



Technical workflows for AI research: skills, challenges and future developments – Use case Air Transport Modelling

Centre for Air Traffic Management Research

The Team and Core Areas

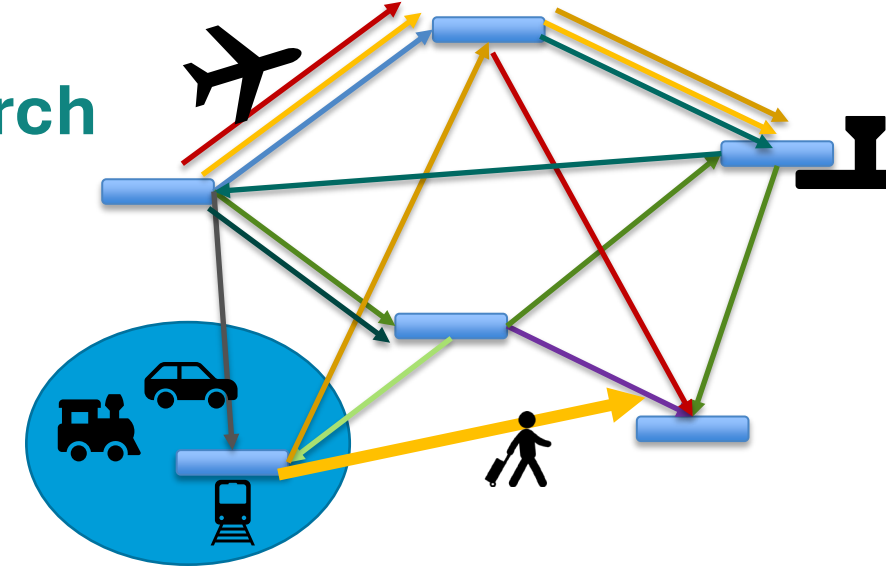
Centre for Air Traffic Management (ATM) Research

- **Members**

- Andrew Cook (PROF), Luis Delgado (PRF)
- Gérald Gurtner (PRF), Graham Tanner, Tatjana Bolić (SRF)
- Majid Soolaki, Michal Weiszer (RF)
- <https://blog.westminster.ac.uk/atm-team/>

- **Specialisms of our Centre** (no implied order)

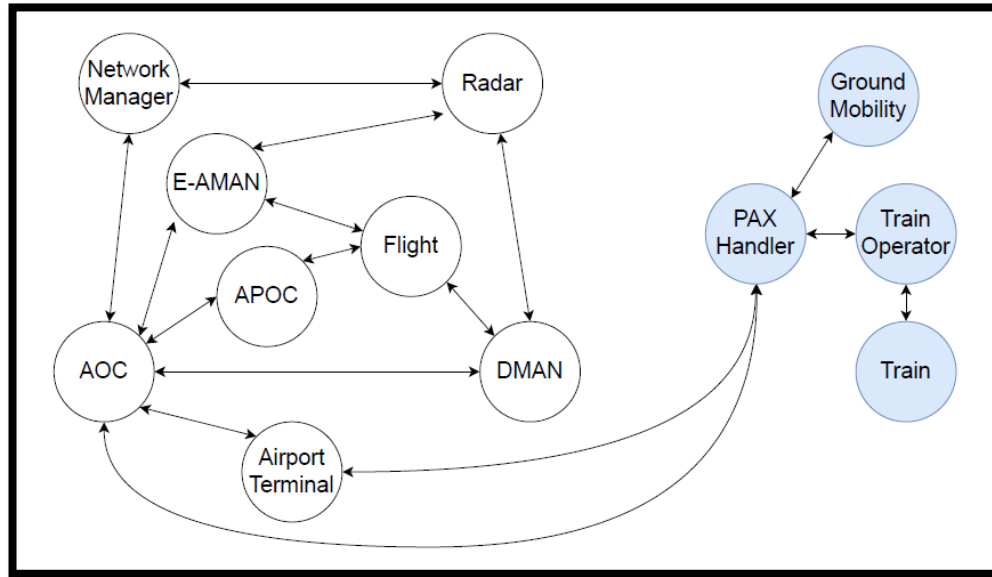
- performance assessment (from fundamental to industrial)
- economic analysis (incl. behavioural economics & conjoint)
- modelling and simulation (incl. ABM, ML, metamodeling)
- pax centricity, mobility, multimodality (SESAR award)
- flight dynamics; flight prioritisation
- data management



AI applications to ATM research

Modelling of the transport network

- Model-based simulation



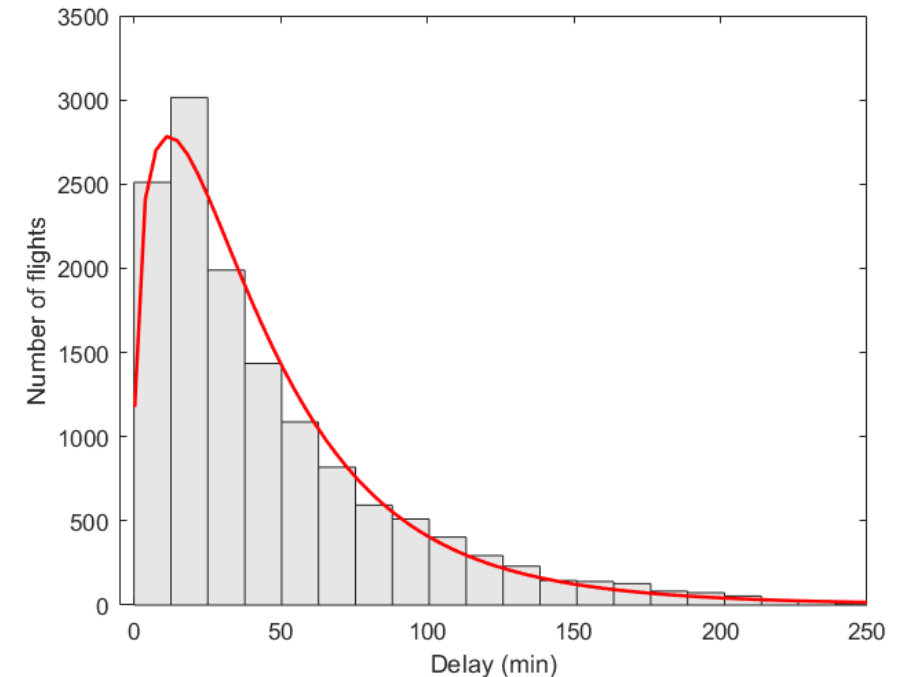
- Open-source
- Low-level modelling of passengers and services
- Connectivity
- Disruption and disturbances modelling
- Multimodal (and monomodal) mechanisms evaluation

KPA	Focus Area	KPI	KPI Definition
Capacity	Airspace Capacity	CAP1	TMA throughput in challenging airspace per unit time

Cost-Efficiency

Operational Efficiency

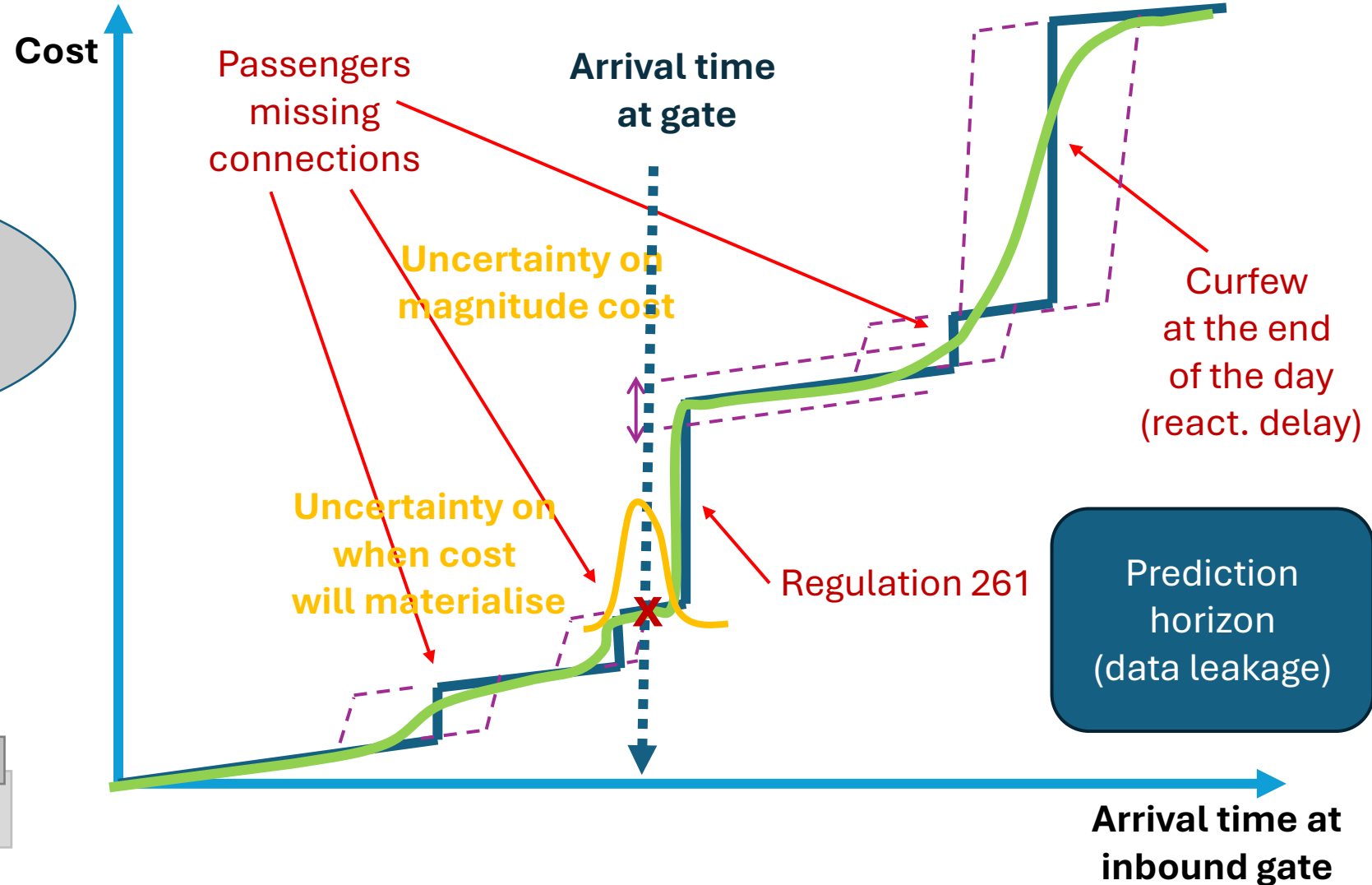
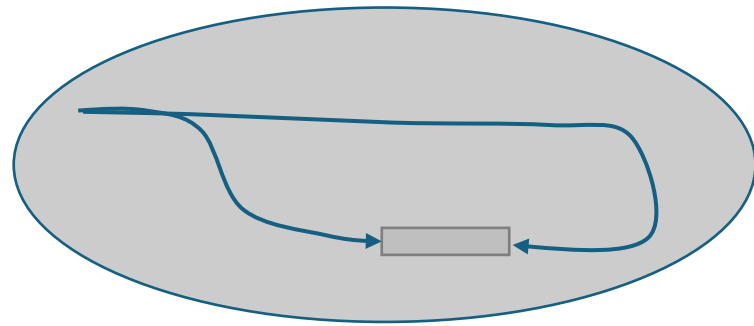
Safety



AI applications to ATM research

Capturing uncertainty

- Modelling expected cost of delay



Uncertainty
characterisation

Features
analysis

Operational
uncertainty

AI applications to ATM research

Data aspects

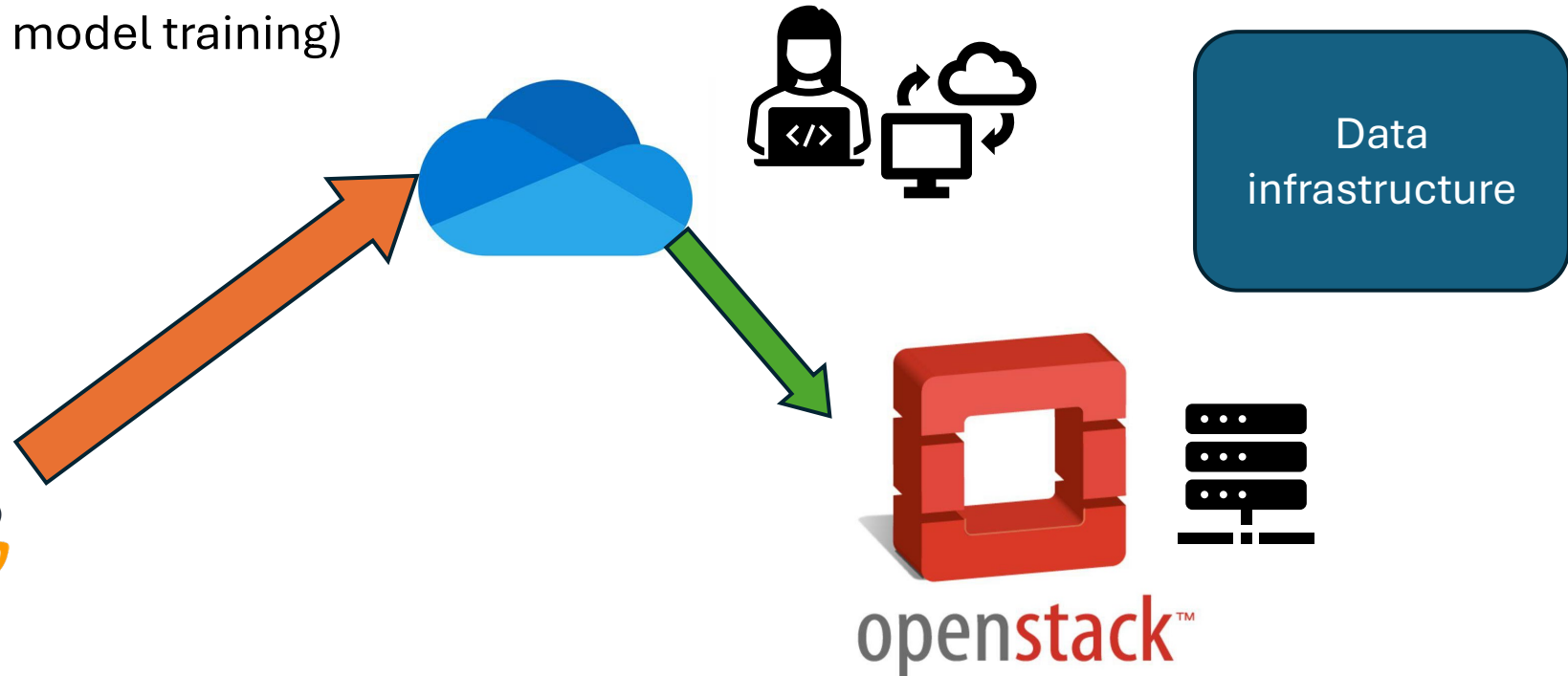
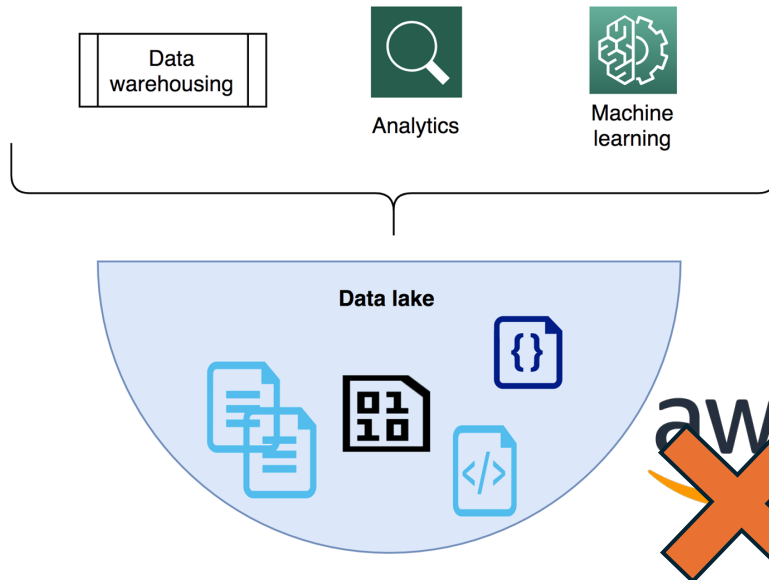
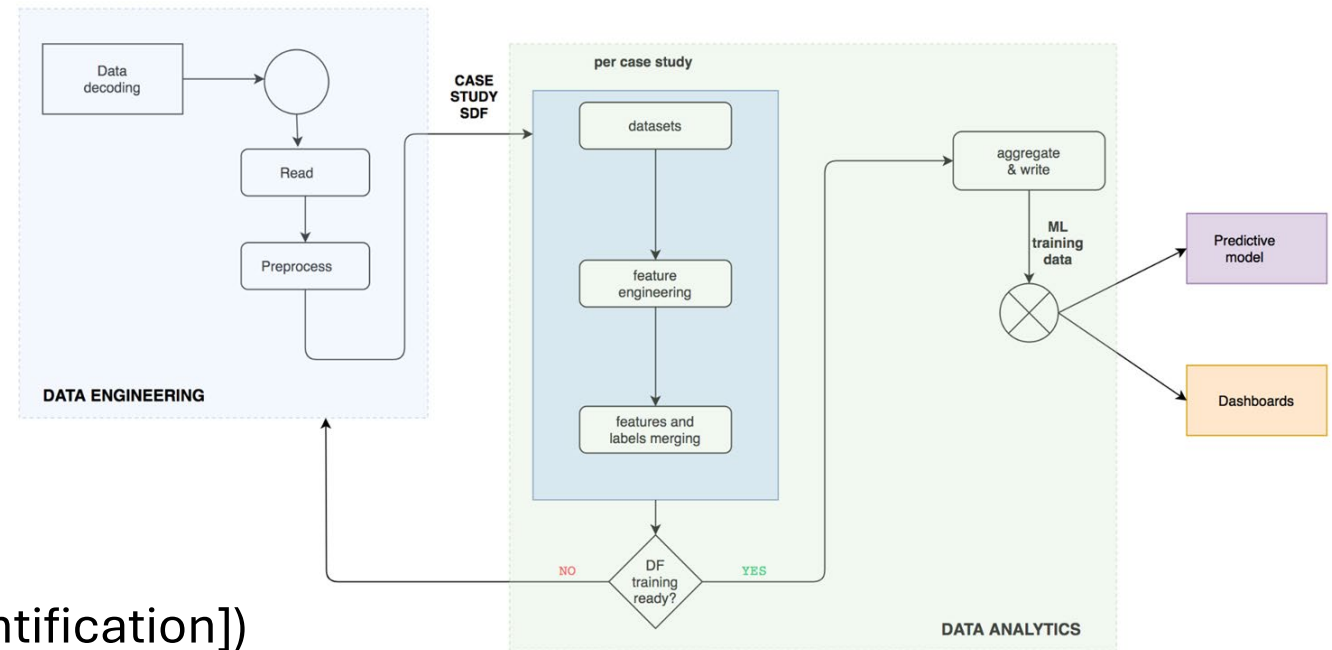


- **Data governance**

- Data protection agreement

- **Roles**

- Data engineer (data preparation [de-identification])
- Data scientist (features and model training)

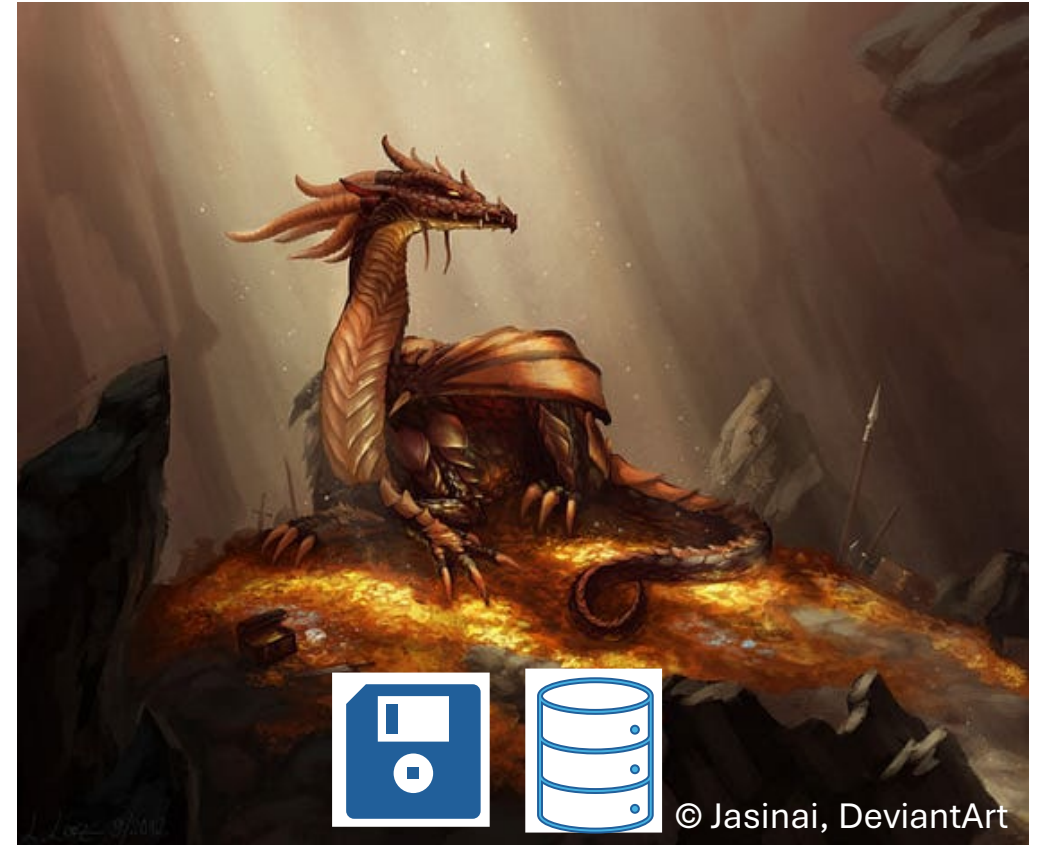


AI applications to ATM research

Data aspects

- **Data silos**

- Air traffic
- Flight schedules
- Flight plans
- Passenger flows
- Rail timetable
- Aircraft performance models
- Weather data
- ...



AI applications to ATM research

Data aspects



SynthAir

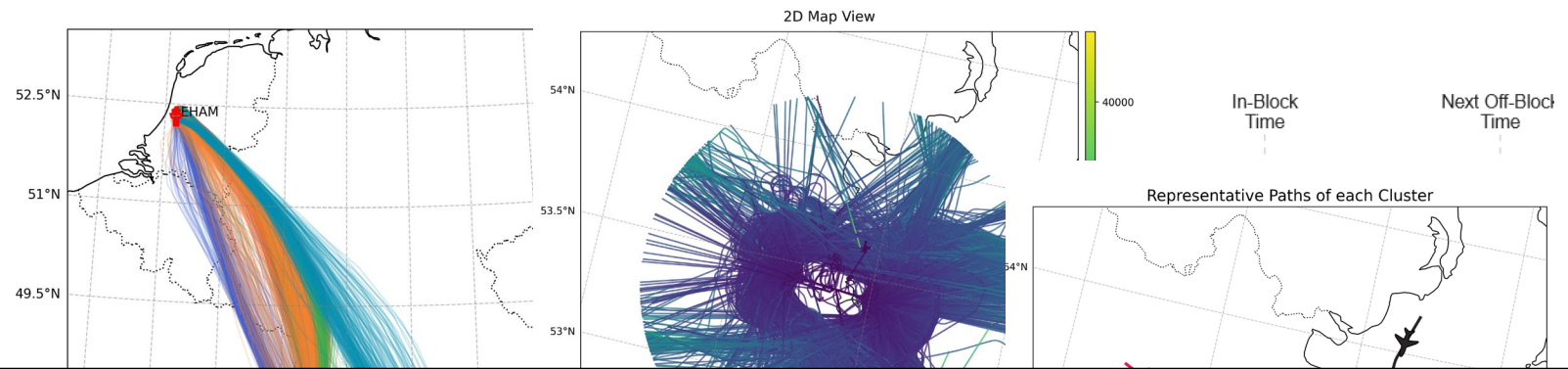


<https://synthair.github.io/>

- **Data silos**

- Air traffic
- Flight schedules
- Flight plans
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- Weather data
- ...

9 generative models validated across 6 operational use cases



- ✈️ **Develop AI systems** without accessing sensitive operational data
- 🔒 **Preserve competitive advantages** while enabling collaborative research
- 🎯 **Test rare scenarios** safely through synthetic event generation
- 📊 **Share standardized datasets** across organizations and borders
- 🚀 **Accelerate research** through publicly available synthetic datasets
- 🌍 **Scale solutions globally** via transfer learning capabilities

AI applications to ATM research

Challenges

- 1. Strong focus on data analysis: characterisation, clustering, fitting, etc.
- 2. Need of distribution not only expected average value
- 3. Prediction horizon, historical data availability and data leakage
- 4. Data accessibility, management and infrastructure