

Master Thesis:

Modelling pre-tactical ATFM-decision processes with Machine Learning/Deep Learning approaches

Task Description:

The rapid increase of European air traffic in recent decades (pre-Covid-19) has pushed airspace capacity to its limits. Air Traffic Flow Management (ATFM) in Europe aims to balance limited capacities with growing demand. One of the main constraining factors in this process are existing uncertainties in current prediction logics on a pre-tactical level. These lead to necessary capacity buffers, which result in reduced network efficiency. As increasing air traffic demand rates can be assumed in a post-Covid era, this will become a pressuring issue again in the long term.

In this work, Machine Learning/Deep Learning methods should be used to model the pre-tactical ATFM-decision processes based on flight plan data in order to predict Operational Flight Plan trajectories (OFP). For this purpose, the trajectories should first be parameterised and clustered in order to use them in the model training process. For validation, the model should be compared to the currently used PREDICT logic at Eurocontrol. Initial Flight Plan data as well as flight plan trajectories are provided by the Institute. The improved flight plan predictions should allow a more accurate prediction of planned airspace demand and reduce uncertainties.

The following tasks should be worked on:

- Familiarisation with the topic of Air Traffic Flow Management in Europe
- Familiarisation with the subject and background research on the topic of Machine Learning/Deep Learning
- Data-interfacing for relevant data sources
- Discretization of flight plan trajectories through clustering
- Implementation of Machine Learning/Deep Learning approaches for modelling ATFM-decisions
- Prediction of Operational Flight Plan trajectories within large datasets of European air traffic
- Discussion and documentation

Requirements:

- Studies in Engineering, Data Science, Computer Science, etc.
- Motivation and ability to work independently and collaboratively
- Good programming skills (preferably Python)
- Preferably experience with Machine Learning Frameworks (e.g. Scikit-Learn, Keras, Tensorflow or Pytorch)
- Accurate and reliable working style

Begin and duration:

From now on, for approximately 6 months

Contact:

Manuel Derra

✉ manuel.derra@dlr.de
☎ +49 40 2489641 221
📍 Raum 3.07

Institut für Lufttransportsysteme

Deutsches Zentrum für Luft- und Raumfahrt
Blohmstraße 20
21079 Hamburg