Door-to-door Travel Time Analysis from Paris to London and Amsterdam using Uber Data

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2. Full door-to-door model definition

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Current situation

First observations:

Air transportation is multi-modal
Which makes the full door-to-door travel time difficult to assess
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**Passengers want a seamless door-to-door trip**

The European Commission and ACARE Flightpath 2050 have heard this demand:

- 90% of travellers within Europe to be able to complete full journey in less than 4 hours in 2050
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**How do we do it?**
- By opening access to aggregated and anonymized data!
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Full door-to-door travel time

\[ T = t_{to} + t_{dep} + t_{in} + t_{arr} + t_{from} \]

where

Figure: Model of the full door-to-door travel time
Time traveling to and from the modal station

Using aggregated Uber data, daily average travel times between city zones are available as well as over the following periods:

- Early Morning: midnight - 7am
- Morning: 7am - 10am
- Midday: 10am - 4pm
- Afternoon: 4pm - 7pm
- Evening: 7pm - midnight

Data was gathered over the three months of January, February and March 2018.
Time spent at stations

Based on a previous study and on the stations’ website:

**Table**: Time spent at modal stations

<table>
<thead>
<tr>
<th>Mode</th>
<th>Time at departure</th>
<th>Time at arrival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>90 min</td>
<td>45 min</td>
</tr>
<tr>
<td>Rail</td>
<td>15 min</td>
<td>10 min</td>
</tr>
<tr>
<td>Eurostar</td>
<td>45 min</td>
<td>10 min</td>
</tr>
</tbody>
</table>
Based on a weekly schedule, using available data at the time of the study:

- Official 2019 schedule from Eurostar
- A week’s schedule for Thalys in July 2019
- A week’s schedule for flights in January 2019
Full door-to-door time

Assumptions

- Flights and trains are on time
- Travelers schedule their departure time in order to arrive \( t_{\text{dep}} \) minutes before the scheduled departure time at the departure station
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Case studies

A Londoner wants to leave from the Eiffel Tower area in Paris and reach his home in London:

1. When is it best to leave and with what transportation mode?
2. Which areas of London can he/she reach?

Same questions are considered for an Amsterdamer.
Case studies

Figure: Paris layout for the considered case studies
Travel time comparisons: By hour

First question: At what time of day should the trip start?
Travel time comparisons: By hour

Figure: Hourly door-to-door time variations from Paris to London
Travel time comparisons: By hour

Figure: Hourly door-to-door time variations from Paris to London
Travel time comparisons: By hour

Figure: Hourly door-to-door time variations from Paris to London
Travel time comparisons: By day of week

Second question: On what day should the trip take place?
Travel time comparisons: By day of week

Figure: Daily door-to-door time variations from Paris to London
Travel time comparisons: By day of week

Figure: Daily door-to-door time variations from Paris to London
Reach visualization

Third question: Where does the trip end?
Eurostar reach visualization

Figure: Door-to-door travel times to London starting from the Eiffel Tower in Paris using the Eurostar train
Air travel reach visualization

**Figure**: Door-to-door travel times to London starting from the Eiffel Tower in Paris using the air transportation
Travel time comparisons: By hour

Looking at Amsterdam now:
Back to the first question: At what time of day should the trip start?
Travel time comparisons: By hour

Figure: Hourly door-to-door time variations from Paris to Amsterdam
Travel time comparisons: By hour

Figure: Hourly door-to-door time variations from Paris to Amsterdam
Travel time comparisons: By day of week

Second question: On what day should the trip take place?
Travel time comparisons: By day of week

Figure: Daily door-to-door time variations from Paris to Amsterdam
Travel time comparisons: By day of week

**Figure:** Daily door-to-door time variations from Paris to Amsterdam
Reach visualization

Third question: Where does the trip end?
Rail reach visualization

Figure: Door-to-door travel times to Amsterdam starting from the Eiffel Tower in Paris using the train
Air travel reach visualization

Figure: Door-to-door travel times to Amsterdam starting from the Eiffel Tower in Paris using the air transportation
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ACARE Flightpath 2050 objectives

(a) From Paris to London

- For rail transportation:
  - $t_{in}$ most important

(b) From Paris to Amsterdam

- For air transportation:
  - $t_{dep}$ most important
ACARE Flightpath 2050 objectives

(a) From Paris to London

(b) From Paris to Amsterdam
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Conclusion

Summary of this work:

- Leveraged Uber data to estimate full door-to-door travel times in Europe
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▶ Leveraged Uber data to estimate full door-to-door travel times in Europe
▶ Enables comparison between different modes (air vs. rail)
▶ Enables comparison of the allocation of time spent in the different travel legs
▶ Enables evaluation of the objectives within ACARE’s Flightpath 2050
Discussion

Possible next steps:

▶ Use actual schedules of the different modes
▶ Consider alternative modes to/from the stations (e.g. subways)
▶ Use the daily proportion of travellers per mode per area (Requires more data sharing from GPS apps or phone operators for example)
Discussion

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Thank you for your attention