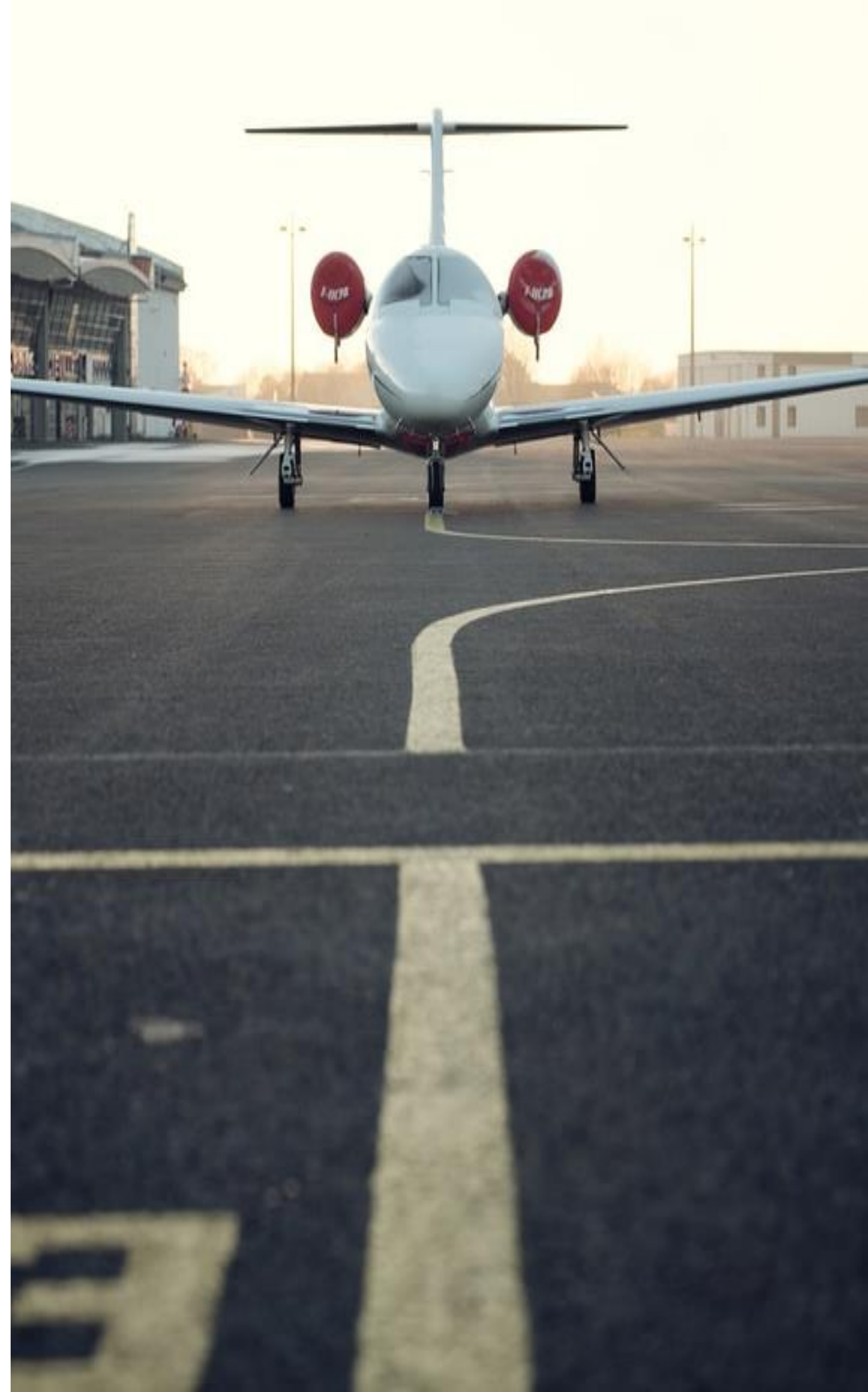
Supercase 2

Taxi-time prediction

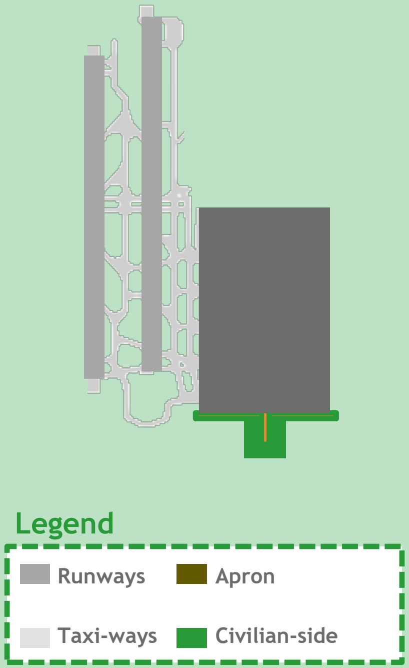
To the attention of Data Science for Business' master students

September 29th, 2020

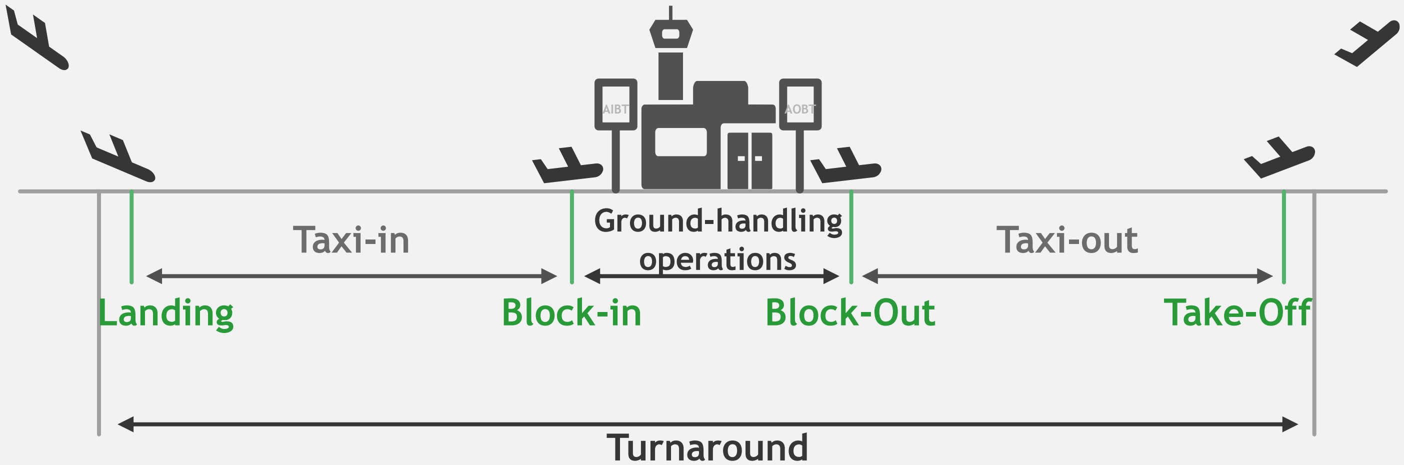


Take-off time (TOT) prediction – Airport overview

Airport overview



Turnaround process breakdown



TAXI-TIME PREDICTION CAN IMPROVE AIRPORT AND AIRLINES OPERATIONS AND REVENUES AS WELL AS REDUCE OVERALL GHG EMISSIONS

Take-off time (TOT) prediction – Use case description

TOT Prediction

Taxi-time definition

The taxi-time is the time an airplane spends "driving" on the ground:

- **Taxi-in** is the time window between the moment the airplane's wheels touch the ground i.e. the Actual Landing Time (ALDT) and the moment it arrives at its assigned dock i.e. Actual In-Block Time (AIBT)
- **Taxi-out** is the time window between the moment the airplane starts moving from its dock i.e. Actual Off-Block Time (AOBT) to the moment its wheels leave the ground i.e. Actual Take-Off Time (ATOT)

Use case description

- Provide an accurate Take-Off Time (ATOT) prediction based on an actual off-block time (AOBT) and an algorithm-based taxi-out time prediction considering factors such as airport configuration, AC type, weather…

Status quo

- Currently almost every airport around the world is using a moving average approach to predict TOT: the airport assumes that the taxi-out time for a given day will be equal to the average of taxi-outs during the past two months

Customer type & examples

- Airlines
- Ground handlers
- Airports

User

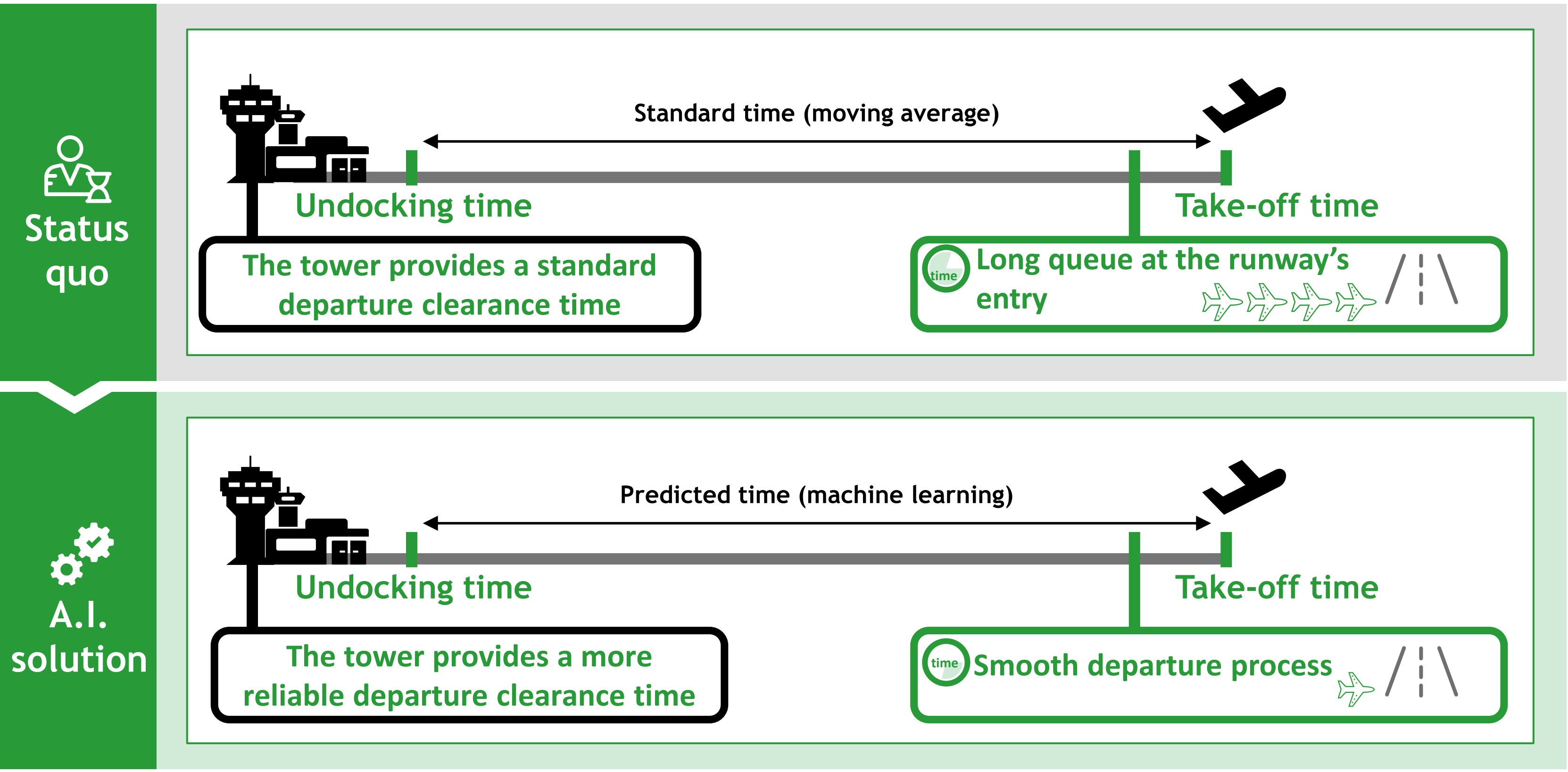
- Air Traffic Controllers
- Operation center

Key Expected Benefits

- Know more accurately when an aircraft will be airborne
- Reduce GHG emissions resulting from airplanes' idle time at the runway entrance
- Optimize ground movement and airport flow

Source: eleven research and analysis

Take-off time (TOT) prediction – Use case description



Awareness

Efficiency

Safety

Green

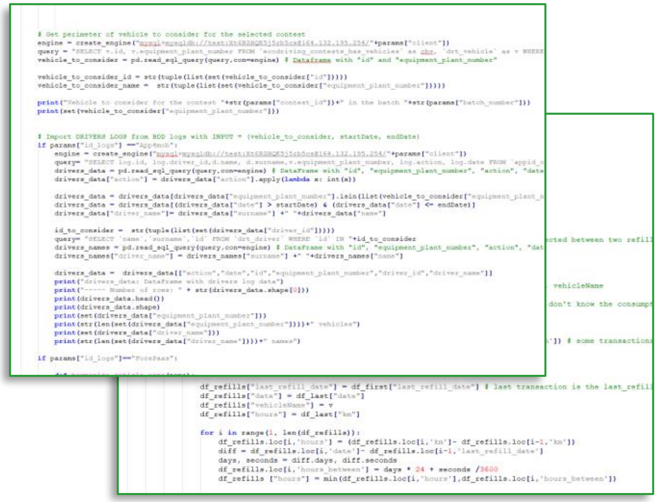
Expected output

- A PowerPoint presentation that should include at least the following:
  - ✓ A presentation of your models' results and how they compare to the status quo (the moving average)[1]
  - ✓ An explanation of the expected impact of your best model on ground operations at the airport
  - ✓ A final assessment of your models by using interpretability methods

- Your code which should include:
  - ✓ Your feature engineering code specifying how you modified your data and why (make sure to clearly comment your code to explain why you processed the data the way you chose to)
  - ✓ Your models' parametrization, training code and testing code

PRESENTATION

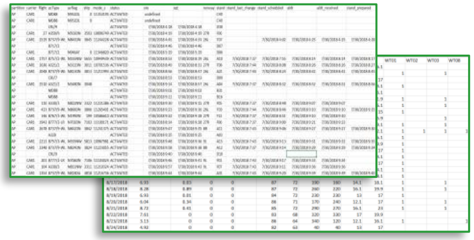
CODE



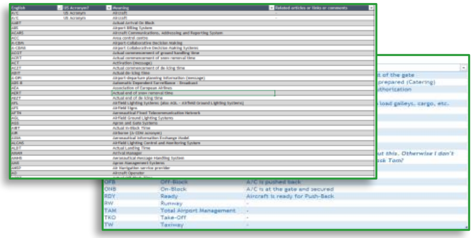
Provided input

- An airport terms glossary: Glossary > Glossary.xlsx
- Historical airport and weather data :
  - *Airport data:*
    - ❑ Data > Airport data > training_set_airport_data.csv
    - ❑ Data > Airport data geographic_data.csv
  - *Weather data:*
    - ❑ Data > Weather data > training_set_weather_data.csv
- Academic papers on the taxi-time prediction subject: Taxi time academic papers > Paper 1.pdf…Paper 6.pdf
- Aircraft (A/C) types' characteristics: AC characteristics > ACchar.xlsx
- A test set: Test set - this folder contains weather data, airport data and geographical data for your model testing

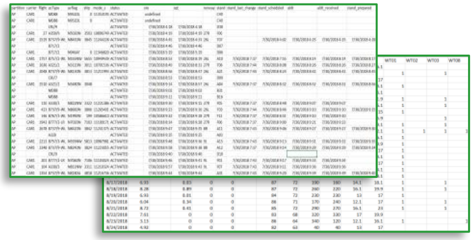
AIRPORT & WEATHER DATA



GLOSSARY

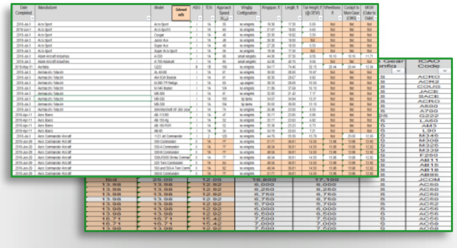


TEST SET



RESEARCH PAPERS

A/C TYPE CHARACTERISTICS



APPENDIX

Example of model performance comparison sheet

Chosen models' description and performance overview

		IBT Prediction		
	Rolling average	**Model 1**	**Model 2**	**...**
Key elements	▪ Average of the last 2 months of taxi-times	▪ Model details: ▪ Used features: ○ ... ○ ...	▪ Model details: ▪ Used features: ○ ... ○ ...	▪ Model details: ▪ Used features: ○ ... ○ ...
Results — Average error vs. real data	2.8 min	xx min	xx min	xx min
Results — First quartile max error	1.7 min	xx min	xx min	xx min
Results — Third quartile max error	3.9 min	xx min	xx min	xx min