected to:

- Design a stated preference survey (focusing on relevant target groups)
- Disseminate the survey through multiple channels (websites, social media, flyers, etc.) and collect responses
- Analyze the collected data and present interesting insights
- Develop mode choice models

During data analysis and model development, the master student can investigate several research questions and apply innovative methodologies. In particular, the AMI-AirShuttle project aims to explore new methods in discrete choice model development, such as artificial neural networks, decision trees and cluster analysis, and to compare them to established multinomial logit models.

Results

This master thesis will result in a mode choice model including conventional modes of transport and urban air mobility. Then, the mode choice models will be integrated into an existing agent-based transport simulation model of Munich and/or Upper Bavaria to determine the future behavior of the travelers.

Expected key skills

1. Fluency in English, good communication skills in German will be highly appreciated.
2. Willingness to collect data and work independently over a period of 6 months.

3. Completed the course “Discrete Choice Methods for Transportation Systems Analysis” at TUM or similar.
4. Previous experiences with discrete choice modeling tools such as Biogeme, Apollo (in R) or similar.

Preliminary work

Fu, M., Rothfeld, R., & Antoniou, C. (2019). Exploring Preferences for Transportation Modes in an Urban Air Mobility Environment: Munich Case Study. *Transportation Research Record: Journal of the Transportation Research Board*, 2673(10), 427-442.

Ploetner, K. O., Al Haddad, C., Antoniou, C., Frank, F., Fu, M., Kabel, S., Llorca, C., Moeckel, R., Moreno, A. T., Pukhova, A., Rothfeld, R., Shamiyeh, M., Straubinger, A., Wagner, H., & Zhang, Q. (2020). Long-term application potential of urban air mobility complementing public transport: An upper Bavaria example. *CEAS Aeronautical Journal*, 11(4), 991–1007.

Al Haddad, C., Chaniotakis, M., Straubinger, A., Plötner, K., & Antoniou, C. (2020). Factors affecting the adoption and use of urban air mobility. *Transportation Research Part A Policy and Practice*, 132, 696-712.

For more information about AMI-AirShuttle, please check:

<https://www.mos.ed.tum.de/en/vvs/research/projects/ami-airshuttle/>

Starting date

From September 2022

How to apply:

Interested applicants should contact Filippos Adamidis (filippos.adamidis@tum.de) and Hao Wu (wu.hao@tum.de) by sending an email including your resume, a short explanation (max. 100 words) of why you are interested in this thesis topic and your starting date.