DETECTING CONTROLLERS’ ACTIONS
on past ADS-B data

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Joint work with ATC/pilot training centre @ENAC

Simulations of a gate-to-gate flight for pilot trainees require a high number of specialised ATC → need for automation in producing a realist context

Simulations for ATC trainees: hints “your peers would usually…”

ML looks appropriate: imitation vs. optimization (realism); no need for early certification (simulators/training)

So show me the dataset!
One year of ADS-B data (2017) of flights between three city-pairs:

- LFPO → LFBO (28 callsigns, 3536 trajectories);
- LFPG → EDDF (8 callsigns, 2105 trajectories);
- EHAM → LEMD (4 callsigns, 977 trajectories)

Source: OpenSky Network

Context:

- METAR, satellite images;
- DDR m1/m3 records;
- regulation history

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MULTI-KERNEL ANOMALY DETECTION

- Linear combination of Kernel Methods
- Performs well with discrete and continuous data
- State of the art in anomaly detection
- Many publications by NASA with open datasets
Autoencoders are an unsupervised learning method aiming at minimizing the difference between the input and the output (the reconstruction error).
DISTRIBUTION OF THE RECONSTRUCTION ERROR

Number of samples

Reconstruction error

AFR61UJ, Jun 14
AFR27GH, Jul 16
AFR51ZU, Jun 28

EZY24EH, Aug 27
AFR47FW, Jul 19
FLIGHTS WITH HIGHER RECONSTRUCTION ERROR...

- AFR47FW, Jul 19 (0.0876)
- EZY24EH, Aug 27 (0.0857)
- AFR51ZU, Jun 28 (0.0362)
Vigilance météo

- **Vigilance absolue**
- **Soyez très vigilant**
- **Soyez attentif**
- **Pas de vigilance**

**Forte activité orageuse sur l’Occitanie et le Massif central, se déplaçant en soirée sur la Bourgogne puis la Champagne, en perdant en intensité.**

**Validité : jusqu’au mercredi 28 juin à 16h**

Source : Météo France
AVOIDING REGULATIONS
A good method for detecting controllers’ action in data, with many applications (safety analysis, simulation, etc.), based on the analysis of the reconstruction error of an autoencoder network.

Data is available on request for academics: https://opensky-network.org/impala-guide

Source code for the ML model available here: https://tinyurl.com/atc-detect

though the biggest part of the work lies in context analysis