

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



9th SESAR Innovation Days

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1. Introduction
2. Full door-to-door model definition
3. Applications
 - 3.1 Mode comparison tool for passengers
 - 3.2 ACARE Flightpath 2050
4. Conclusion & Discussion



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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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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

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

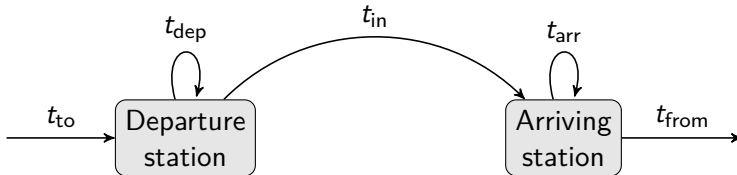
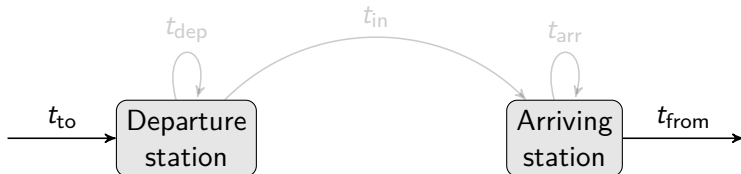


Figure: Model of the full door-to-door travel time

Time traveling to and from the modal station

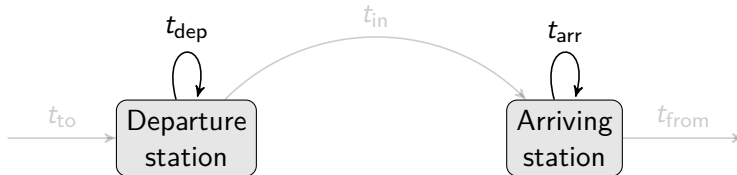


Using aggregated Uber data, daily average travel times between city zones are available as well as over the following periods:

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

Data was gathered over the three months of January, February and March 2018

Time spent at stations

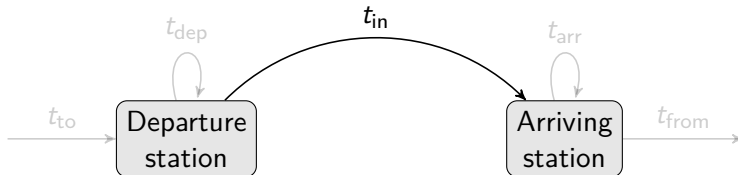


Based on a previous study and on the stations' website:

Table: Time spent at modal stations

Mode	Time at departure	Time at arrival
Air	90 min	45 min
Rail	15 min	10 min
Eurostar	45 min	10 min

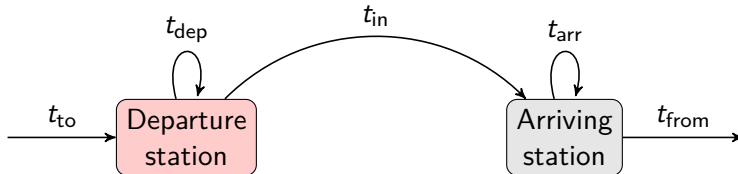
Time in the air or on the rail



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_{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

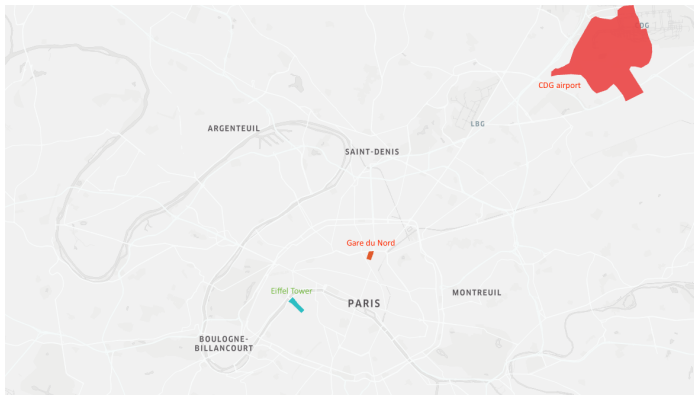


Figure: Paris layout for the considered case studies

Travel time comparisons: By hour

First question: At what time of day should the trip start?



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Travel time comparisons: By hour

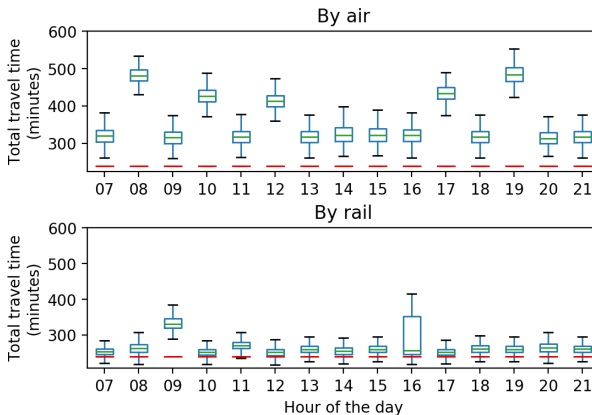


Figure: Hourly door-to-door time variations from Paris to London

Travel time comparisons: By hour

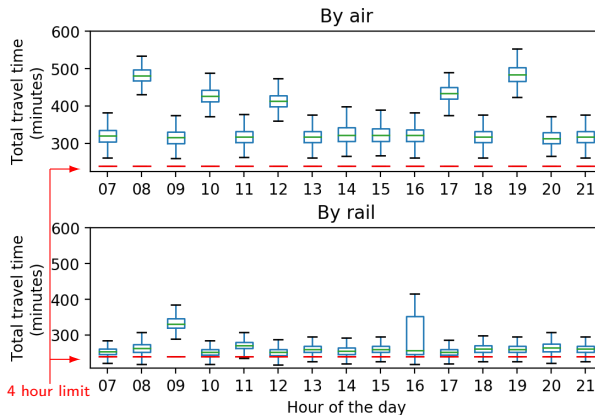


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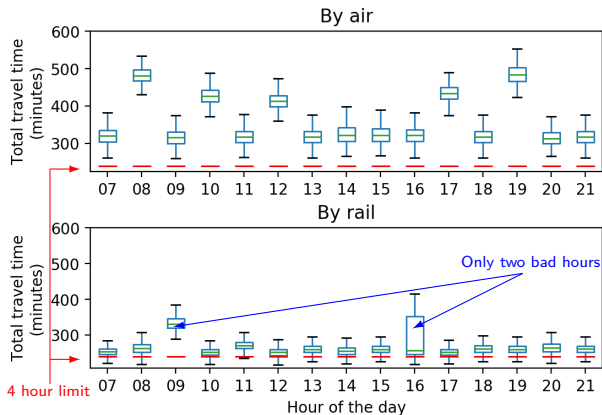


Figure: Hourly door-to-door time variations from Paris to London

Travel time comparisons: By day of week

Second question: On what day should the trip take place?



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Travel time comparisons: By day of week

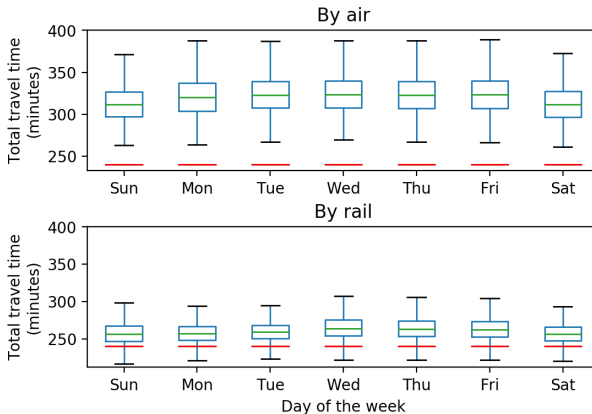


Figure: Daily door-to-door time variations from Paris to London

Travel time comparisons: By day of week

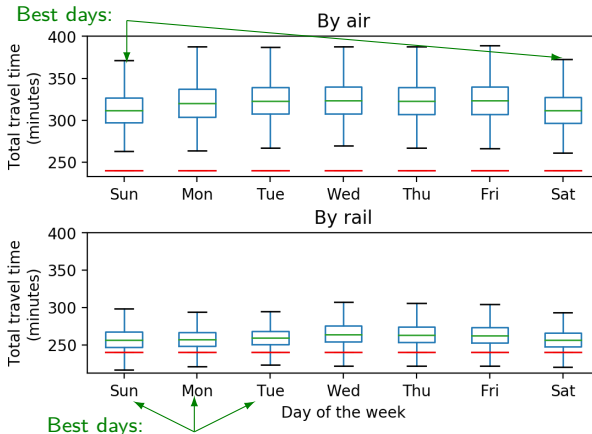


Figure: Daily door-to-door time variations from Paris to London

Reach visualization

Third question: Where does the trip end?



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Eurostar reach visualization

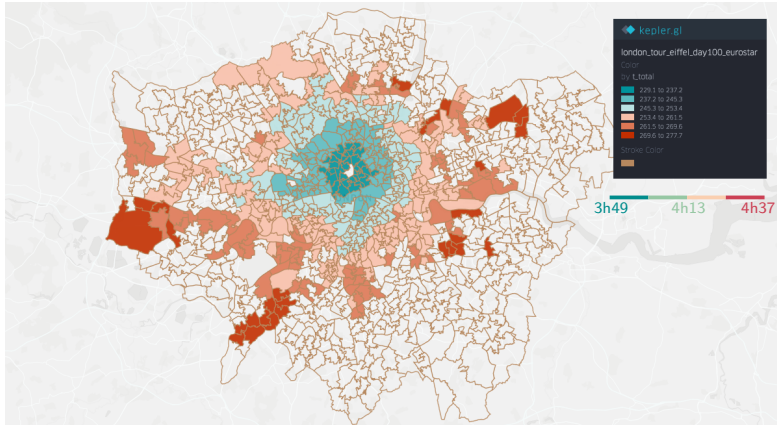


Figure: Door-to-door travel times to London starting from the Eiffel Tower in Paris using the Eurostar train

Air travel reach visualization

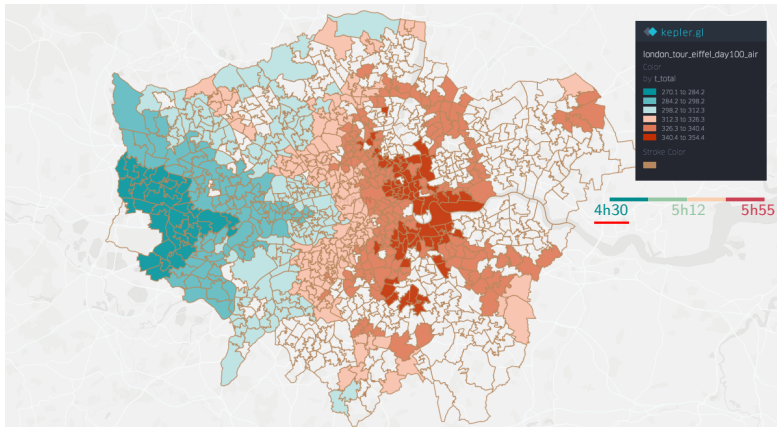


Figure: Door-to-door travel times to London starting from the Eiffel Tower in Paris using the air transportation

Travel time comparisons: By hour

Looking at Amsterdam now:

Back to the first question: At what time of day should the trip start?



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Travel time comparisons: By hour

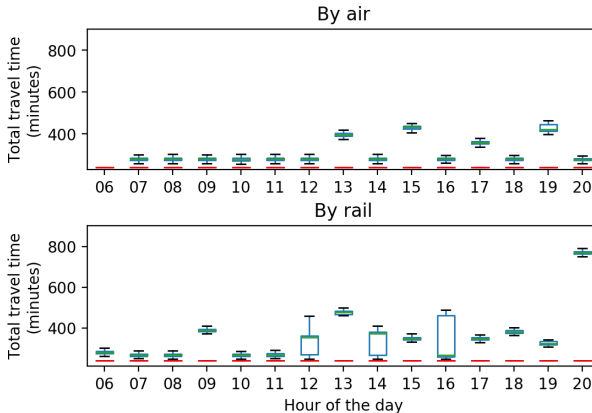


Figure: Hourly door-to-door time variations from Paris to Amsterdam

Travel time comparisons: By hour

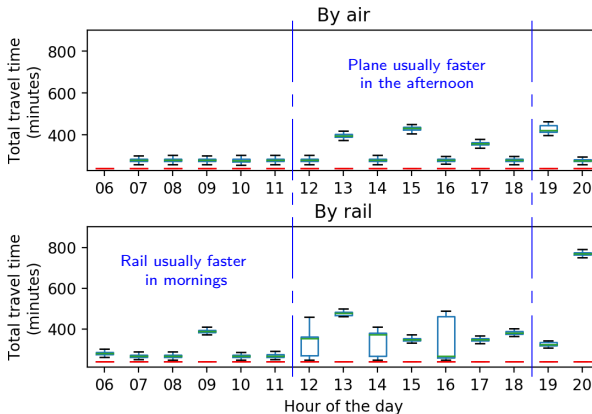


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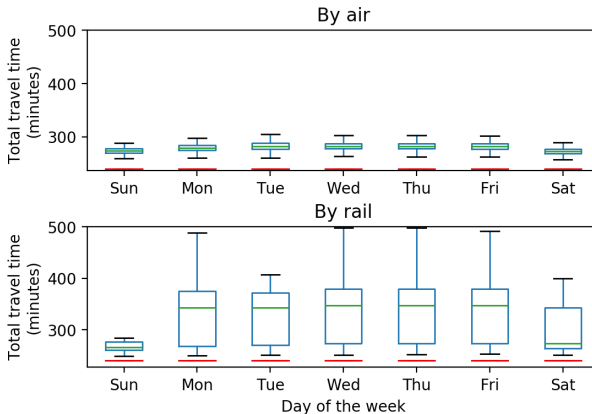


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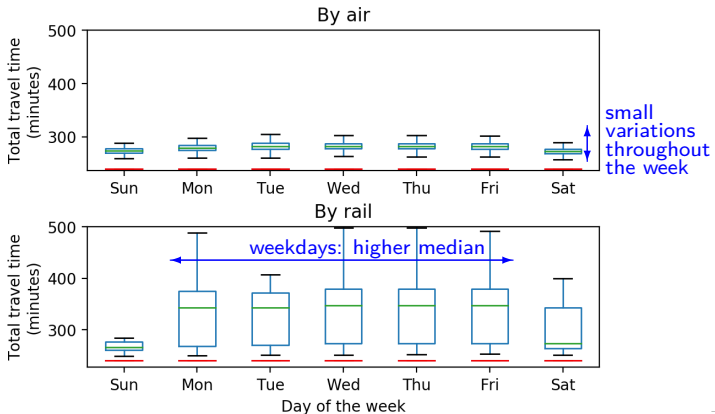


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Rail reach visualization

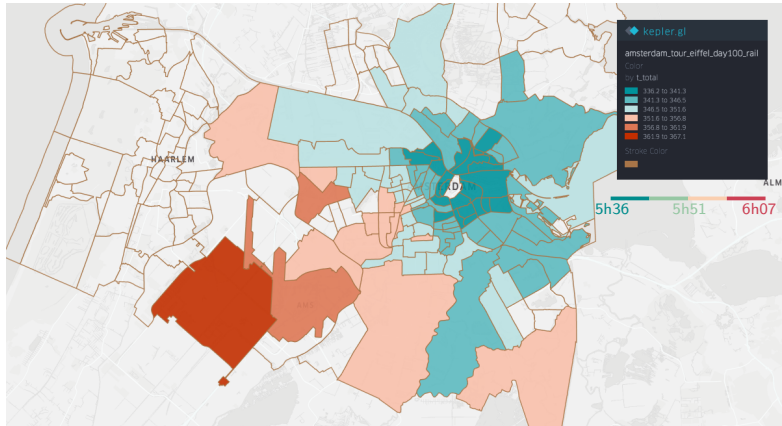


Figure: Door-to-door travel times to Amsterdam starting from the Eiffel Tower in Paris using the train

Air travel reach visualization

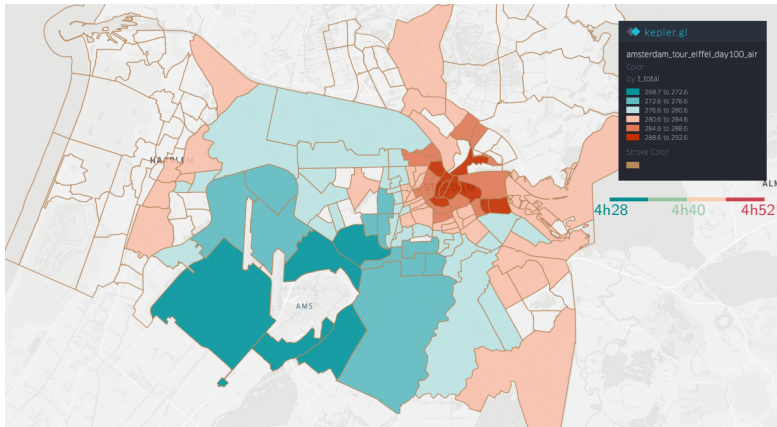


Figure: Door-to-door travel times to Amsterdam starting from the Eiffel Tower in Paris using the air transportation

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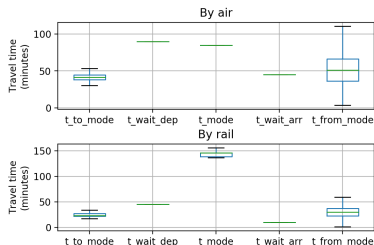
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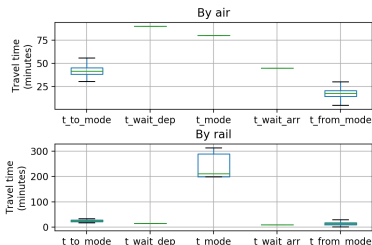


ACARE Flightpath 2050 objectives



(a) From Paris to London

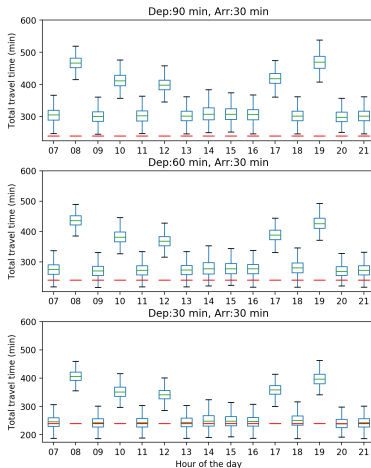
- For rail transportation:
 - t_{in} most important



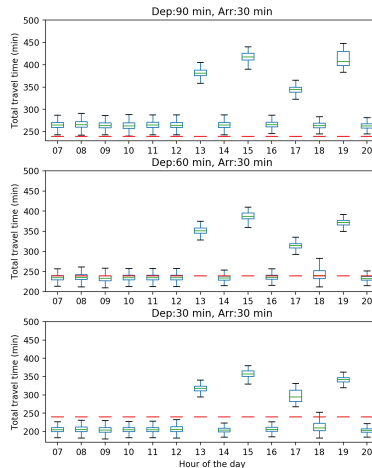
(b) From Paris to Amsterdam

- 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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- ▶ Enables comparison between different modes (air vs. rail)



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Conclusion

Summary of this work:

- ▶ 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



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Conclusion

Summary of this work:

- ▶ 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)



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Thank you for your attention



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