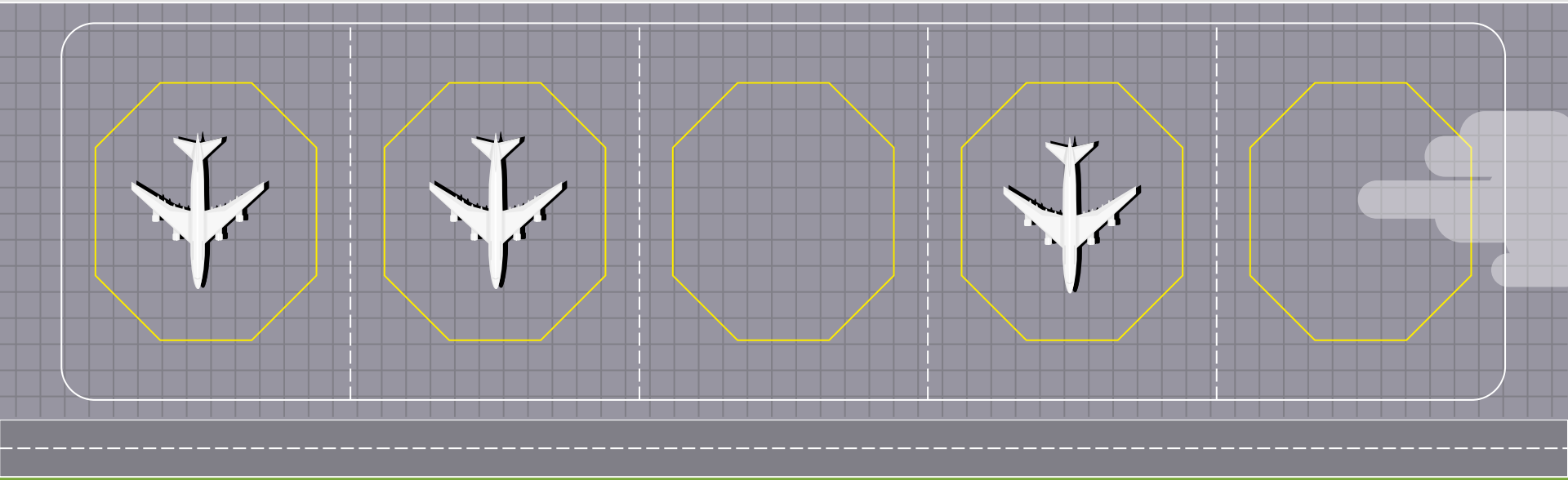
Airline Passenger Satisfaction

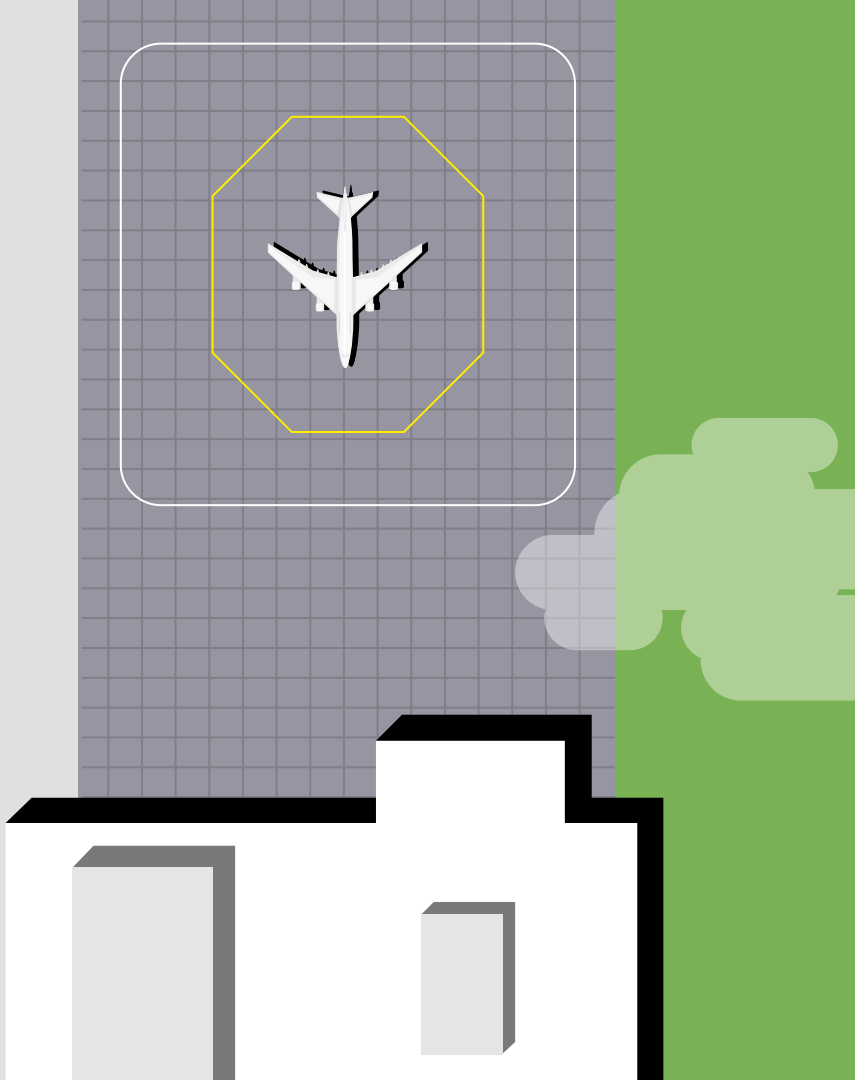
Big Data Computing, a.y. 2021/22, Michele Spina



01

A/D

What are the starting points and objectives of this project?



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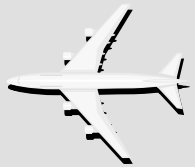


More than 100.000 rows and 23 columns

What do we know?

Customer information

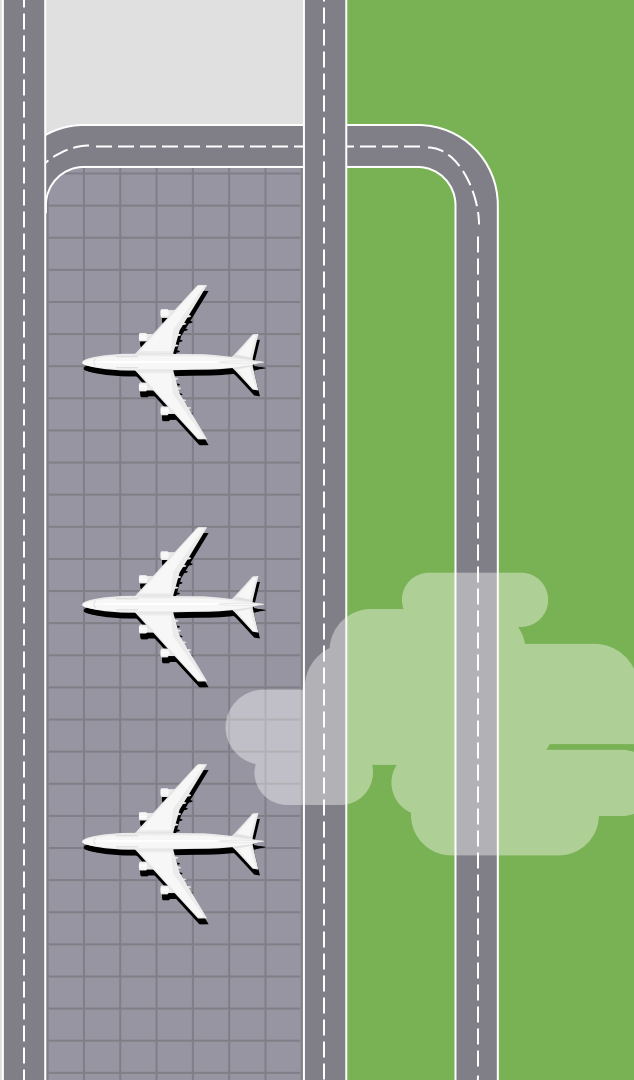
Age and gender of the passenger and reason of the travel

Flight data

Flight distance, class and delay

Satisfaction levels by category

Satisfaction level (0 to 5) of flight services, like food or cleanliness



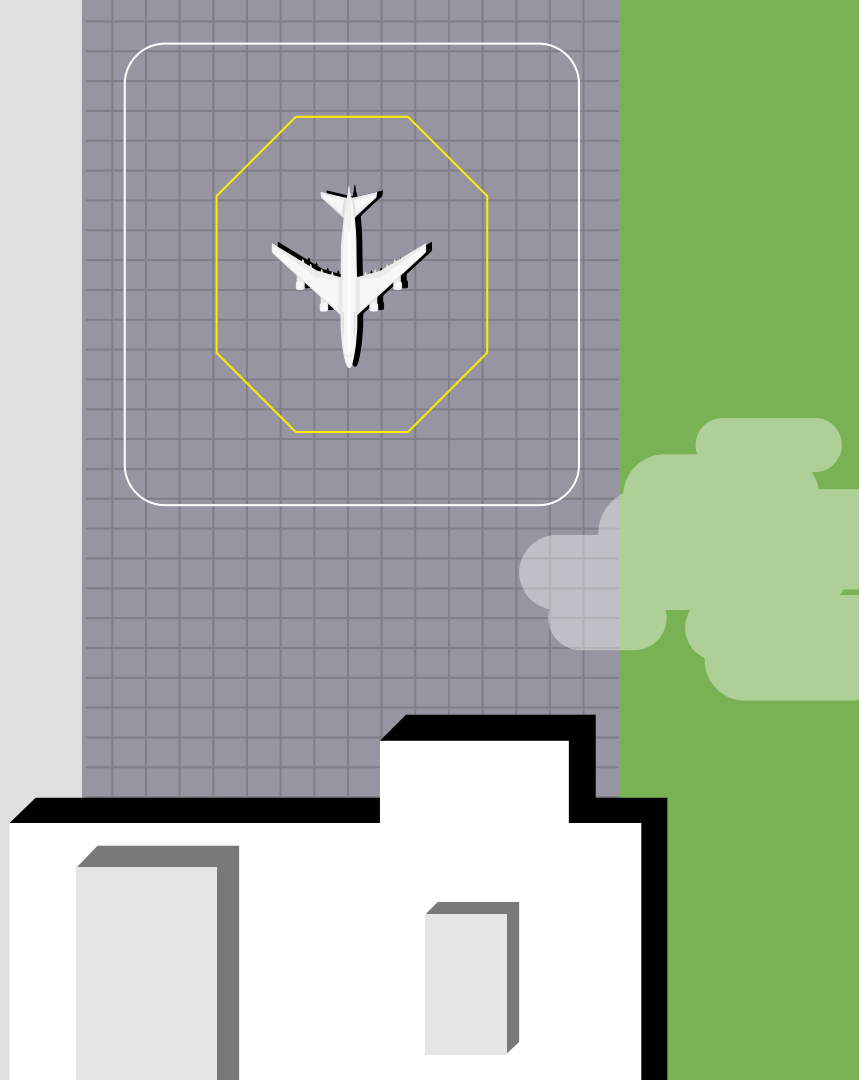
Arrival point

The goal of the project is to predict if a passenger it's satisfied or not

02

Pre-processing

Analyze the distribution and correlation of the data, and apply feature engineering



Pre-processing

A

Analyze dataset

Analyze data distribution and correlation

B

Drop columns

Drop useless or redundant columns

Data encoding

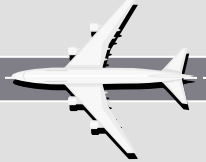
C

Convert categorical values to numerical values

Normalize

D

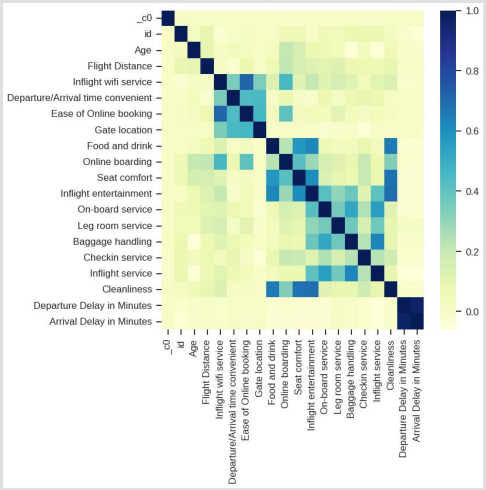
Normalize the data distribution



Analyze dataset

Data distribution

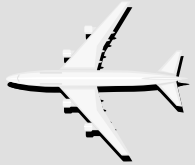
Data are not normally distributed



Correlation matrix

High correlation
arrival-departure delay

Data encoding pipeline



StringIndexer

it encodes string column of labels to a column of label indices

OneHotEncoder

it maps a categorical feature to a binary vector indicating the presence of a specific feature value

VectorAssembler

It combines a list of columns into a single vector column;

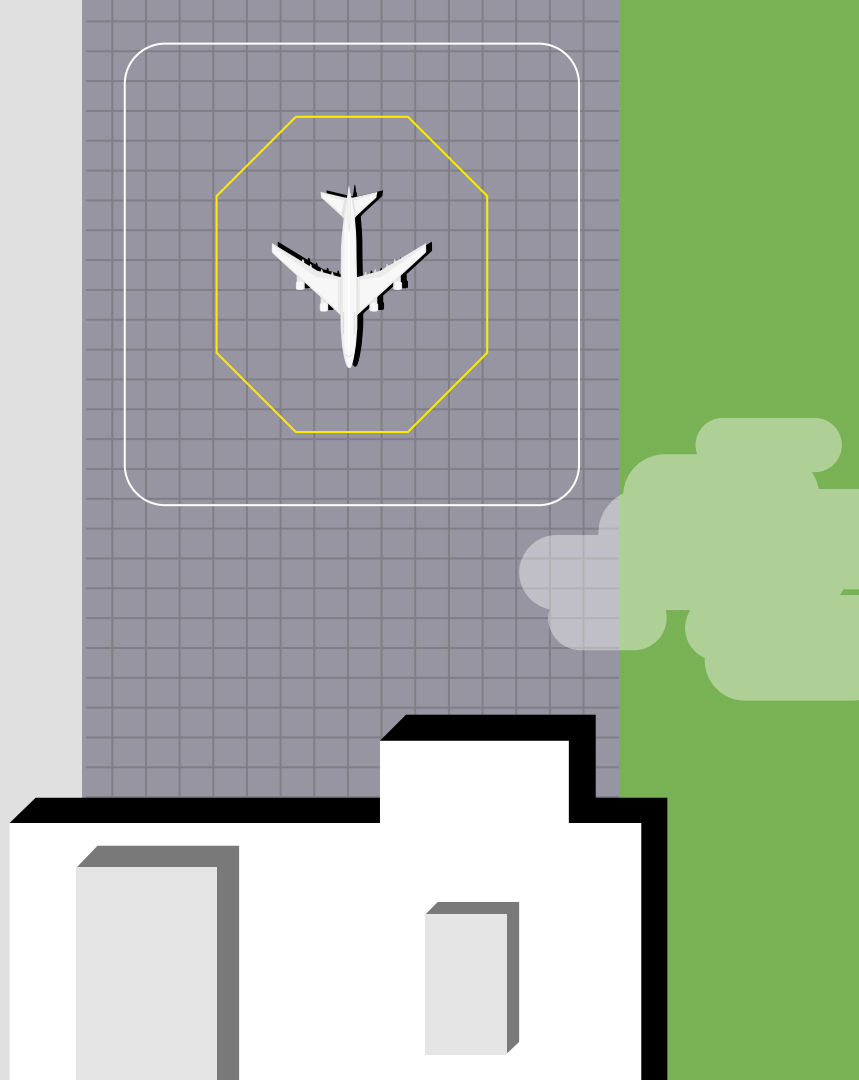
StandardScaler

it normalizes each feature to have unit standard deviation and/or zero mean;

03

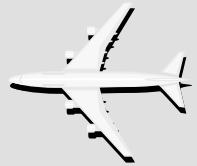
Classification models

Logistic Regression, Random Forest and Decision Tree



Classification models

Logistic Regression	Random Forest	Decision Tree
LR	RF	DT



LR results

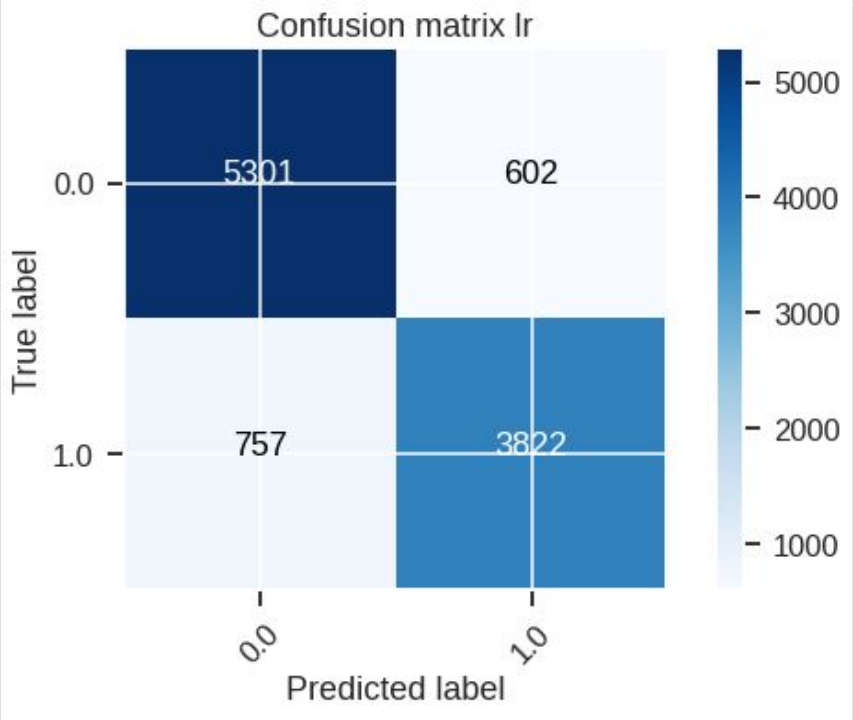
Precision metric: 0.869

Recall Metric: 0.866

Accuracy Metric: 0.870

F1-score Metric: 0.868

AUROC: 0.925



RF results

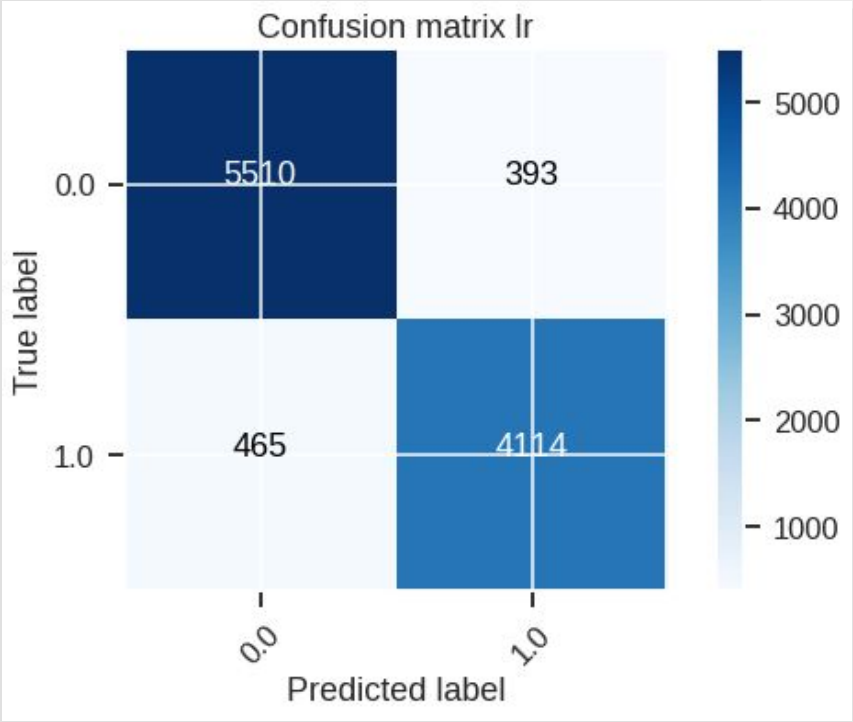
Precision metric: 0.917

Recall Metric: 0.916

Accuracy Metric: 0.918

F1-score Metric: 0.917

AUROC: 0.972



DT results

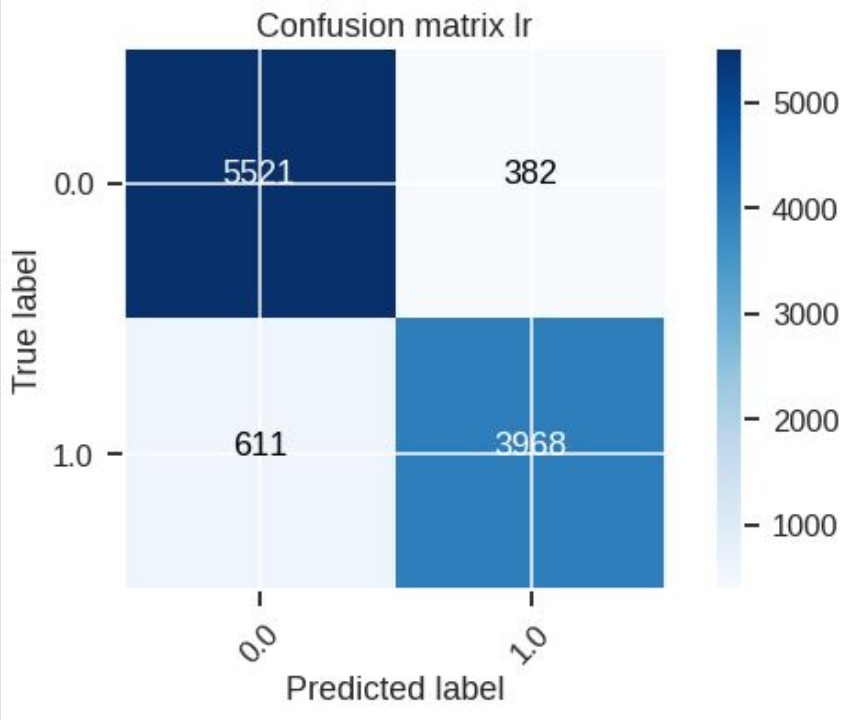
Precision metric: 0.906

Recall Metric: 0.901

Accuracy Metric: 0.905

F1-score Metric: 0.904

AUROC: 0.752



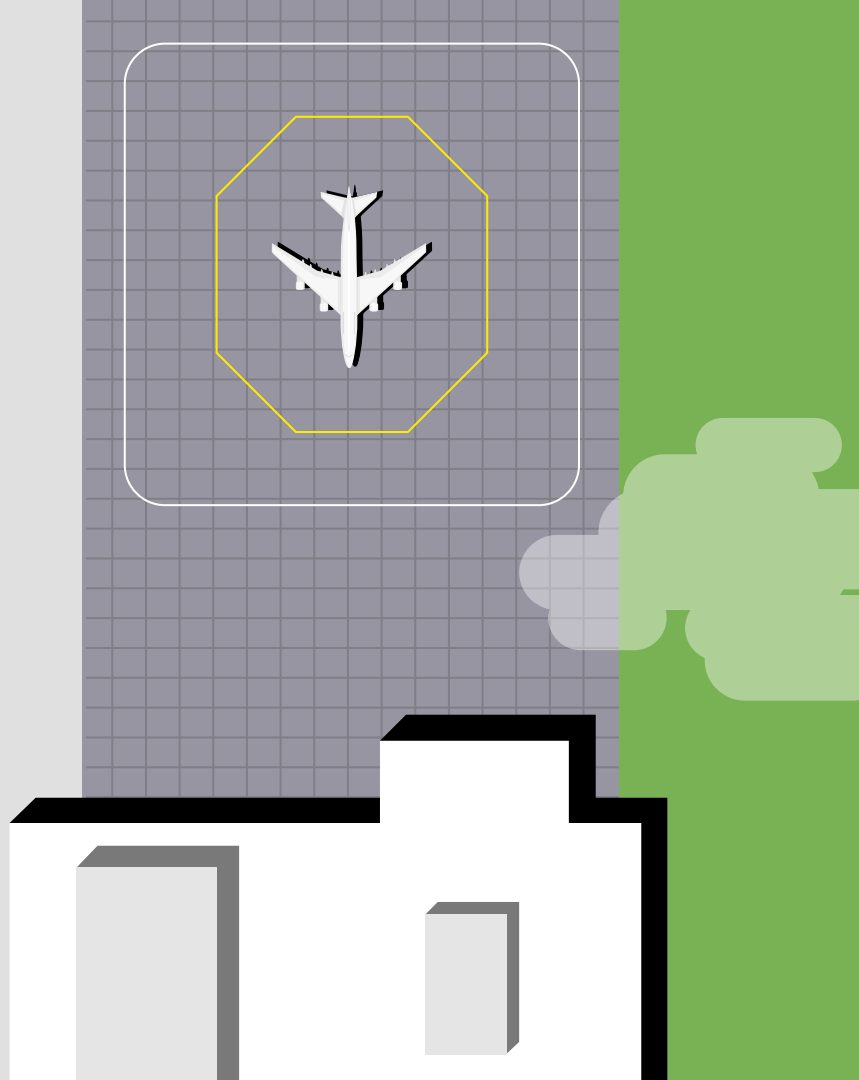
Models evaluation

	AUROC	Precision
Logistic Regression	0.925	0.869
Random Forest	0.972	0.917
Decision Tree	0.752	0.906

05

Tuning & K-fold

Tuning hyperparameter and apply k-fold validation



Tuning hyper-Parameter (AUROC)

Logistic Regression

lambda= 0 alfa=0
maxiter= 1000

0.927

Random Forest

maxDepth = 8
numTrees = 100

0.986

Decision Tree

maxDepth= 8
impurity= entropy

0.945

Precision evaluation

Logistic Regression

lambda= 0 alfa=0
maxiter= 1000

0.868

Random Forest

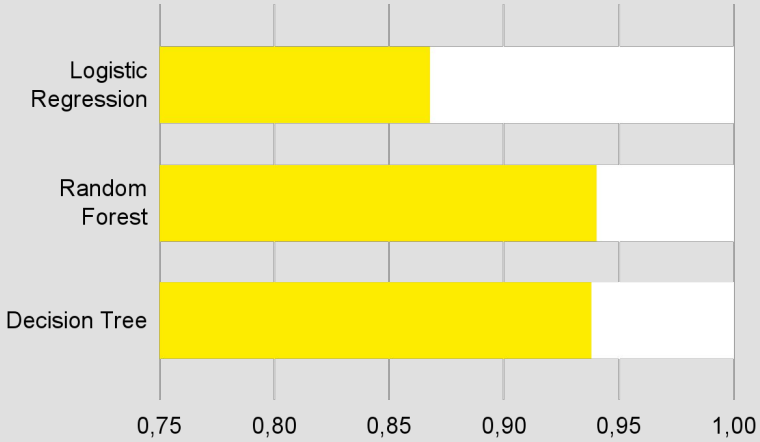
maxDepth = 8
numTrees = 100

0.940

Decision Tree

maxDepth= 8
impurity= entropy

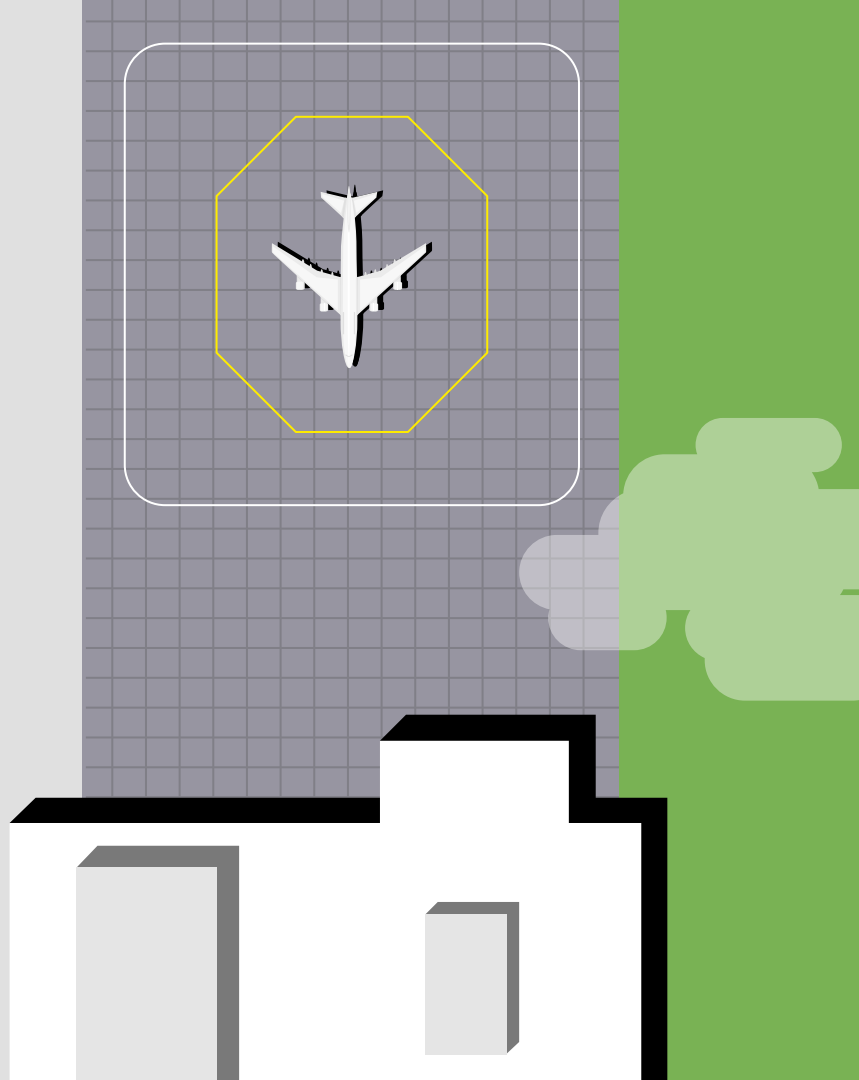
0.938

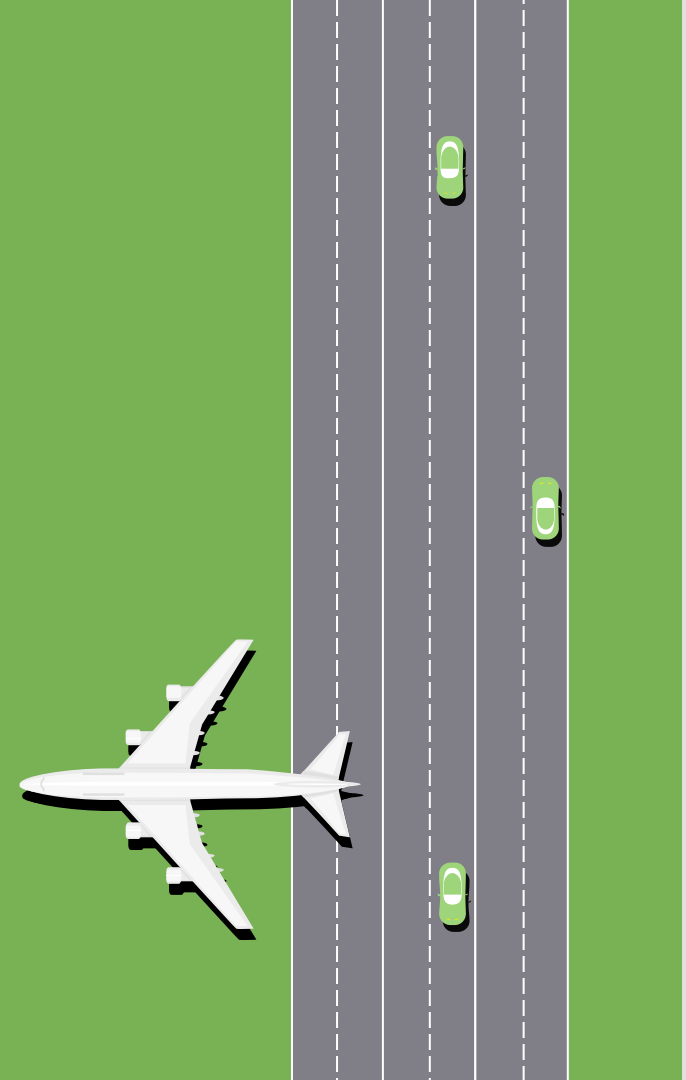


05

Conclusion

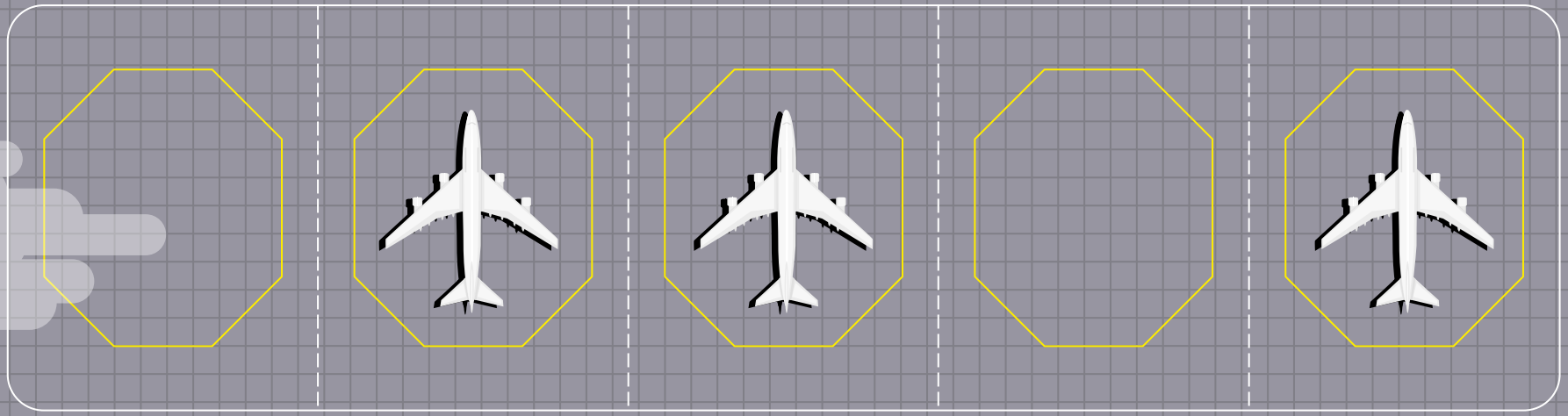
Conclusion and future works





Conclusions

- I trained 3 differents model and Random Forest result the best ono, and decision tree is the most improved by tuning
- The best results occurs for high number of iterations
  It's probably I initially occurs in underfitting
- Overcoming the limits of Google Colab it would be possible to perform the tuning with more interaction or trees or use more dense intervals to tune the parameters



Thanks

Does anyone have any questions?

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