



TaxiHailer: A Situation-Specific Taxi Pick-up Points Recommendation System

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Motivation and Goals



Still standing in the same corner and waiting for a never-coming taxi?

TaxiHailer is a situation-specific pick-up points recommendation system for passengers.

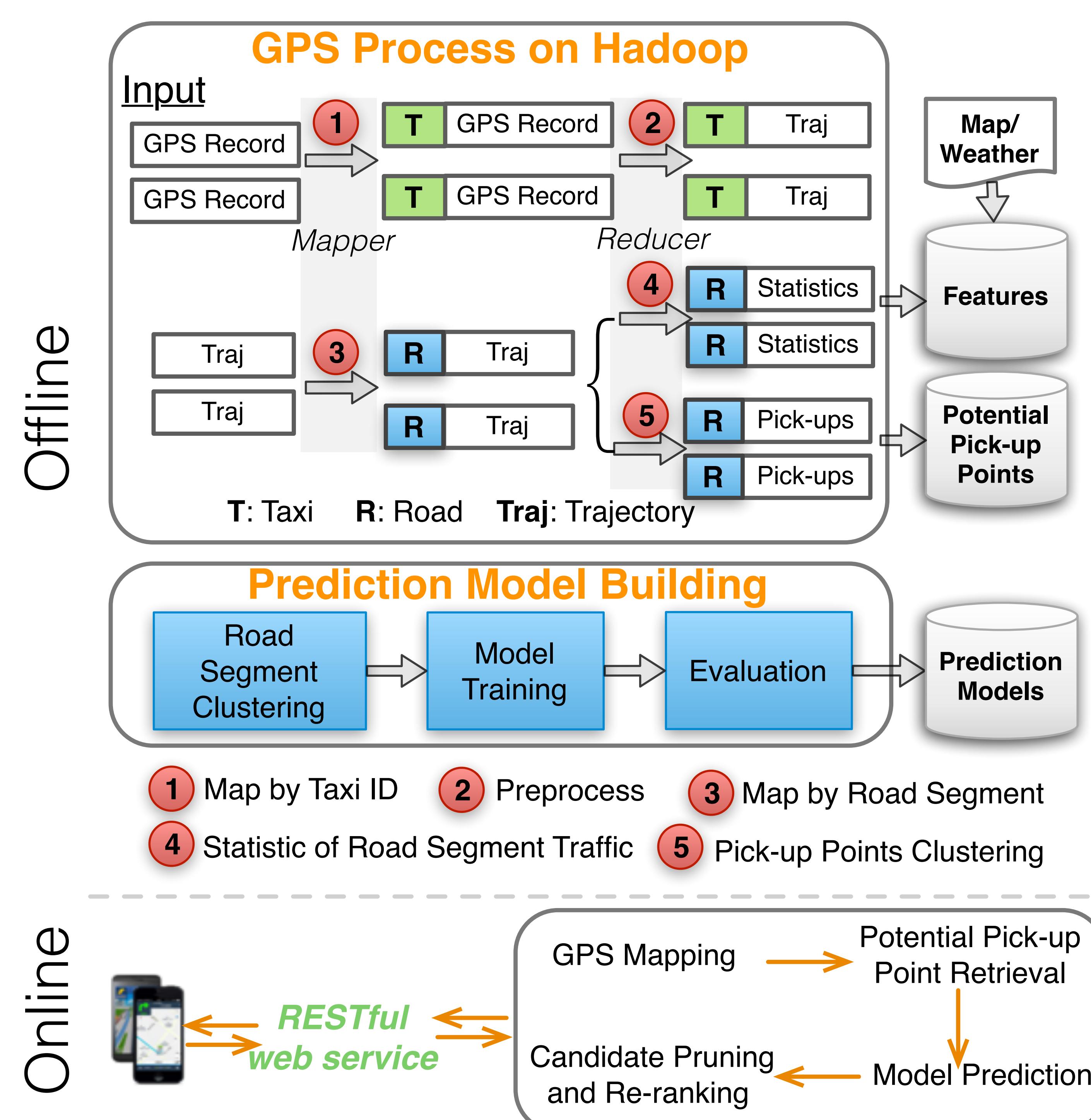
Motivation

- Avoid getting lost in an unfamiliar city
- Find a proper place to get a taxi in the complex road network
- Reduce waiting time in a busy journey

Goals

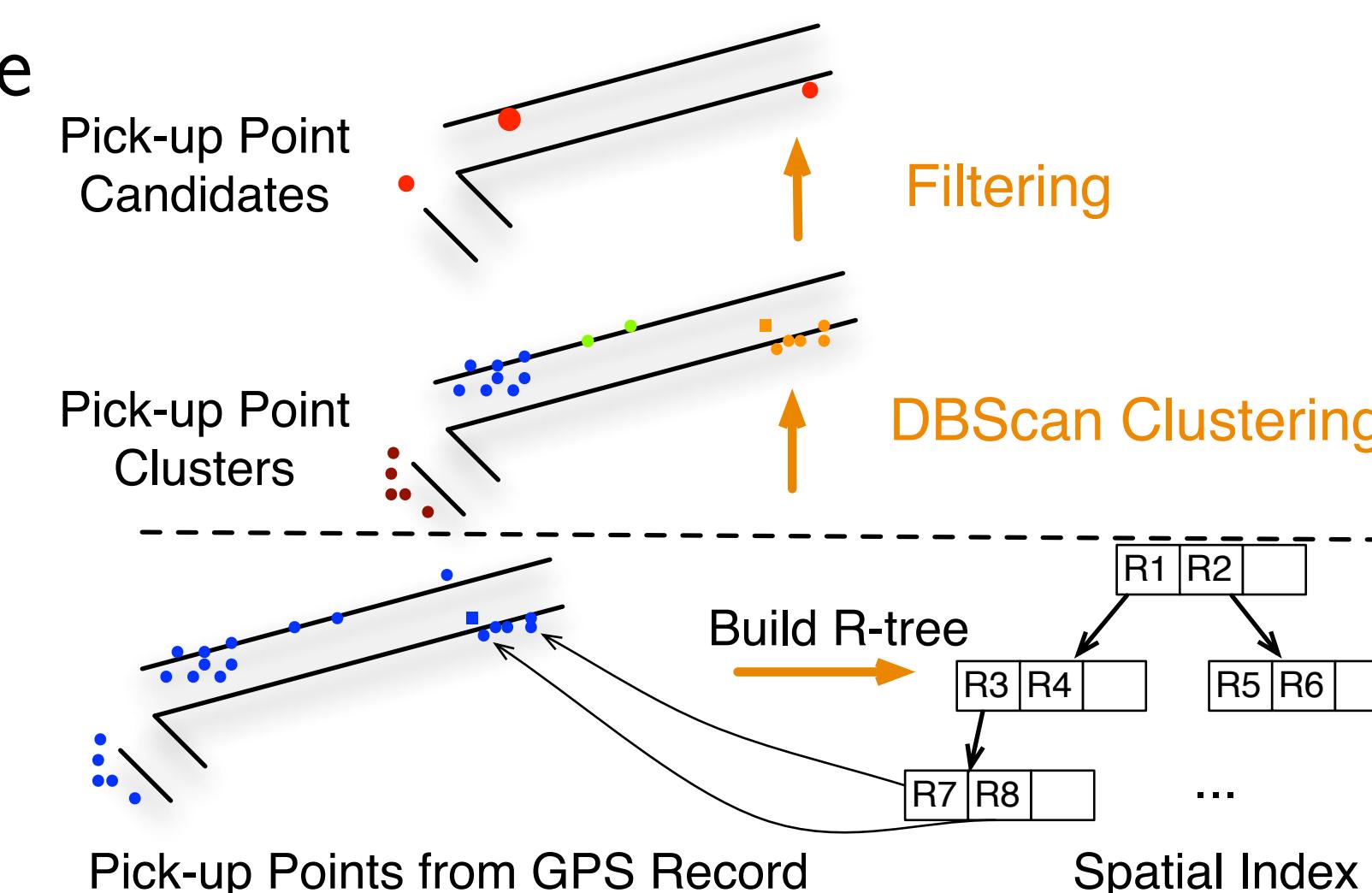
- Large scale taxi GPS data for accurate prediction
- Consider many factors for different situations
- Generate a list of pick-up points within a specified region

System Architecture



- Build spatial index on pick-up points to accelerate region queries
- Perform clustering on pick-up points
- Filter out 'sparse' clusters by frequency and distance rules
- Generate potential pick-up points for recommendation

Candidate Points Generation



Waiting Time Prediction Model

- Road Division** cluster road segments by traffic patterns
- Time Division** divide into hours and weekday/weekend/holiday
- Features** trajectory features, road features and weather features
- Models** linear regression, tree-based regression and Poisson process (model selection done by periodical evaluation)

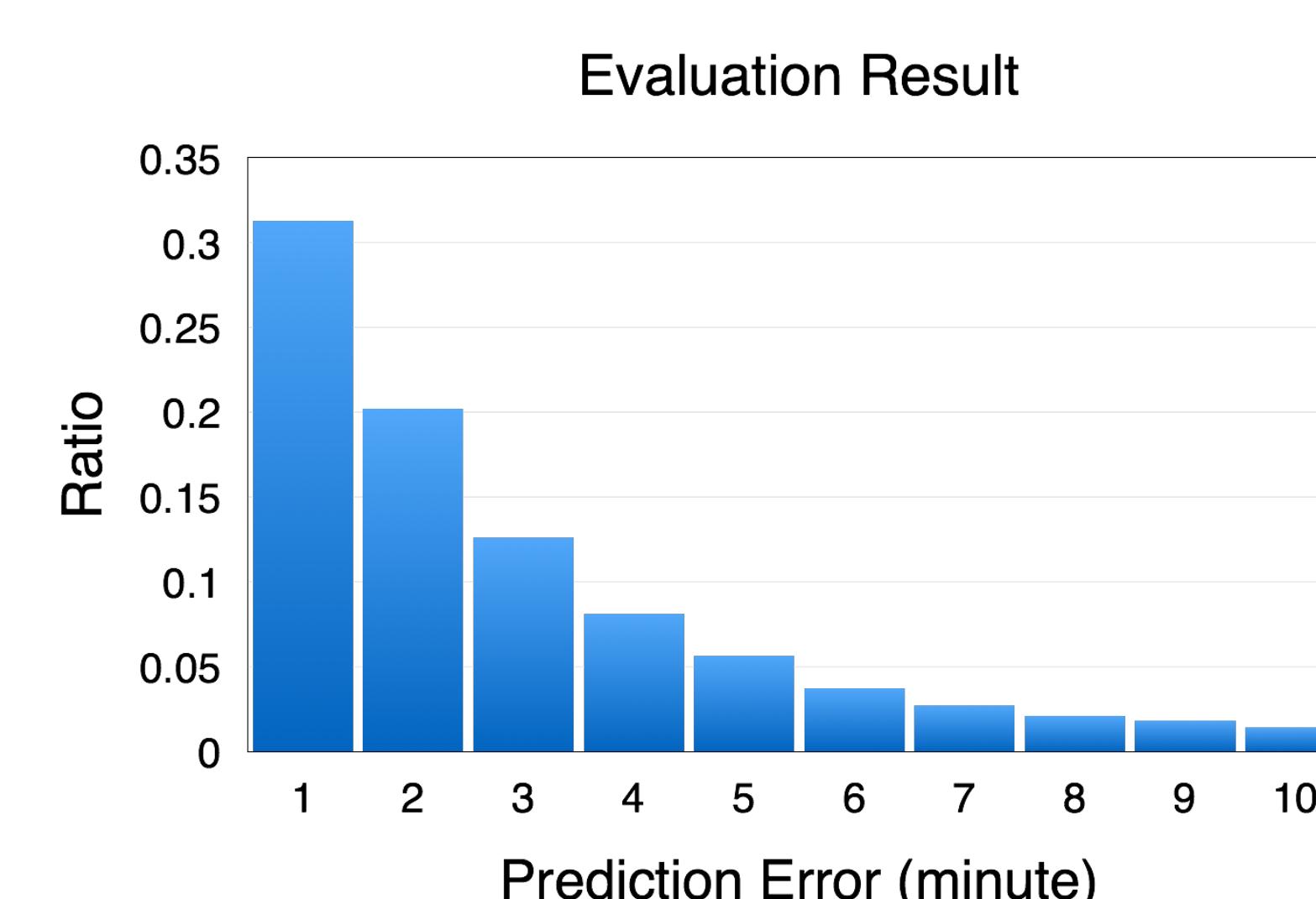
Pick-up Points Recommendation

- Query road segments in a specified distance and prune them by the route, if destination is provided.
- Use corresponding model to predict waiting time for each segment.
- Retrieve pick-up points and rank them.
- Prune and re-rank candidates by direction.

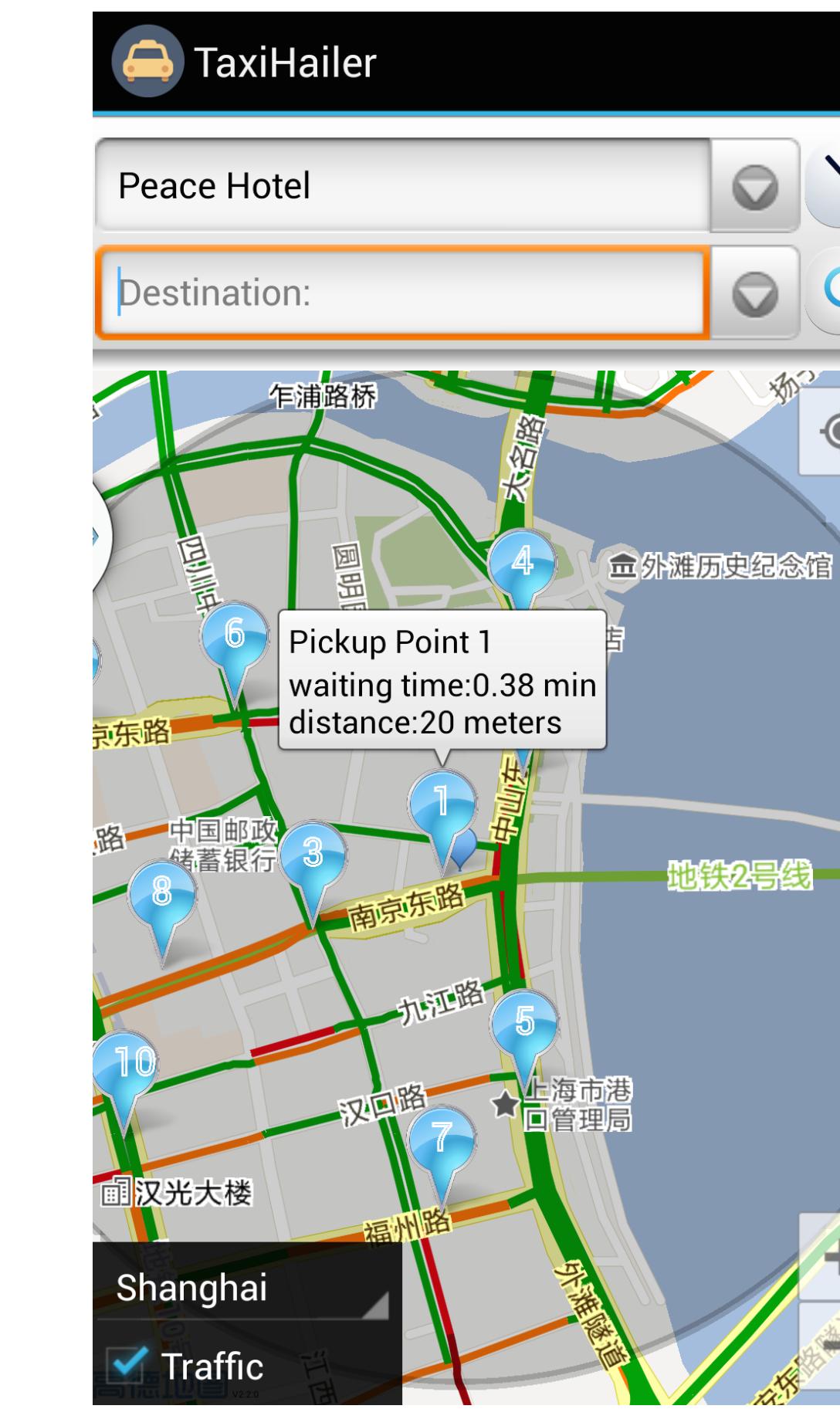
Dataset & Evaluation

Dataset Description

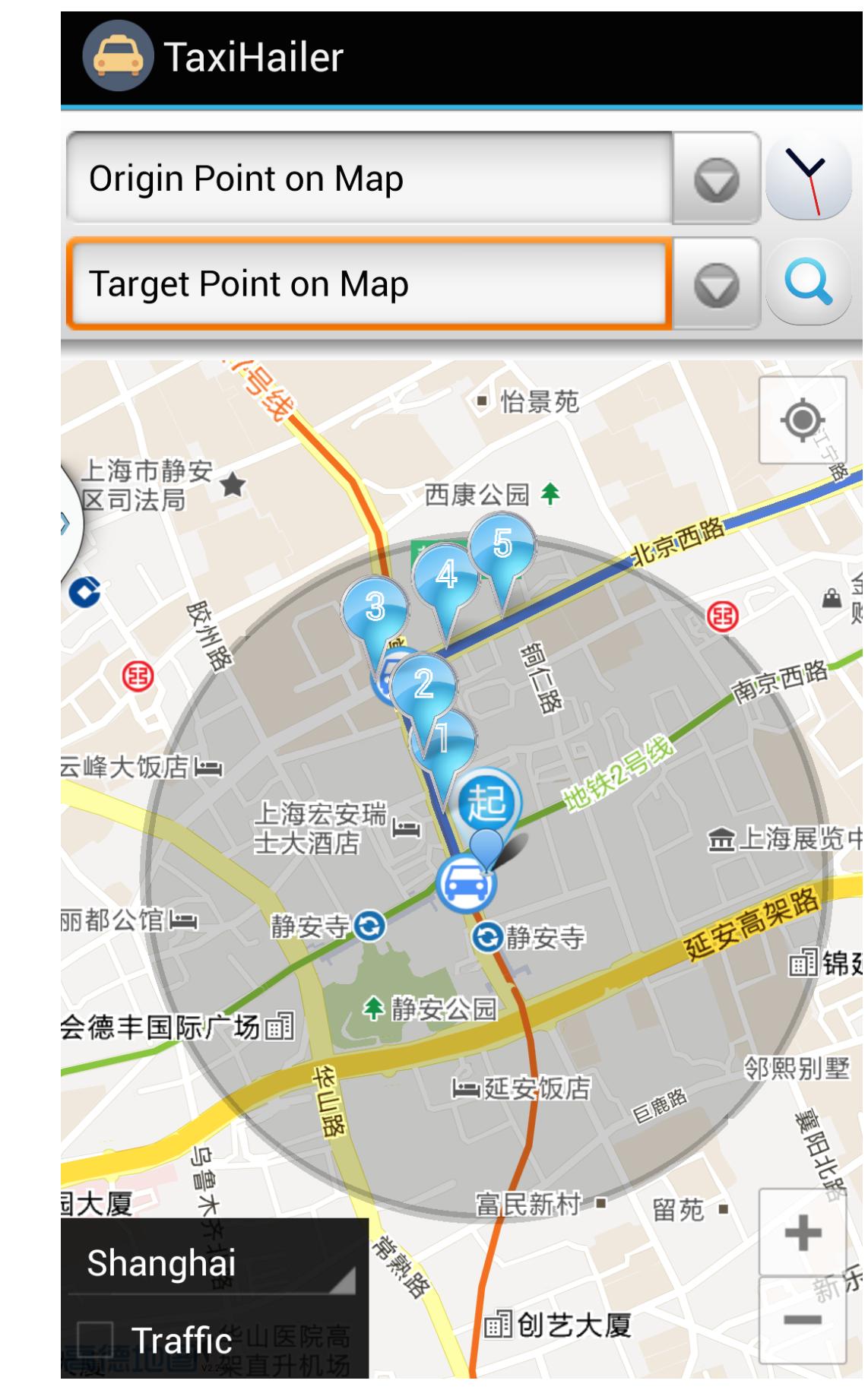
- GPS data of taxis in China (real and synthetic)
- Shanghai: 29,000 taxis
- Beijing: 12,000 taxis
- Time span: 4 weeks
- Evaluation: 65,000 queries



TaxiHailer Application



(a)



(b)

(a) Given a query point, e.g. Peace Hotel, TaxiHailer will display the top recommended pick-up points with their waiting time and distance information at the current time.

(b) If the destination and departure time are provided, TaxiHailer will make recommendation according to the specific situation, which describes the time interval of a day, weekday/weekend/holiday, weather and so on according to the query context. Also, it will prune and re-rank the pick-up point list with the planned route to the destination.

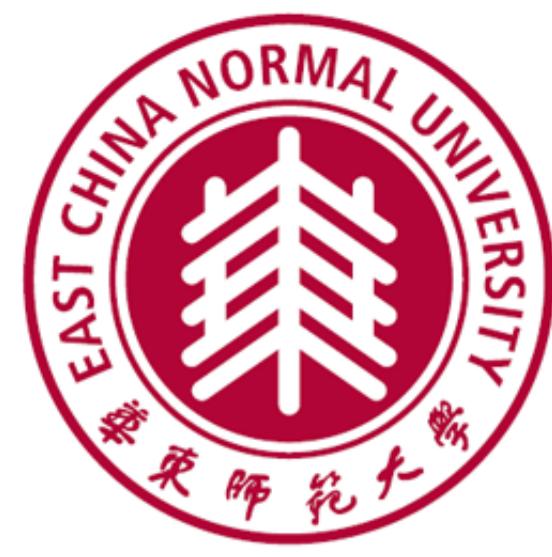
Future Work

- Recommend drivers locations to pick up passengers with real-time prediction functionality
- Crowd souring platform for both drivers and passengers

Demonstration Website

<http://database.ecnu.edu.cn/taxihailer/demo.html>
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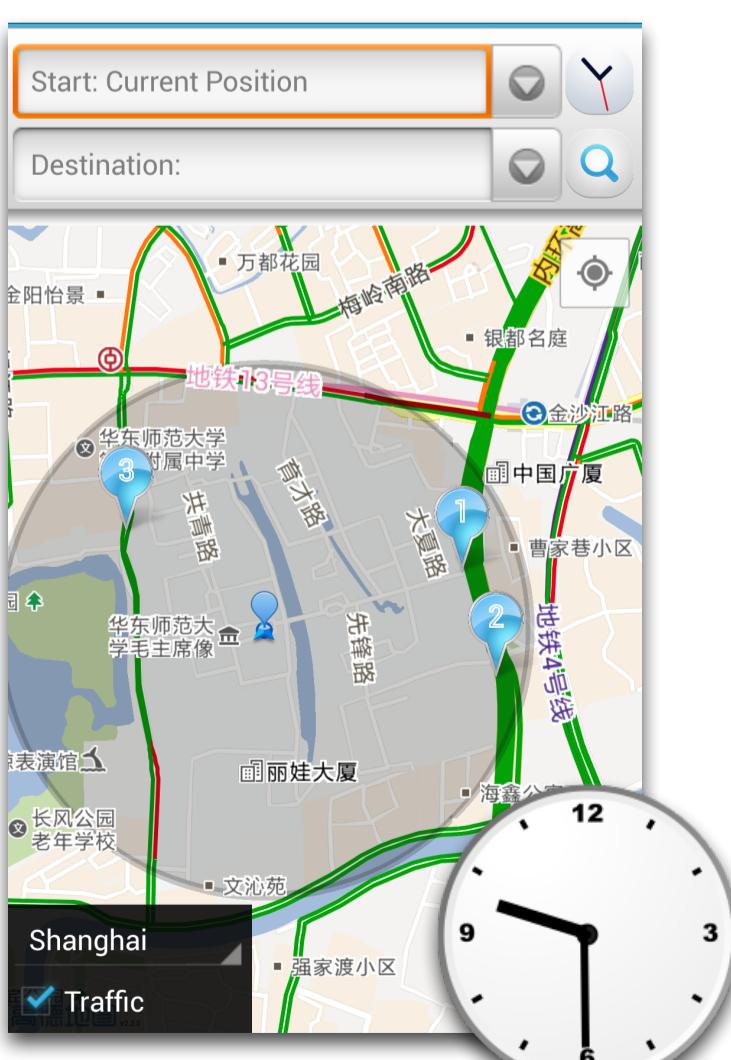
TaxiHailer - A Case Study: Michael's Trip in Shanghai

Michael is a visiting scholar at ECNU. After he delivered a speech here, we make a one-day itinerary for him.

With the help of **TaxiHailer**, he can find the most proper place to take a taxi in a short time.



ECNU Campus



- 9:30 AM
- Start on a journey from ECNU campus
- Three potential pick-up points nearby at the current time according to TaxiHailer
 - **Point 1: campus front gate**
 - Point 2: residential neighborhood exit
 - Point 3: campus back gate
- Next stop: People's Square

1

People's Square



- 10:00 AM ~ 12:00 AM
- Visit Urban Planning Exhibition Centre
- Visit the Shanghai Museum
- TaxiHailer recommends pick-up points to take a taxi to Yuyuan Garden at 12:00 AM

2

Yuyuan Garden



- 12:30 AM ~ 3:00 PM
- Enjoy the lunch at Lvbolang Restaurant in Yuyuan Garden
- Visit the Yu Garden Fashion Street and Shanghai Old Street
- Plan to take a taxi to the next stop: Shanghai World Financial Center (SWFC) located at Lujiazui CBD at 3:00 PM

3

Lujiazui CBD



- 4:00 PM ~ 8:00 PM
- Marvel at the magnificence of Shanghai on the 100th floor observatory deck of SWFC
- Visit the Lujiazui Financial and Trade Zone
- Have dinner in Zhengda Plaza at about 6:00 PM
- Enjoy the night view of the Bund on Riverside Avenue at the side of Lujiazui
- Back to campus at 8:00 PM

4