# Trends and Concepts in the Software Industry III
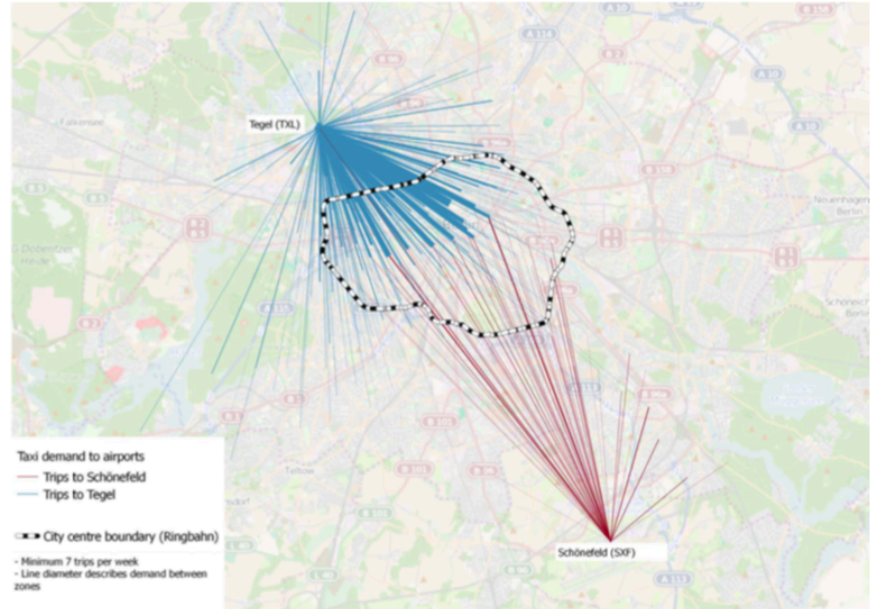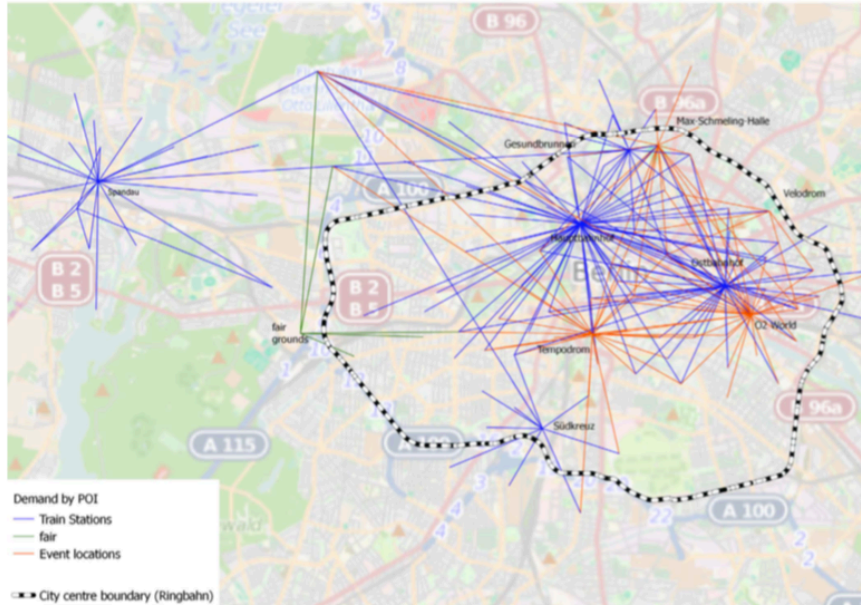# Exercise: In-Memory Geospatial Analysis

Matthias Uflacker, Keven Richly
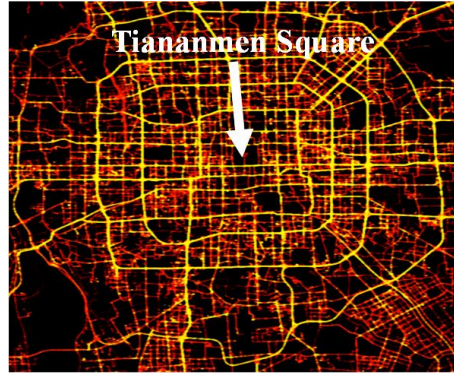
# Lecture Organization

- Teaching staff: Dr. Matthias Uflacker, Keven Richly

- Location: HPI Campus II, Building D

- Room: D-E.9/10

- 4 (SWS) 6 ECTS (graded)

- Enrollment: Sign up for the course until **Fri April 20**


- Grading

  - Implementation and presentation of your application

  - Project documentation

# Analysis of Berlin's Taxi Services by Exploring GPS Traces
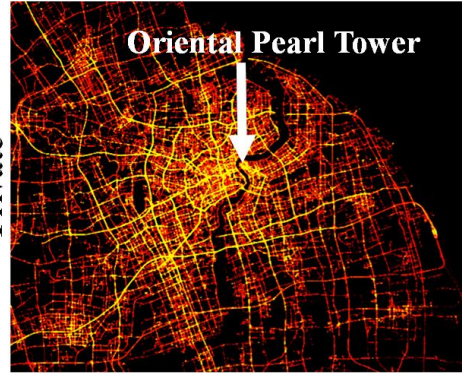
# Point of Interest Detection



Private — Beijing: Tiananmen Square; Shanghai: Oriental Pearl Tower; Shenzhen: Window of the World

Commercial — Beijing: 4th Ring Road, 5th Ring Road; Shanghai: Outer Ring Expressway; Shenzhen: G4 Expressway
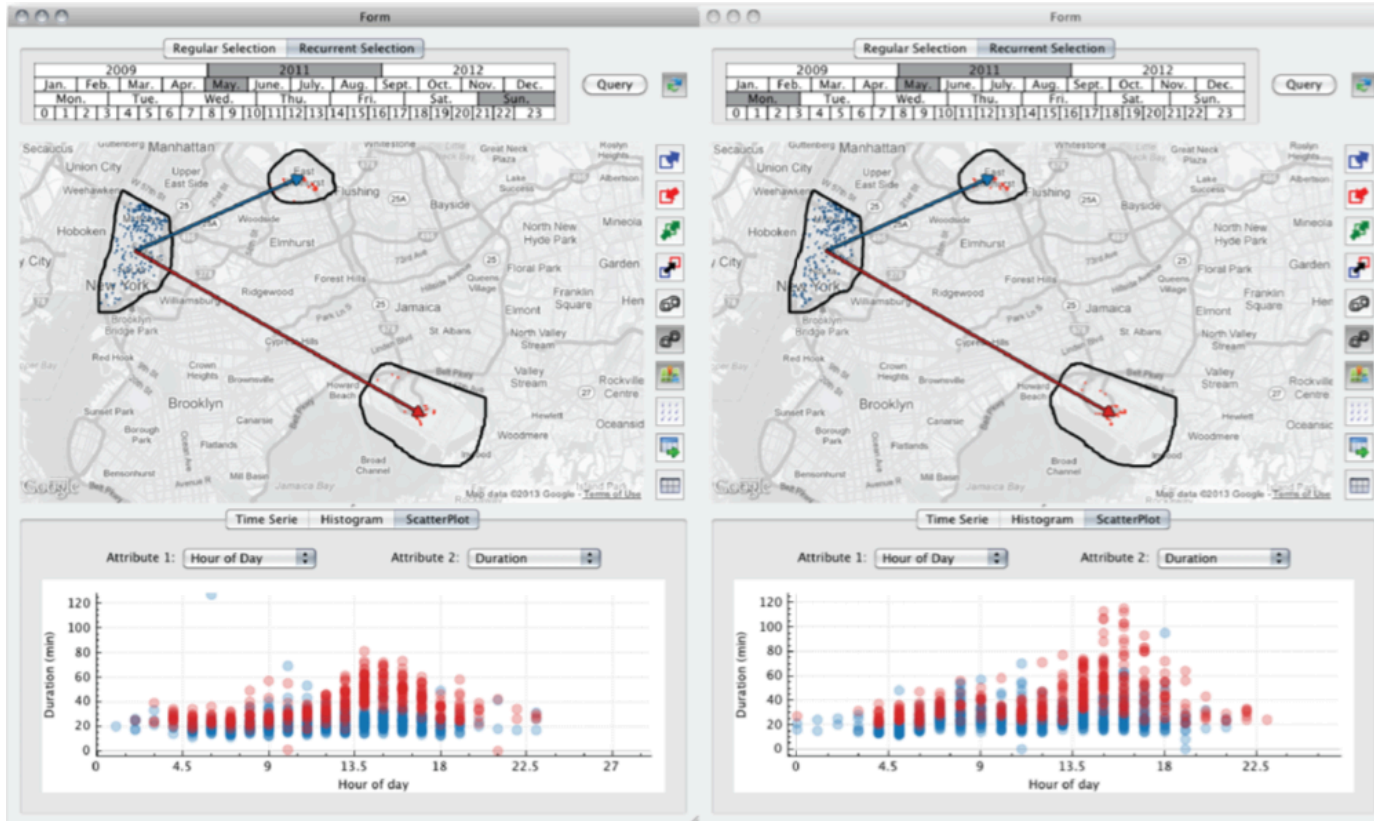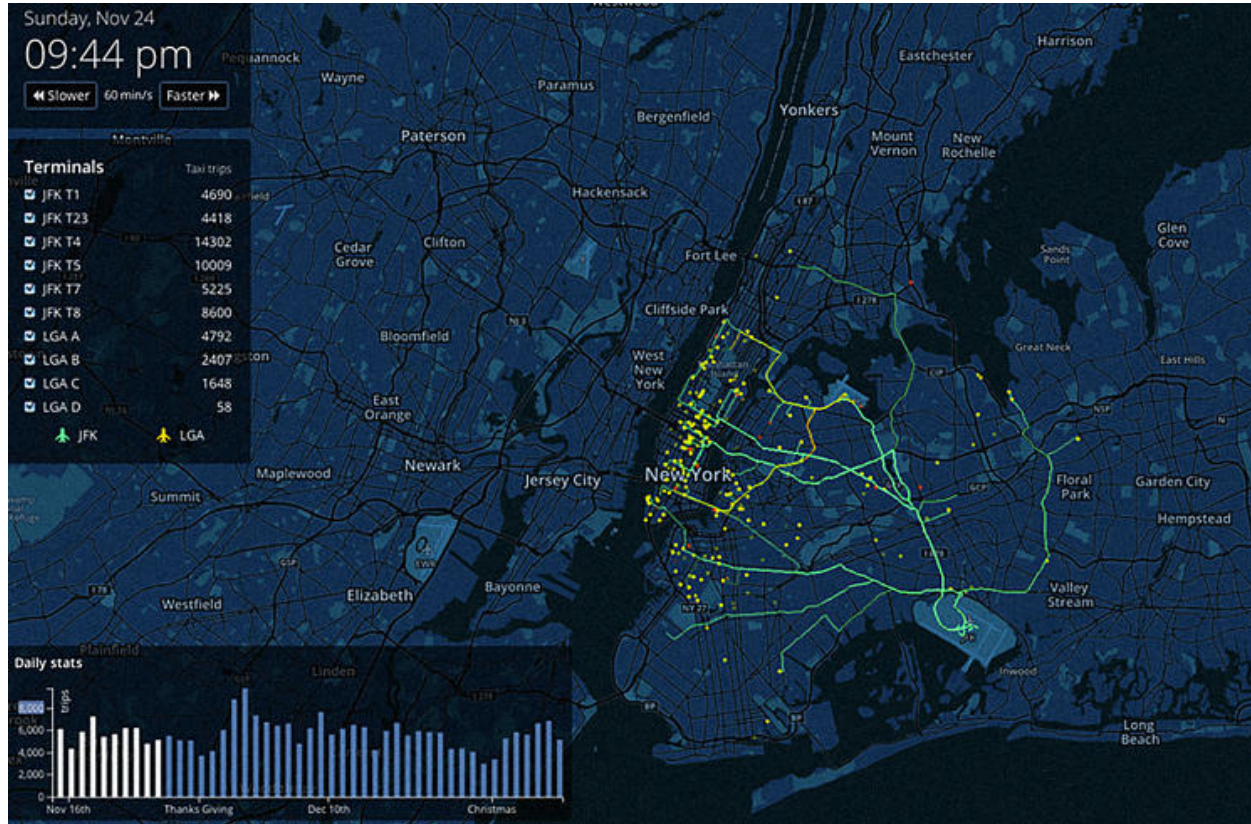
# Visual Exploration of Big Spatio-Temporal Urban Data: A Study of New York City Taxi Trips

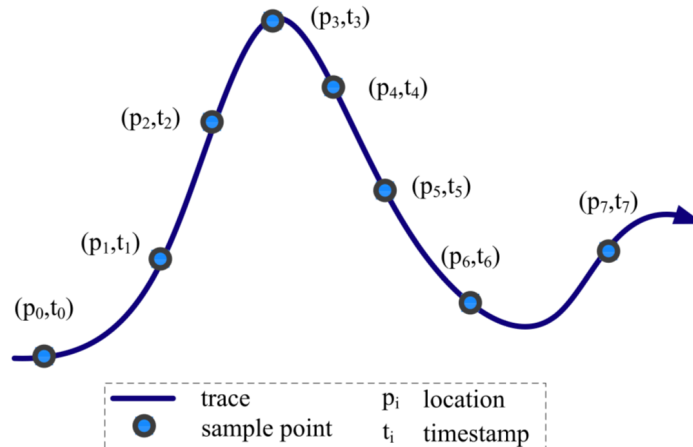# Holiday Craziness of NYC Airport Taxi Trips
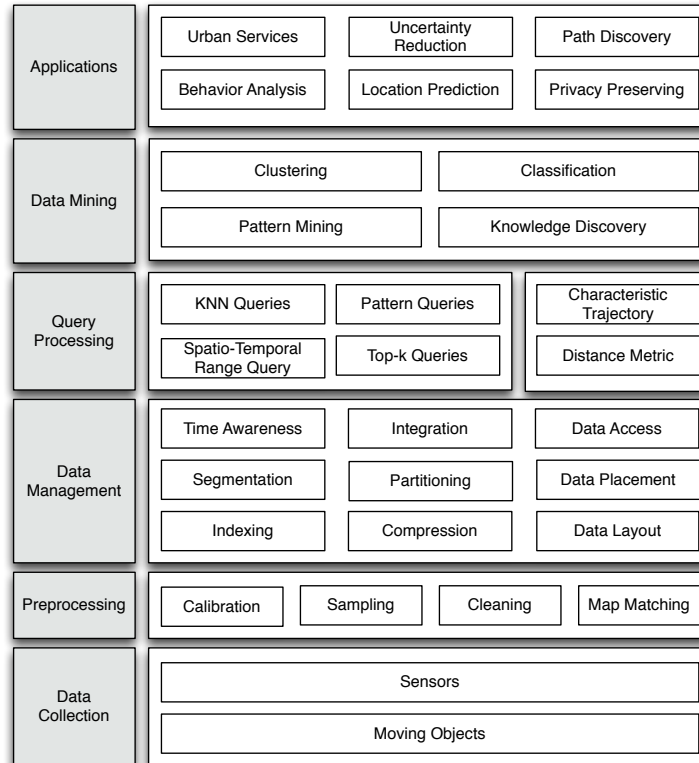
# Ride Sharing

# Trajectory Data

**DEFINITION**

A Trajectory $T_i$ of a moving object $O_i$ is a chronological ordered sequence of observed locations. Each instance $O_i(t_j)$ of a trajectory $O_i(t_1),O_i(t_2), \dots ,O_i(t_n)$ describes the specific spatial location of the moving object $O_i$ at the time $t_j$.

# Trajectory Analysis Framework

| Applications | Urban Services | Uncertainty Reduction | Path Discovery |
| | Behavior Analysis | Location Prediction | Privacy Preserving |

| Data Mining | Clustering | Classification |
| | Pattern Mining | Knowledge Discovery |

| Query Processing | KNN Queries | Pattern Queries | Characteristic Trajectory |
| | Spatio-Temporal Range Query | Top-k Queries | Distance Metric |

| Data Management | Time Awareness | Integration | Data Access |
| | Segmentation | Partitioning | Data Placement |
| | Indexing | Compression | Data Layout |

| Preprocessing | Calibration | Sampling | Cleaning | Map Matching |

| Data Collection | Sensors |
| | Moving Objects |

Questions?

# Sources

[1]: Bischoff, Joschka, Michal Maciejewski, and Alexander Sohr. "Analysis of Berlin's taxi services by exploring GPS traces." Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2015 International Conference on. IEEE, 2015.

[2]: Ferreira, Nivan, et al. "Visual exploration of big spatio-temporal urban data: A study of new york city taxi trips." IEEE Transactions on Visualization and Computer Graphics 19.12 (2013): 2149-2158.

[3]: https://www.psfk.com/2017/05/uber-the-future-of-cities-product-experience.html

[4]: https://www.grab.com/ph/share/

[5]: Feng, Zhenni, and Yanmin Zhu. "A survey on trajectory data mining: Techniques and applications." IEEE Access 4 (2016): 2056-2067.

[6]: https://www.cs.rutgers.edu/~dz220/visualization.html

[7]: https://www.6sqft.com/this-map-shows-the-holiday-craziness-of-nyc-airport-taxi-trips/