eleven super case data challenge

To the attention of the master in Data Science & Business analytics' students

February 8th , 2021

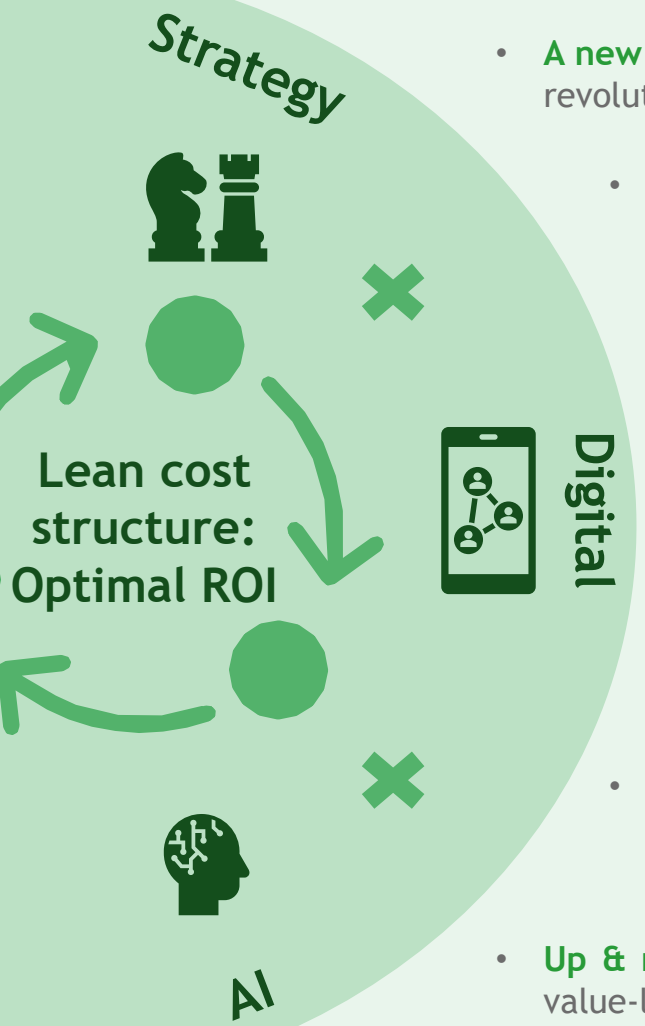
CentraleSupélec ESSEC BUSINESS SCHOOL

eleven strategy consultants
London • Paris • Madrid

AGENDA

1. About eleven
2. Case presentations
   a) Airplane Interior Service
   b) Aircrafts' take-off time prediction
3. Practical information
4. A few advice

eleven is Europe's first ever specialist strategy firm specifically founded to accompany clients' transformation through the data and digital revolution, thanks to a unique combination of strategy perspective, entrepreneurship approach and a strong proximity with data and digital ecosystem

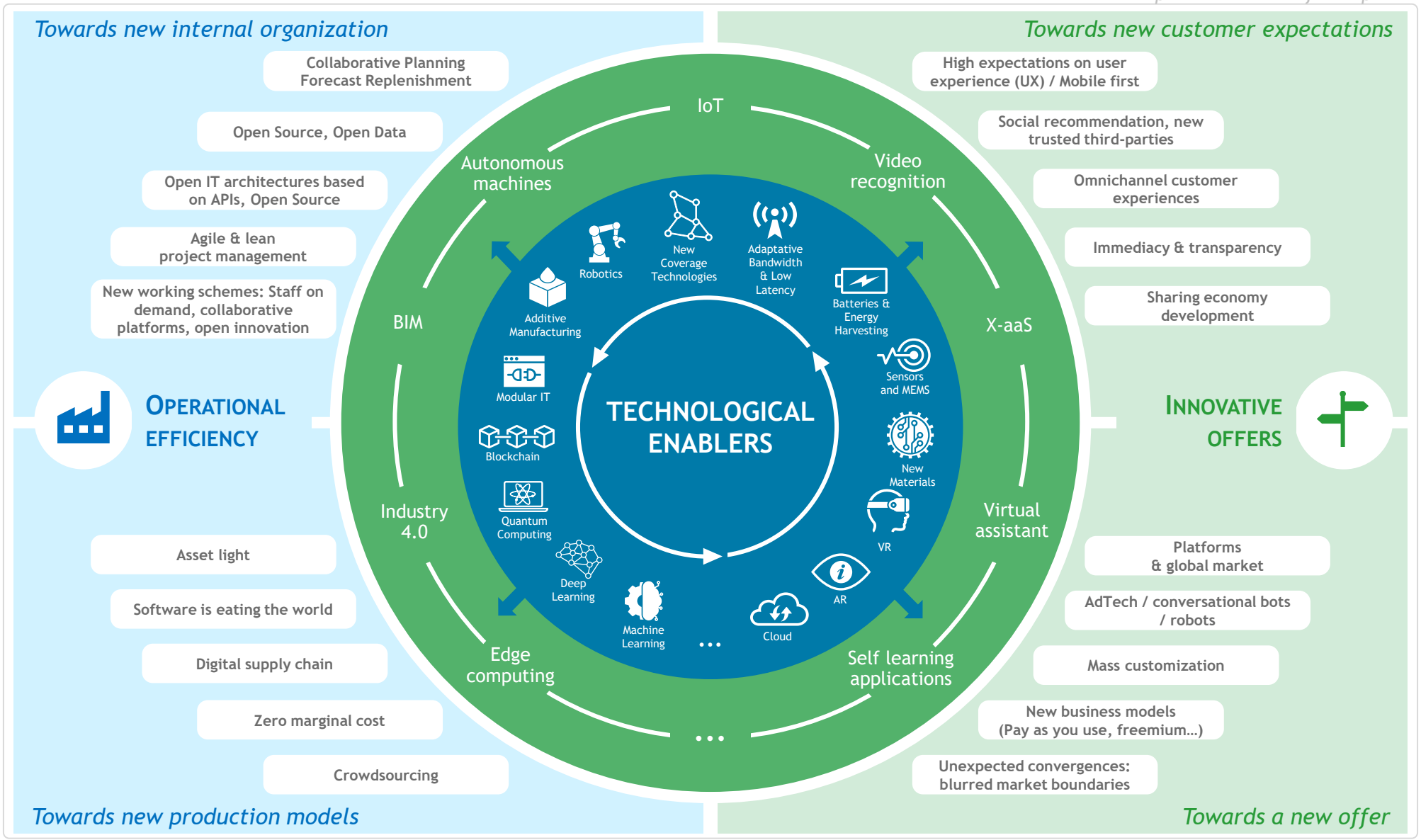


- **A new paradigm**: In today's world, immediately following and leveraging the ongoing digital revolution, the AI revolution is unlocking new, untapped value-creation opportunities
  - **Our unique positioning**: eleven has been founded to specifically address strategic challenges raised by both digital and data, supporting C-level executives and organizations from strategic ignition to project scale-up and industrialization
    - **A unique blend of skills**: As strategic issues around digital raised more and more data challenges, eleven's unique expertise lied in its capacity to blend strategic problem-solving skills with tech and data science ones, thanks to its 50+ consultants that master the continuously evolving technological enablers at stake
    - **Distinctive entrepreneurial mindset and business model**: Our deeply-rooted nimble and entrepreneurial culture, combined with a lean cost structure enables us to offer optimal and demonstrated ROI for our clients' projects
  - **CSR at the core of eleven's DNA**: Our approach enables our clients' projects to meet CSR expectations. Both financial and CSR impacts are tracked, proven and reported thanks to our mastering of digital and data levers
- **Up & ready for the new challenge**: We believe firms better equipped with data & digital value-levers are the best prepared to tackle the extended ongoing sanitary crisis era

Sources: eleven strategy

Our projects are built around ongoing major digital & data disruptions, including new modes of production, consumption and collaboration, which represent major challenges for existing players

eleven's 'plate tectonics' of disruptions



MEMS: Microelectromechanical systems

eleven addresses the entire spectrum of strategic topics around digitalization and disruption with its four core offers

1

THINK

STRATEGY

Build a strategic vision & associated actionable roadmap

2

MAKE

START-UP STUDIO

Accelerate the delivery of a strategic digital roadmap

"Excubate" the launch of disruptive offers & services

3

BUY

TRANSACTION STRATEGY

Conduct a strategic due diligence of target/portfolio company with a tech angle

4

DATA DRIVEN COMPANY

ELEVEN DATA FACTORY

Data Strategy

Agile Use Case Implementation

Industrialization

eleven serves top large cap clients and leading mid cap players across several key industries as well as leading International large cap and smid cap Private Equity funds

ELEVEN'S KEY REFERENCES

CORPORATE

CAC 40

VINCI, ENGIE, SNCF, SOCIETE GENERALE, AXA, LVMH, ACCOR, orange, TOTAL, ...

Mid Cap players

sanef, INDIGO, ALCATEL onetouch smart move., FONCIA, Club Med, SERVAIR, EURALIS, Van Cleef & Arpels, sonepar, ...

PRIVATE EQUITY

Large cap

BainCapital, THE CARLYLE GROUP, ARDIAN, VITRUVIAN PARTNERS, eurazeo, Bridgepoint, ...

SMid cap

CATHAYCAPITAL Private Equity, naxicap PARTNERS, mbo partenaires l'entrepreneur est capital, ABÉNEX, andera PARTNERS, 21 Partners, ...

Our partners bring a complementary range of expertise to the table, ensuring to address all the dimensions of digital and data transformation

MAXIME CARO

- Maxime joined eleven at its foundation after a first consulting experience in the United States. At eleven, Maxime has been working on projects related to software, data science, and to the launch of new businesses for both corporates & private equity funds.
- Academics: Mines de Paris, National University of Singapore

AMBROISE HURET

- Ambroise began his career as a strategy consultant within Booz.Allen & Hamilton's Telecommunication Media and Technology practice. He co-founded several start-ups with successful exits to Monster.com, Dassault Systems and Bearing Point. Ambroise also teaches strategy at both the HEC Paris MBA and the HEC Paris MSc Strategic Management and is a professor on Coursera.
- Academics: HEC Paris, Singularity University

CHRISTOPHER RISCHARD

- After 10 years in the United States selling internet solutions, Christopher spent 8 years at Booz&Co in Paris and later as a Principal in Madrid, focusing on digitalization strategy in EMEA. Based in London since 2014, Christopher continues to deliver commercial due diligence and disruptive digital strategy work across industries with an emphasis on private equity clients.
- Academics: ESSEC Paris, INSEAD MBA

BERTRAND SEMAILLE

- Bertrand began his career in the Media and Entertainment field before joining the strategy practice of Bossard Consultants in Paris. He then founded and led the consulting team of the Cap Gemini affiliate dedicated to digital strategy. Bertrand also teaches digital strategy at the HEC Paris MBA.
- Academics: Sciences Po Paris, Pantheon Sorbonne - MSc Econometry

MORAND STUDER

- Morand has been working as a consultant for over a decade and boasts specific expertise the Artificial Intelligence field… gained through several cutting-edge projects he has been leading for global industry majors. Morand heads eleven Data Factory and teaches at the HEC Paris MSc Strategic Management.
- Academics: Ecole Polytechnique Paris, ENSAE, Sciences Po Paris, Singularity University

STEVAN URIEN

- Stevan previously worked for several private equity investors in new technologies, where he led due diligences each time a high level of technical expertise was required. He is involved in numerous assignments alongside innovation divisions of corporate companies, accelerating time-to-market of innovations.
- Academics: Ecole Polytechnique Paris, ENSTA

Our data scientist consultants combine both unique technical and functional skills shaping the backbone of eleven unique strategy-driven data science

eleven data factory
London • Paris • Madrid

Data Science

*eleven's consultants master most of Data Science techniques (supervised, non-supervised, deep learning, etc.) that enable them to quickly identify data challenges of companies in order to implement tools for **visualization**, **modelling**, **prediction** and **recommendation** aiming at **generating value through data***

Hacking and industrialization

*Mastering the majority of Data tools (R, Python, Spark, Docker, Elasticsearch, TensorFlow ...) allows eleven consultants to **quickly adapt to the data environments** of each customer*

Strategy

*eleven's consultants are able to **understand their clients' core business**, to focus on the highest stakes and to frame the problem optimally*

Transformation

*eleven's consultants are able to adapt to various stakeholders and to demonstrate the value of the implemented initiatives in order to **generate the cultural changes** necessary to make the **transformation sustainable over the long term***

eleven leverages its academic and R&D efforts to constantly keep an edge in terms of digital and AI technologies

eleven's academic exposure to the talents at the cutting edge of digital, data, and technological evolutions

Organization of the MSc Data Science for Business Hackathon

Organization of the MSc Data Science & Business Analytics Hackathon

eleven's differentiative R&D efforts

- ✓ Several consultants holding PhD
- ✓ Numerous highly skilled engineers
- ✓ R&D efforts deployed on the cutting edge of innovation: model explicability, computer vision (video), …
- ✓ 1200+ man-days per year dedicated to R&D efforts
- ✓ A portfolio of 100+ trainings around digital and data trends and competencies

Sources: eleven strategy

eleven data factory covers all disruptions brought by the data revolution from customer expectation to internal production models and organization

Towards new customer expectations

Detect and anticipate client and prospect needs to react at the right time

Optimize customer lifetime value : Get - Grow - Keep

Better understand client expectations to increase **conversion rate and loyalty**

For a major bank **+€10m NBI** through new targeting methods and processes

Towards a new offer

Build a lean startup approach of products and business models

New data-based products & data business models

Create data & IoT powered products and business models (from product to service with SaaS, pay per use…)

For a global concrete provider **€70m contract** signed thanks to the development of a new service based on IoT

Determine the key stakes of an industry, the competition and client sensitivity

Refine the pricing strategy at customer level thanks to advanced data analytics considering multiple variables such

Strategy and operational dynamic pricing model

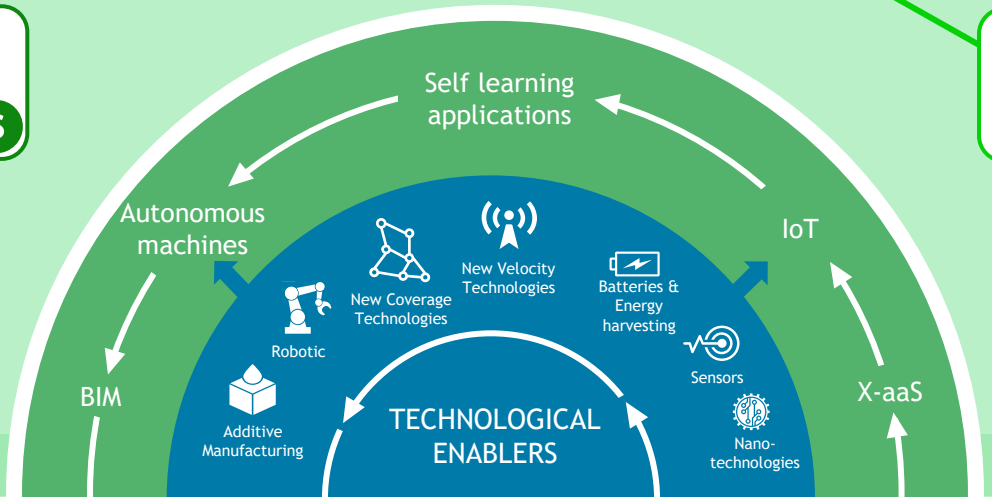
For a major fuel distributor **+€1m/year EBITDA** increase thanks to an innovative dynamic pricing model

Create a comprehensive 5-axis algorithm considering offer, moment, client, channel and sales pitch

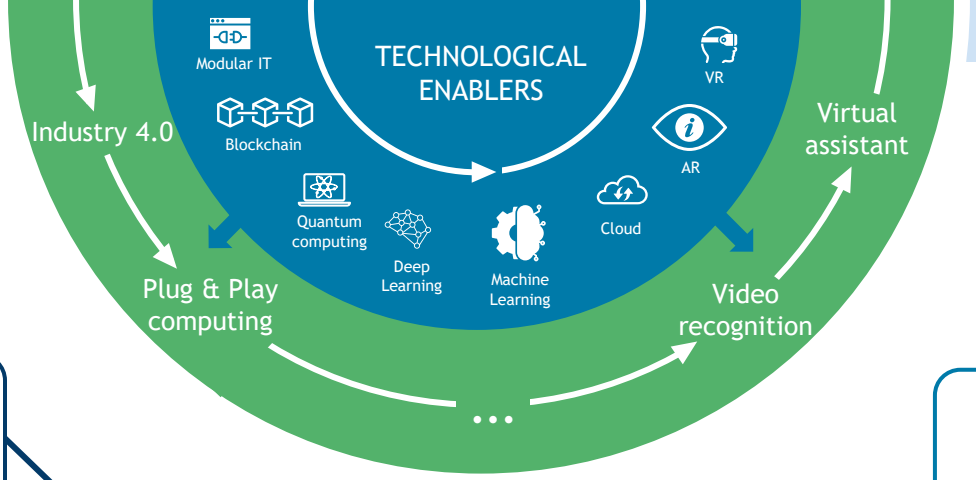
Deploy the solution on all channels (website, retargeting, marketing campaigns, …)

Recommendation algorithms

For a major Oil & Gas player **+25% turnover** thanks to the implementation of a new connected product



Sources : eleven research and analysis



Design & optimize processes leveraging a blend **of NLP, Computer vision, scoring, sentiment analysis**,…

AI-powered business processes automation

Integrate and industrialize AI within production chains to **anticipate and forecast** potential issues

For a financial services player **200 man-day/year** shrink bankers' time dedicated to customer analysis

Optimize industrial processes thanks to **real-time information** provided by IoT sensors

Factory 4.0 and predictive maintenance

Shift from reactive and preventive to predictive maintenance processes leveraging **anomaly detection** & existing **in-house expertise**

For a major oil & gas company **+€.5m/year** Of savings per mine thanks to the reduction of fuel consumption

Build practical and **actionable data roadmaps**, from the first Proof of Concept to the progressive **industrialization** of selected use cases

Issue recommendations on **data architecture**, **organization, governance, technical providers and tools**

Data governance and organization strategy

For a videosurveillance player, **2 new business units created** on data-based new business models

Identify the relevant **key performance drivers** among hundreds of sources in order to **streamline operations**

Identify optimal **machine setups** and **processes** to increase production

Performance assessment & optimization

For a food industry player **+€1m/year** cost savings thanks to quality assessment process improvement

Towards new internal organization

Towards new production models

eleven data factory three complementary offers address the full spectrum of data-related needs from strategy to use case industrialization

ELEVEN DATA FACTORY KEY EXPERTISE

Data strategy

- What A.I. disruptions can I expect?
- To what extent am I prepared to take advantage of this?
- How can I exploit data collected in my company?
- How can I identify data and A.I. use cases that will generate value?
- Which organization and which data governance should I set up?

Agile use case implementation

- How can I speed up my use case built & test phase?
- How can I assess and demonstrate the impact of my use cases?
- How can I leverage state-of-the- art data methods to enhance my business performance?

Industrialization

- How can I scale proven concepts into a new business?
- How can I industrialize them?
- What is the most relevant technological stack that I should use?
- How can I implement the right organization and processes necessary to industrialize use cases?

AGENDA

1. About eleven
2. Case presentations
   a) Airplane Interior Service
   b) Aircrafts' take-off time prediction
3. Practical information
4. A few advice

Supercase 1

Airplane Interior Services

To the attention of the master in Data Science & Business analytics' students

February 8th , 2021

CentraleSupélec ESSEC BUSINESS SCHOOL

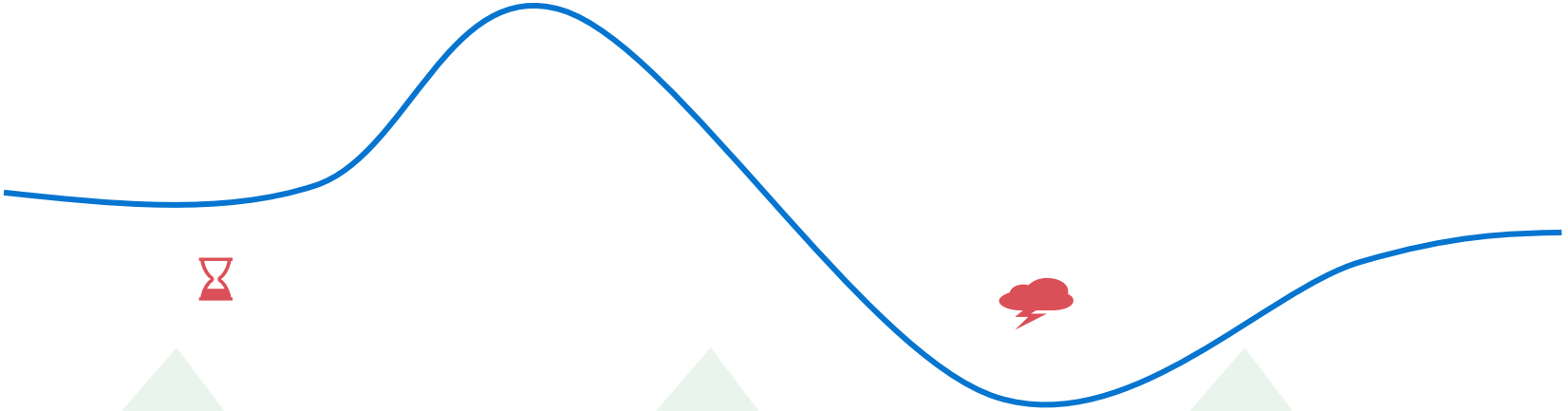
eleven strategy consultants
London • Paris • Madrid

The client, a player in the aeronautic industry, wants to understand how the user experience of airplane passengers can be improved

Traveler journey

For illustration only

Emotional curve and main pain points



Innovation opportunities

- Let's put PlayStations in the waiting areas
- Let's change how the seats are assorted
- Let's give more free food

Several websites enable users to share their experience, thereby providing valuable data sources with large and various information

SKYTRAX

tripadvisor®

1/10

"a horrible airline to fly"

Rachel Beale (United States) 28th July 2019

✅ ***Trip Verified*** | Atlanta to Paris. Air France is just a horrible airline to fly, especially compared to delta. They do not update their movies on their tiny screen they put in front of you it's the same movie names repeated over and over to make it seem like there are choices. I found the food disgusting and they have no WiFi on the plane. I would not recommend flying Air France at all unfortunately due to work and my routes I've had to use them 4 times.

Type Of Traveller	Family Leisure
Seat Type	Economy Class
Route	Atlanta to Paris
Date Flown	July 2019
Seat Comfort	★★☆☆☆
Cabin Staff Service	★★☆☆☆
Food & Beverages	★☆☆☆☆
Inflight Entertainment	★☆☆☆☆
Ground Service	★☆☆☆☆
Value For Money	★☆☆☆☆
Recommended	✖

Baloo wrote a review Sep 9
2 contributions

●●●○○ Moscow - Ulaanbaatar | International | Economy

Delay

After getting inside the aircraft we were waiting about 2 hours on board, then they announced that they are gonna change our schedule. Because they have to change the aircraft. That's all somehow ok, but the worst part of the story is, that the pilot tried to explain what is…

Read more

Date of travel: August 2019

Helpful Share

Praveen Chaudhary wrote a review Sep 9
Little India, Singapore • 44 contributions • 7 helpful votes

●●○○○ New Delhi - Moscow | International | Business Class

Flight to Moscow

You Have no choice to Fly to Moscow in 6 Hours other than AeroFloat. Which cannot offer you the Indian Food ,Indian Movies & even did not understand what you would like to express because they don;t understand English.Even the Very Common Words.Seat in Business class is just the…

Read more

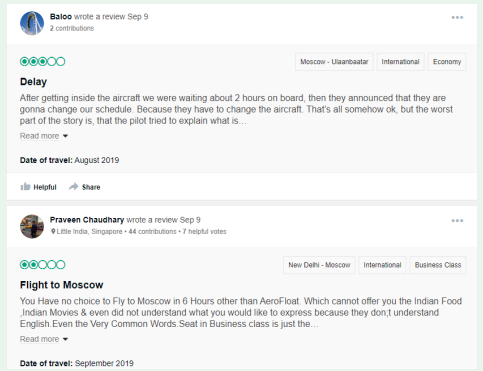
Date of travel: September 2019

Your goal is to leverage webscraping techniques, topic modelling and sentiment analysis algorithms as well as your business sense to provide insights on possible business opportunities

Data Sources:
Customer review websites

Data:
Customer reviews

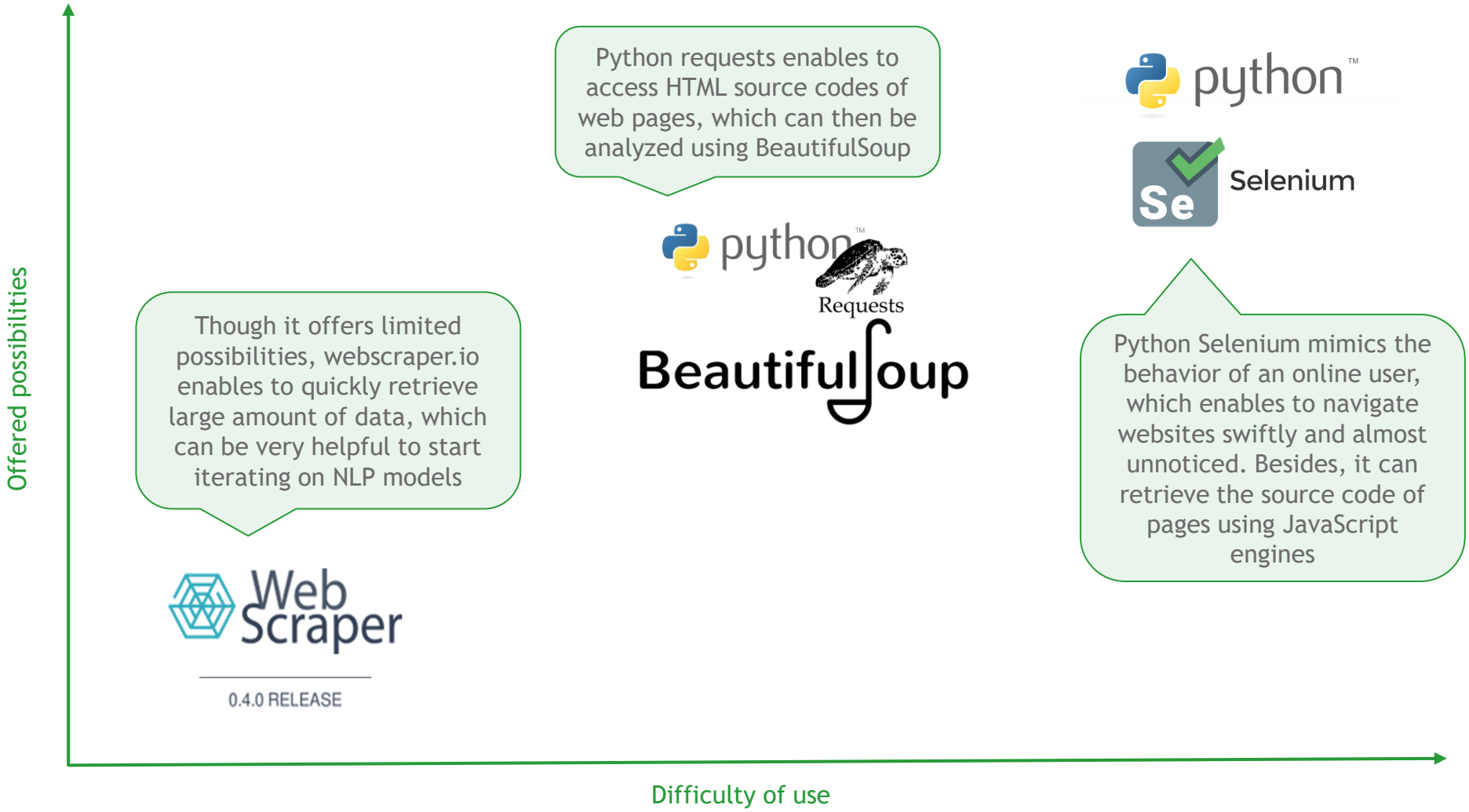
Output:
Business insights, new development opportunities



Webscraping

Topic Modelling,
Sentiment Analysis

Several webscraping techniques, with varying ease of use and offered possibilities, enable to retrieve information from websites



Topic modelling and sentiment analysis enable to derive valuable insights from customer reviews

The service was bad to non-existent. 2 crew members for a rather large area.

TOPIC MODELLING

Aims at extracting topics from text entities.

Typical approaches:
- Latent Dirichlet Allocation
- Classification
- Vectorization and clustering
- …

Typical challenges
- Number of topics
- Granularity of the analysis: full document, sentences, sub-sentences…

SENTIMENT ANALYSIS

Aims at classifying a sentence as expressing a positive, negative or neutral opinion

Typical challenges
- Direct vs. comparative opinions
- Explicit vs. implicit opinions
- Granularity of the analysis: full document, sentences, sub-sentences…

Topic: crew

Sentiment: -0.8

Resources : You are free to use any resources you want, here are some recommendations to help you get started

Languages

We suggest you use either R or Python

Bunch of useful libraries

Selenium, beautifulSoup are powerful Python libraries for webscraping

Gensim, TextBlob are useful Python libraries for Topic Modelling and Sentiment Analysis

Useful links

https://www.seatguru.com/browseairlines/browseairlines.php

https://www.seatguru.com/airlines/Aegean_Airlines/Aegean_Airlines_Airbus_A320-200.php

https://www.airlinequality.com/review-pages/a-z-airline-reviews/

https://www.tripadvisor.com/Airlines

AGENDA

1. About eleven
2. Case presentations
   a) Airplane Interior Service
   b) Aircrafts' take-off time prediction
3. Practical information
4. A few advice

Supercase 2

Taxi-time prediction

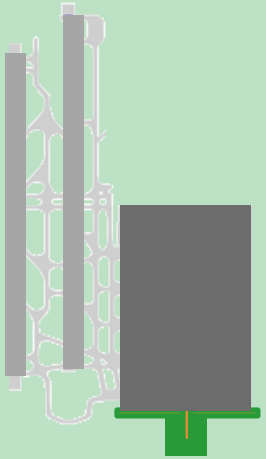
To the attention of the master in Data Science & Business analytics' students

February 8th, 2021

CentraleSupélec ESSEC BUSINESS SCHOOL eleven strategy consultants London • Paris • Madrid

Take-off time (TOT) prediction – Airport overview

Airport overview

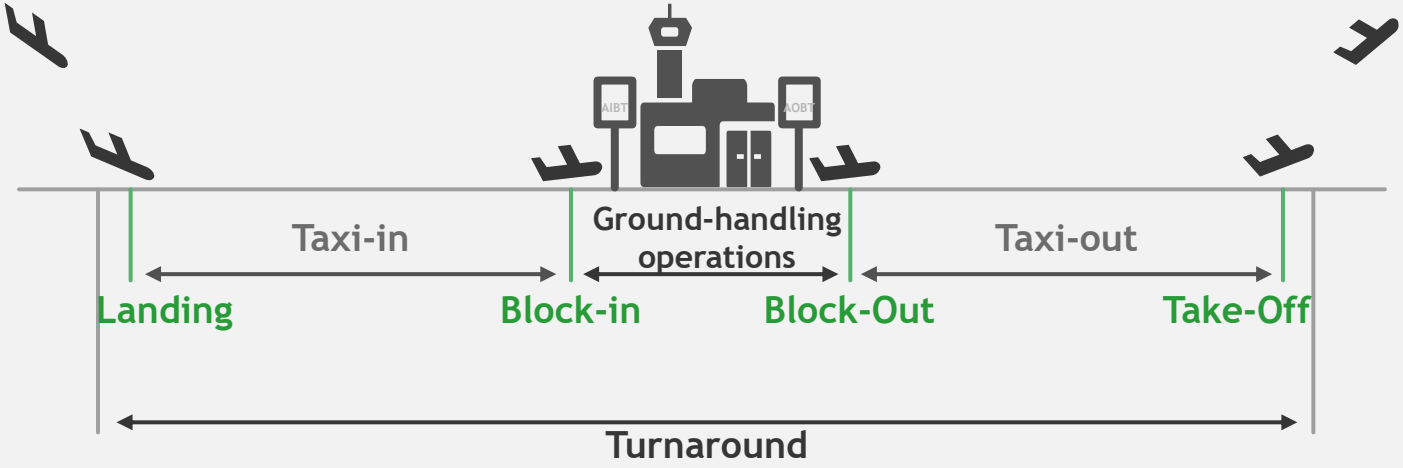


Legend

Runways | Apron

Taxi-ways | Civilian-side

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 Actual 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

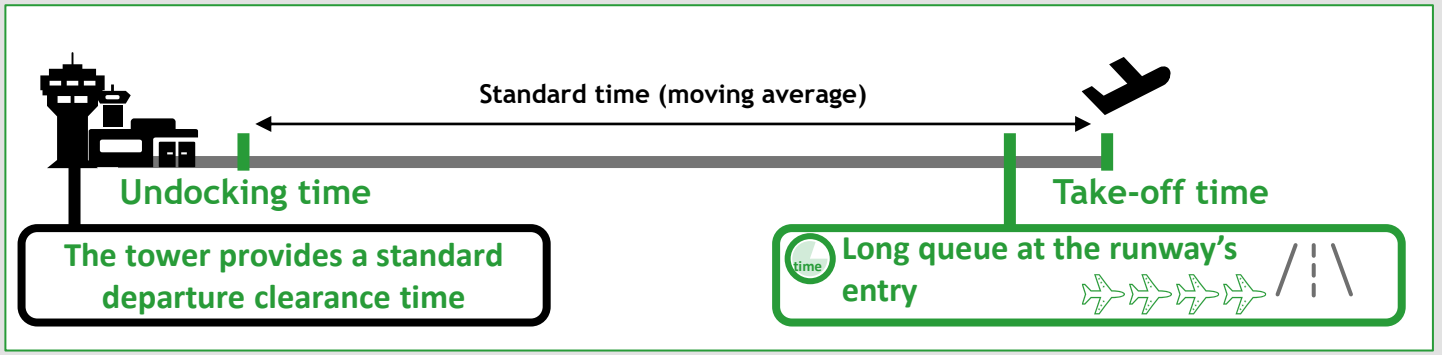
Key Expected Benefits

- 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

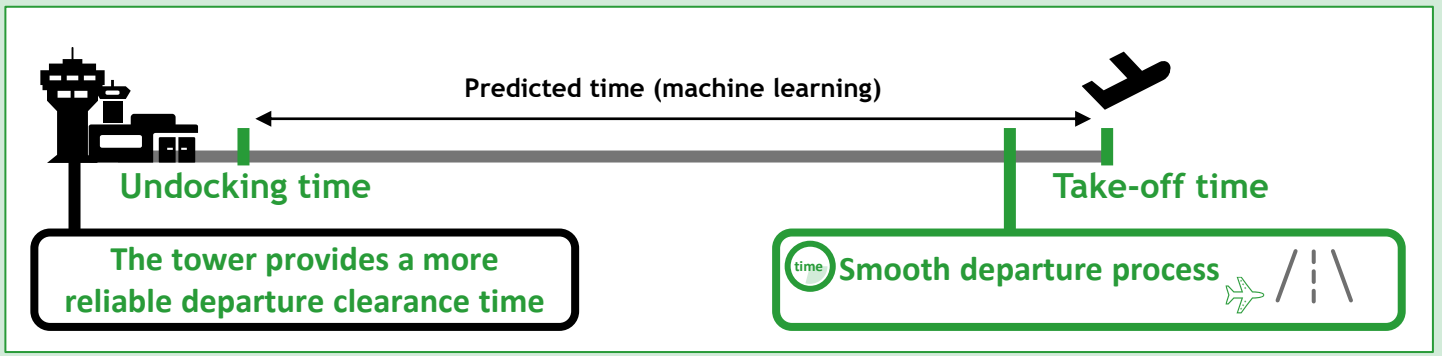
Source: eleven research and analysis

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

Status quo



A.I. solution



- Awareness
- Efficiency
- Safety
- Green

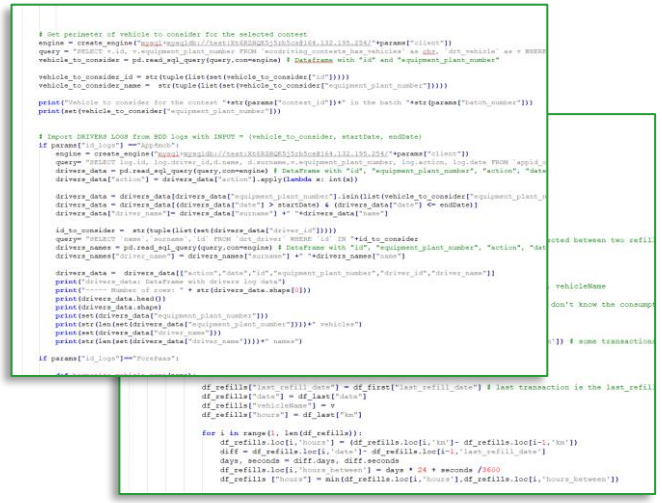
Expected output

- 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

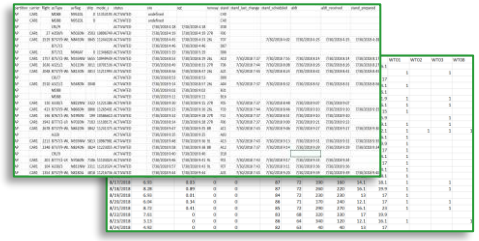


Source: eleven research and analysis
1. See appendix

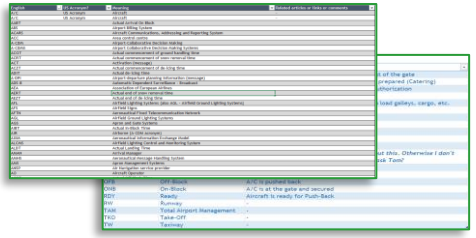
Provided input

- 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

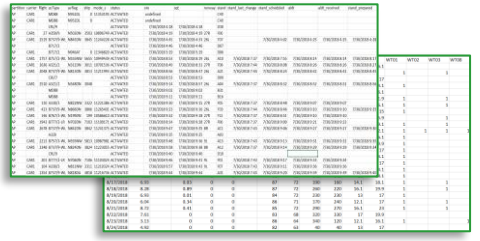
AIRPORT & WEATHER DATA



GLOSSARY

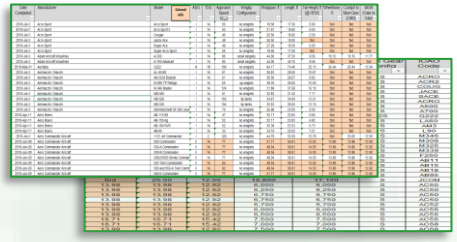


TEST SET



RESEARCH PAPERS

A/C TYPE CHARACTERISTICS



APPENDIX

Example of model performance comparison sheet

Chosen models' description and performance overview

		Off-Block Taxi 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
	First quartile max error: 1.7 min	xx min	xx min	xx min
	Third quartile max error: 3.9 min	xx min	xx min	xx min

Source: eleven research and analysis

AGENDA

1. About eleven
2. Case presentations
    a) Airplane Interior Service
    b) Aircrafts' take-off time prediction
3. Practical information
4. A few advice

The Teams workplace:

For this challenge, we opened a Teams workplace

On this workplace, you will find three channels:

1) **General**: for all questions and information related to the organization of the challenge
2) **Airplane Interior Service**: for all questions specifically related to the Airplane Interior Service case
3) **Taxi-time**: for all questions specifically related to the Taxi-time prediction case

Please use the right channel to ensure fluidity of the interactions

Before asking something, also make sure that the requested information has not been given already ;)

Schedule for the week

	Monday 8th	Tuesday 9th	Wednesday 10th	Thursday 11st	Friday 12th
Morning session	Case Presentations *(9h-10h, Teams)*	Training : Natural Language Processing (10h-11h, Teams)	Training : Interpretability (10h-11h, Teams)	Free working session	Free working session
	Training : Github and Python bestpractices *(10h-11h, Teams)*	Free working session	Free working session		
	Q&A : Taxi-Time *(11h-12h, Teams)*			Q&A : Taxi-Time *(11h-12h, Teams)*	
Afternoon session	Q&A : AIS (13h30-14h30, Teams)	Q&A : Taxi-Time Q&A : AIS (13h30-14h30, Teams)	Q&A : AIS (13h-14h, Teams)	Q&A : AIS (13h-14h, Teams)	Oral Presentations (13h40-15h40, Teams)
	Free working session	Free working session	Q&A : Taxi-Time (13h30-14h30, Teams) Free working session	Free working session	Closing session (16h - 17h, Teams)

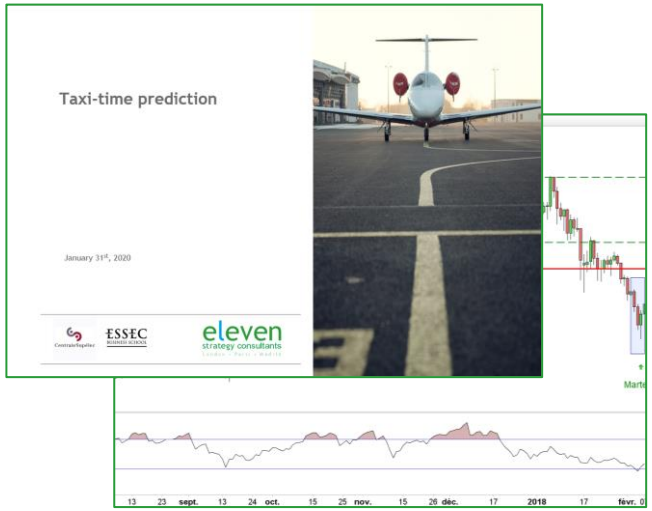
The Q&A will be 1-hour sessions where you can log in each day to ask questions related to your topic. You will also be able to directly contact the coaches on Teams if you have specific questions

Expected output

You are expected to deliver the following:

- The file with your code (for this assignment we highly recommend using Python and/or R)
- A PowerPoint presentation of your work (including your experiment process, your thoughts, the hardships you had to overcome…)

PRESENTATION



CODE

Final presentation details and best practices:

On Friday 12th, you will have to present your work in front of a jury during a closed-door session

The modalities of the presentation will be as follow:

- 15min group pitch based on a PowerPoint presentation
- ~10min Q&A session with the jury
- ~5min debrief from the jury

For each supercase, a winner will be announced. The two winners will then present their work to the other students (same modalities with questions from the students)

The presentation must be as professional as possible. Here are some advices and best practices that may be useful:

- Structure your presentation: start by stating the problem that you want to solve, then present the way you tackled it, and finally describe your solution. The "story" of the presentation should be natural and easy to follow
- Be concise and precise: focus on the most important messages, as you only have 20 minutes to present the work achieved for the entire week. You should limit the number of slides you present (you can still add appendices if needed)
- Be organized as a team: split up the speaking time between the team members beforehand to make it smoother
- Be honest: tell where you encountered issues or challenges
- C-suite level: you should convince both the CEO and the CTO/CDO of the company

Evaluation criteria:

Although different in their essence, all supercases will be graded based on similar criteria:

1. The **engagement** of the team during the week (how far you've gone, how autonomous you have been, etc.)

2. The **creativity** and **relevance** of the **methodology** (i.e. scientific approach) you choose regarding the problem you have to solve and the data you had

3. **Coding assessment** (see next slide)

4. The **performance** of your model (specific to each supercase)

5. The explanation of your **technical choices** and your ability to present them in non-technical terms

6. The critical **business views** on your **current results,** and the **next steps** you could consider to improve them

7. The **quality of your final presentation**: how professional it looks (**slide quality**), how clear and complete it is (**storytelling**), how pertinent your answers are, etc.

8. Your **relative overall performance** compared to other groups

Please note that all groups will be graded at the end of the week

Code evaluation criteria :

1. Your code must be easy to run: someone outside your group must be able to run your code autonomously
    - Write a clear readme with instructions
    - Set-up an environment to run the project with the necessary packages
    - Write a single/few main files
    - …
2. Your code must be well-structured:
    - Use functions/OOP
    - Break-up the pipeline in several files for each steps (preprocessing, feature engineering, etc)
    - …
3. Your code must be easy to understand:
    - Document your code with clear comments
    - Use understandable variable/function names
    - Respect pep8 recommendations*
    - …

*https://www.python.org/dev/peps/pep-0008/

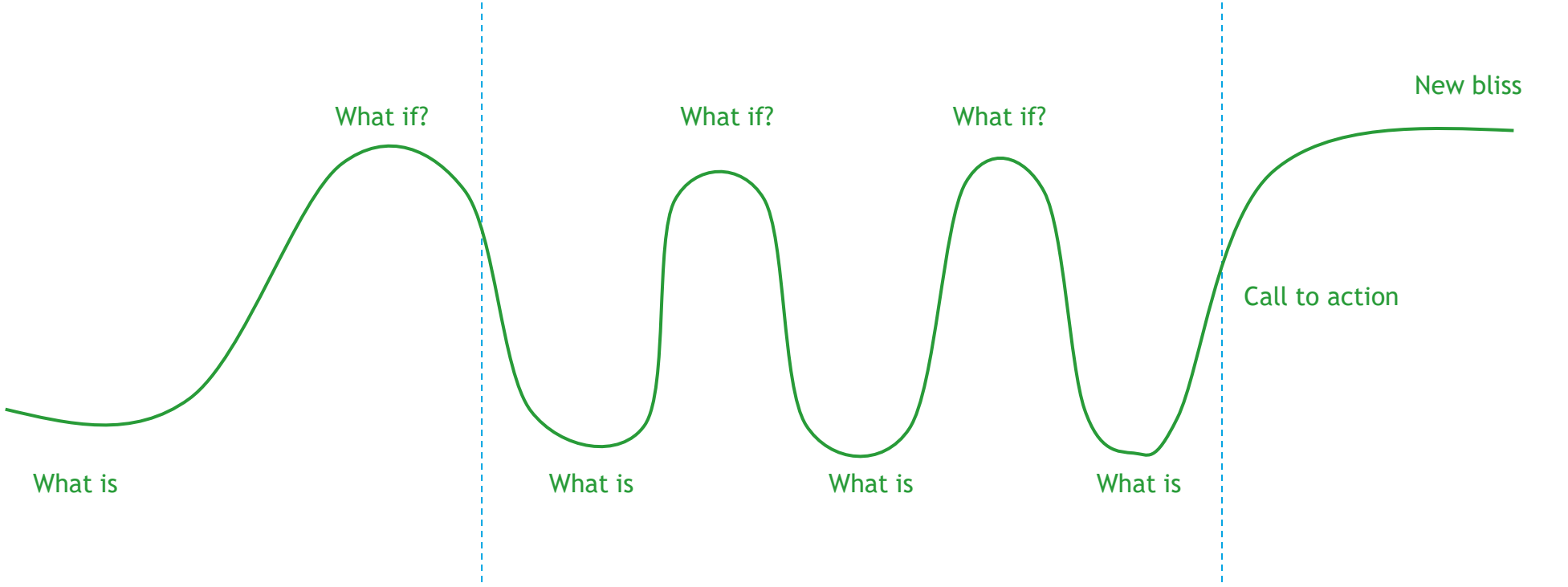
AGENDA

1. About eleven
2. Case presentations
    a) Airplane Interior Service
    b) Aircrafts' take-off time prediction
3. Practical information
4. A few advice

Presentation best practices (1/2): the anatomy of a story

By reminding people of the status quo and then revealing the path to a better way, they set up a conflict that needs to be resolved.

Beginning — Middle — End



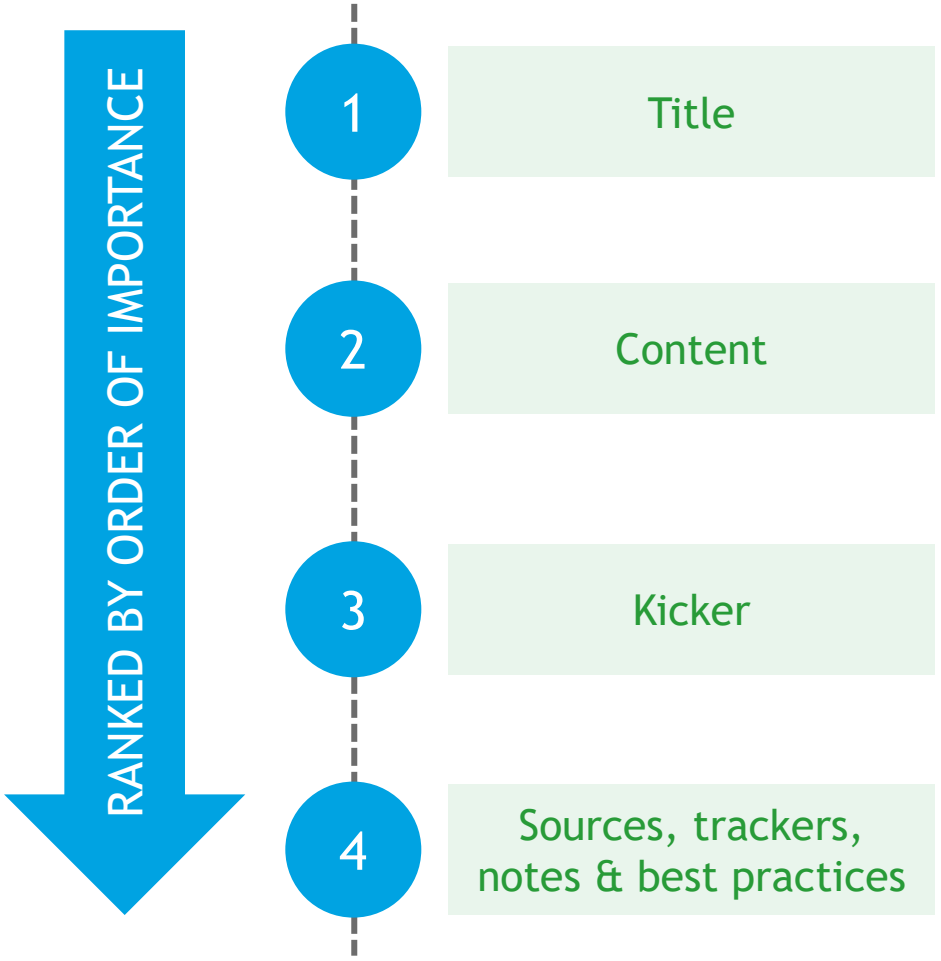
Start by describing life as the audience knows it: this creates a bond and open them up. The introduce your idea for change. The gap creates tension and draws them in…

…Continue to play the contrast to keep tension and slowly show them how change is possible and show how alluring the solution is…

… Make a powerful ending. Don't finish with a to-do list but rather a call to action and a glimpse at the benefits following success.

Presentation best practices (2/2): slide design

How to structure a slide



Other key points on slide design

1. 1 message per slide !
2. The content of the slide must illustrate/ demonstrate/ have a link with the title
3. The title can be either descriptive-oriented or action-oriented
4. Once put all together, your titles should read like a coherent story

Any Questions ?

Enjoy the challenge ...

Land you project !