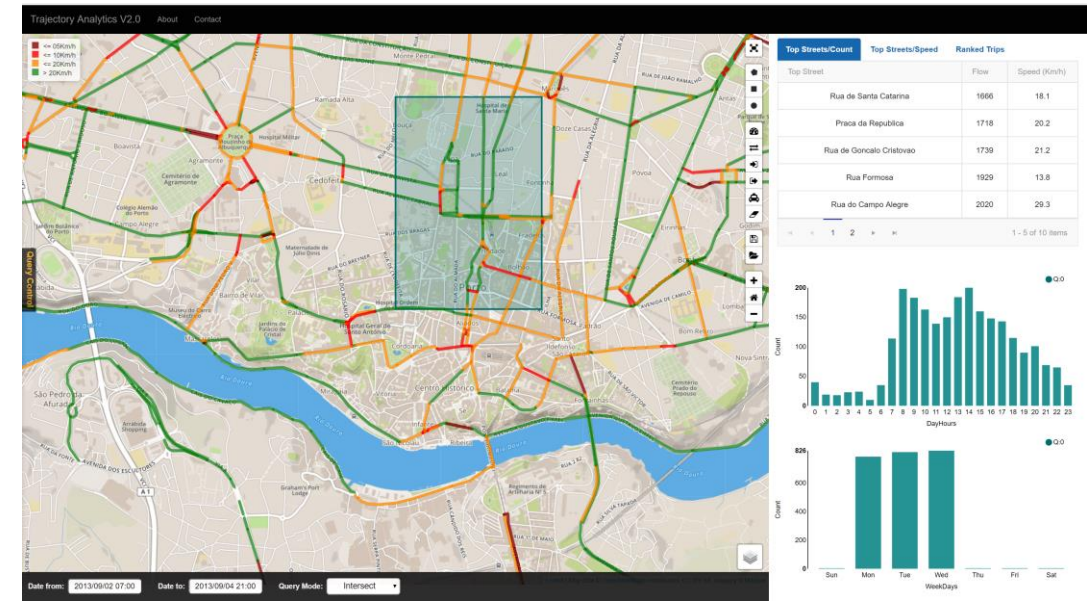# TrajAnalytics:

An open-source, web-based software system for visual analysis of urban trajectory data

YE ZHAO AND XINYUE YE   KENT STATE UNIVERSITY

JING YANG   UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Urban Trajectory Data

Advanced sensing technologies and computing infrastructures produce massive trajectory data.

- GPS, Wi-Fi, Cellular, RFID, blogs, tweets, etc.
- Taxis, fleets, public transits, human, etc.

Massive trajectory data "sample" city transportation and human mobility patterns.

- Origin/Destination, Positions, speed, occupancy, fare, direction, latitude, etc.
- Big, dynamic and complex spatiotemporal data.
- Taxis generate about 20 percent of traffic flow on road surfaces of Beijing China.

Urban Study with Trajectory Data

Decipher the information hidden in the trajectories of large populations.

Optimize assessment and planning of transportation infrastructures and policies.

Improve life quality and environment.

TrajAnalytics Software: Goal

To support researchers and analysts in transportation studies to

conduct data driven analysis utilizing real-world trajectory data.

◦ A publicly available and easy-to-use visual analytics software system.

◦ Iterative, evolving information foraging and sense making.

◦ Interactive process using domain knowledge.

TrajAnalytics Software: Features

Integrate scalable data management and interactive visualization with powerful computational capability.

◦ Powerful computing platform.

◦ Easy access gateway.

◦ Scalable data storage and management.

◦ Exploratory visualization.
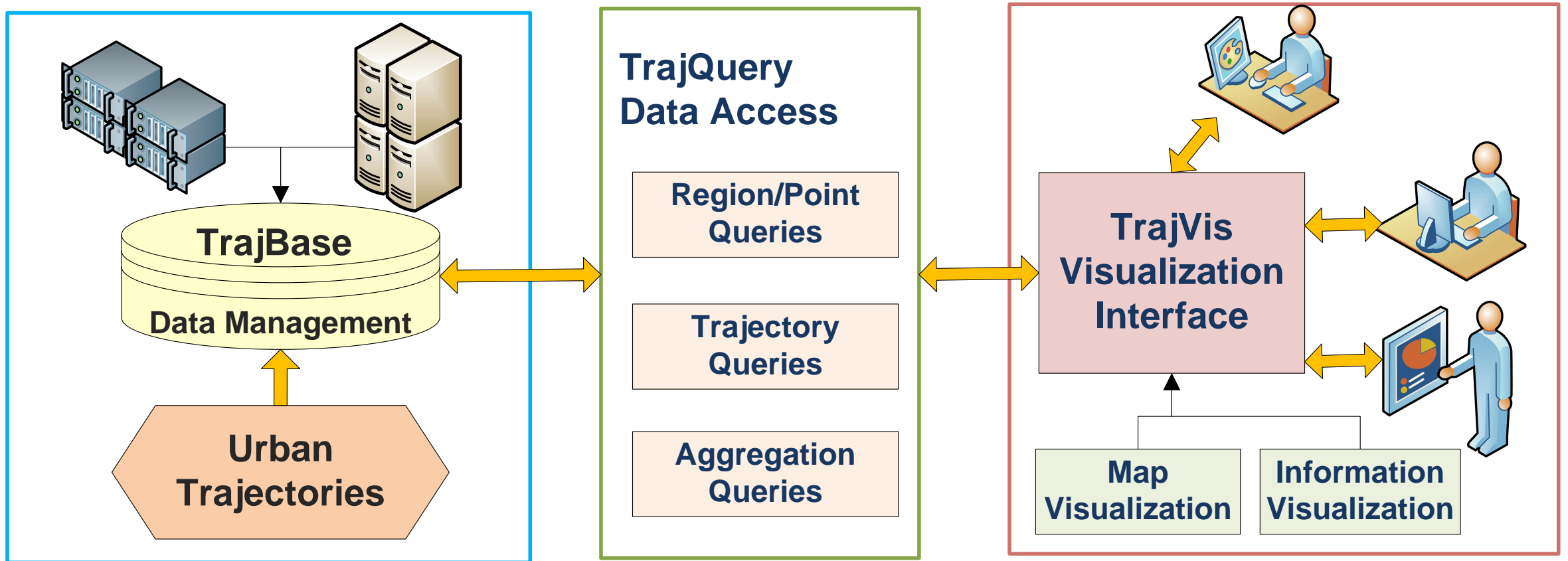
TrajAnalytics Software Design

TrajBase: manage big data over distributed platform.

TrajQuery: quickly answer data queries with parallel computing.

TrajVis: interactive visualization interface for exploratory data analysis and sharing.

- Web-based over internet access

TrajAnalytics Software Framework

TrajBase

Data Management

Urban Trajectories

TrajQuery Data Access

Region/Point Queries

Trajectory Queries

Aggregation Queries

TrajVis Visualization Interface
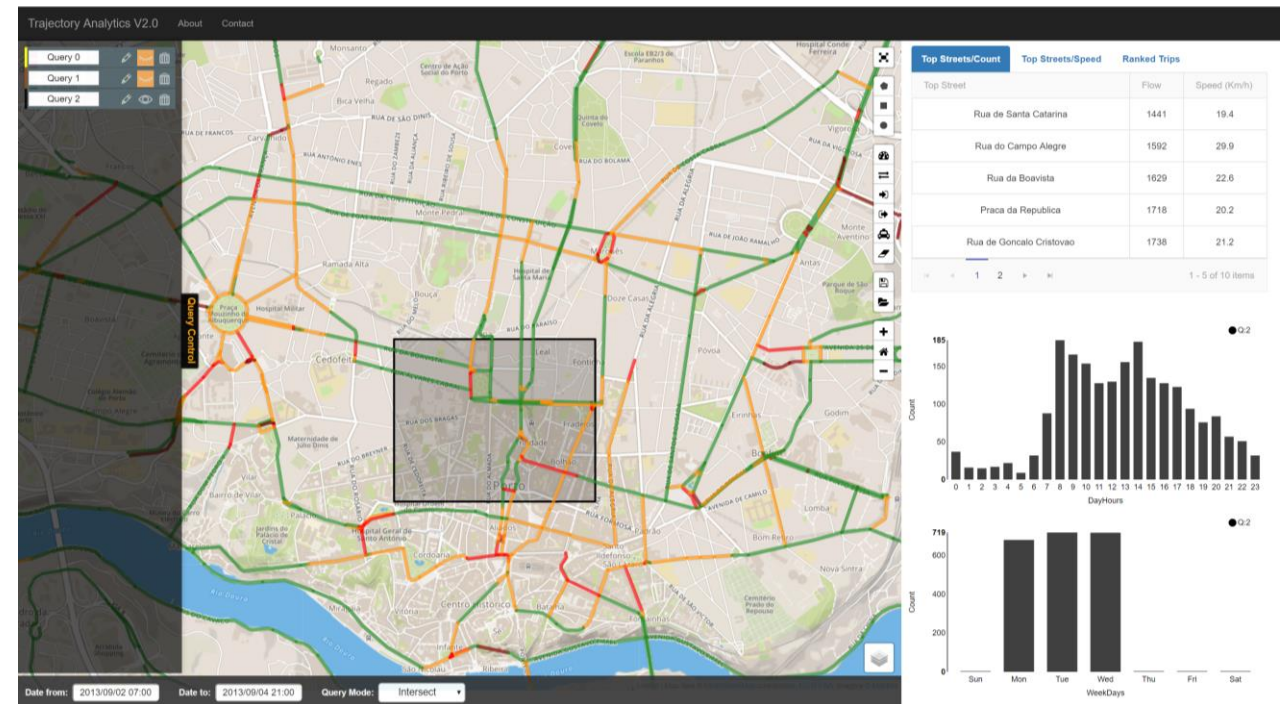
Map Visualization

Information Visualization

Software Implementation

◦ Server: PostgreSQL with spatial indexing

◦ Client web system: PHP with HTTP, accessing with any internet browser

◦ Web interface: JavaScript with multiple libraries

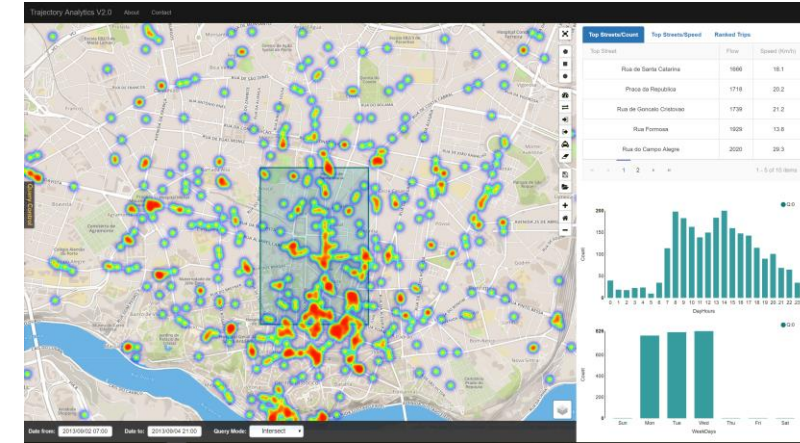   ◦ Leaflet, D3js, and more

Software Website and Code

- Software website: http://vis.cs.kent.edu/

- Version 2 trial is currently available online for evaluation

- Feedback is extremely welcome

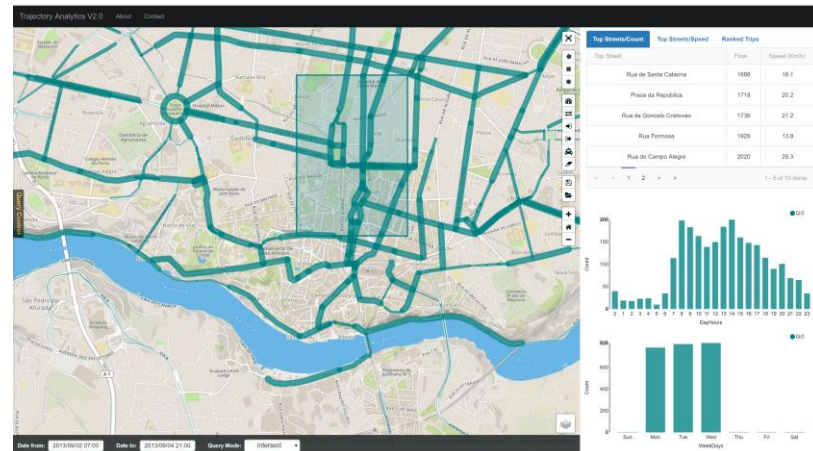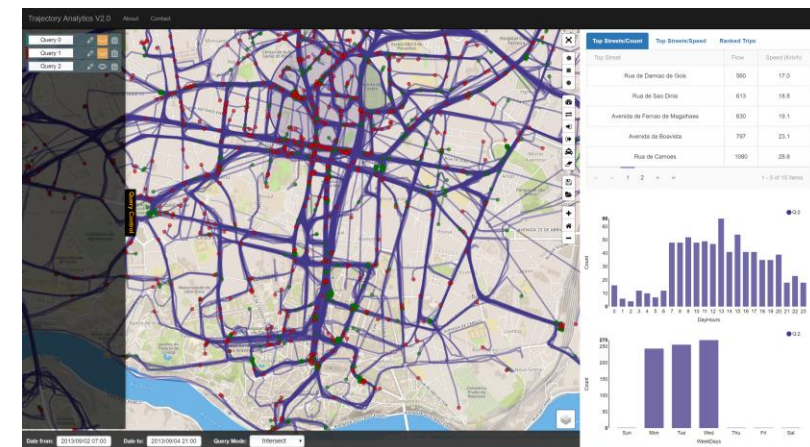- Version 2 code will be available for public download in Fall 2017

Sample Views
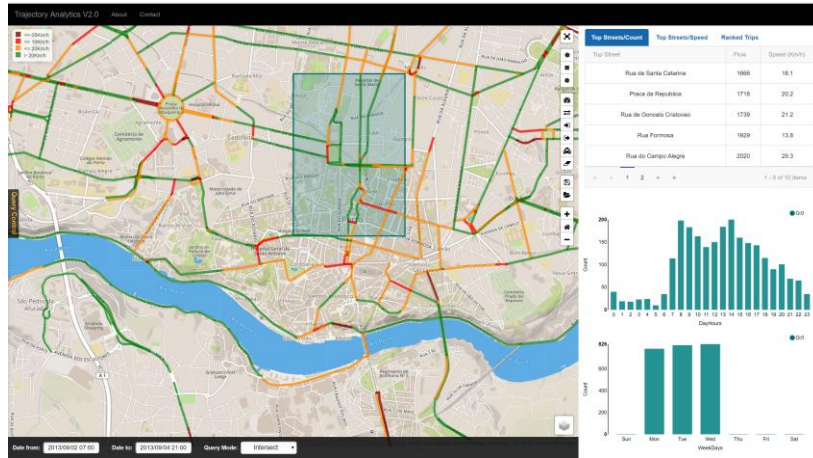
Traffic Speed Visualization

Taxi Pickup Location Heatmap

Traffic Flow Visualization

Trajectory with Taxi Pickup/Drop off locations

Data Preprocessing and Loading Module

◦ A software module for users to conveniently process their own trajectory data

- ◦ Load raw trajectory data sets with massive GPS sample points
- ◦ Automatically fetch corresponding road segments data from OpenStreetMap
- ◦ Automatically match the raw data with road segments
- ◦ Load into TrajAnalytics database
- ◦ Ready for visual analytics tasks in TrajAnalytics system

Select Database. | Extract Road Network. | Map Matching. | Create TDS Data.
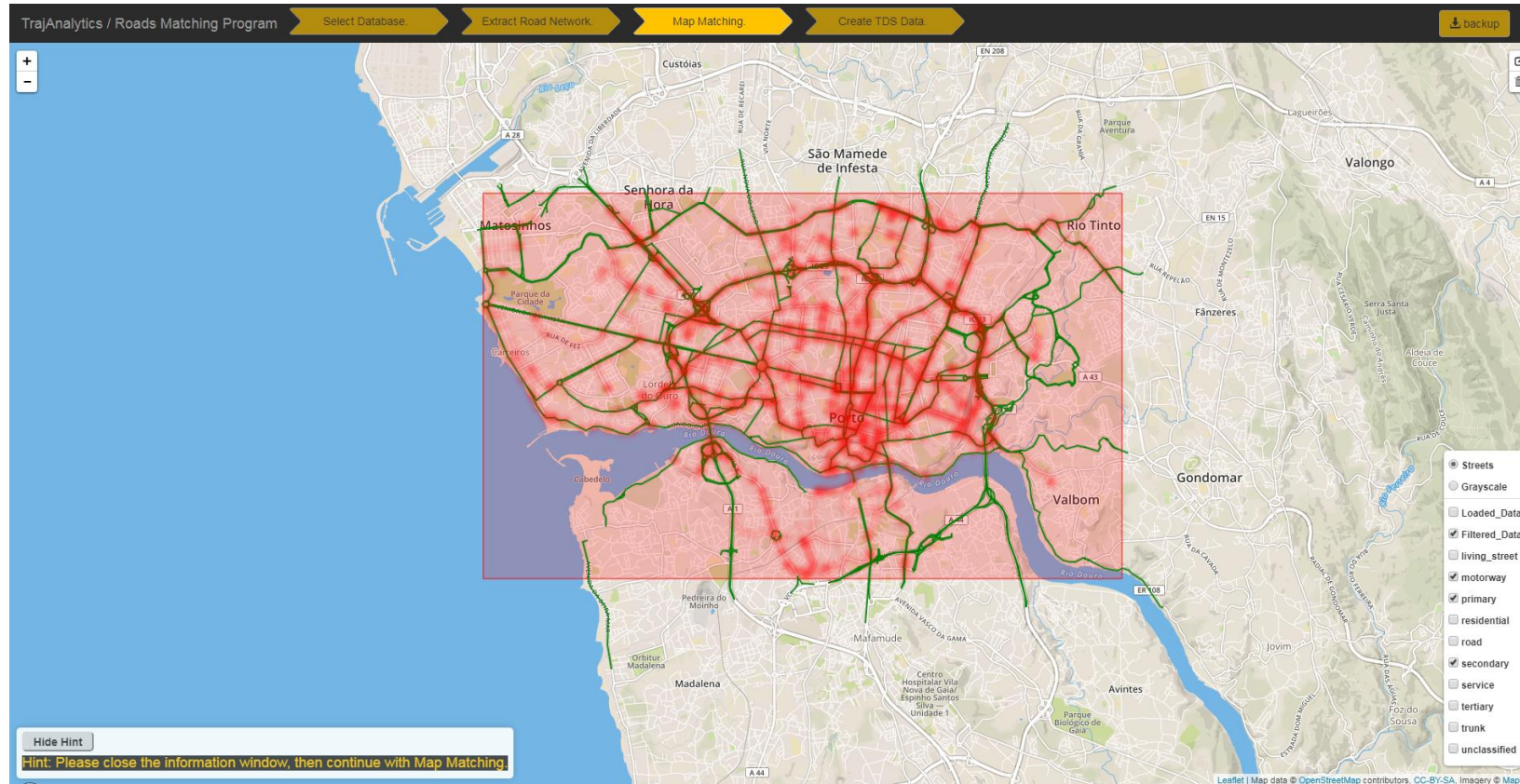
Data Preprocessing Software

Sample points in raw trajectory data
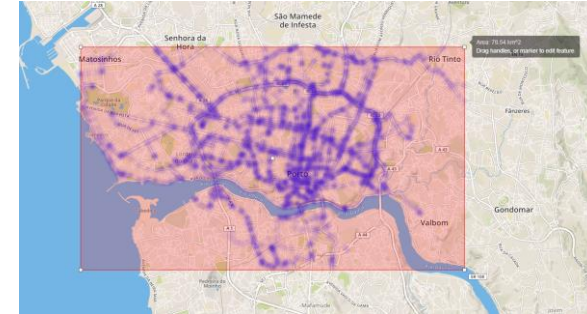
Matched to road networks

Team:

Directors:

Ye Zhao, Xinyue Ye, Jing Yang

Developers:

Shamal AL-Dohuki, Farah Kamw, Xinyi Huang, Suphanut Jamonnak, Tinghao Feng, Yueqi Hu

Oranizations:

Kent State University,

University of North Carolina at Charlotte

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Thank You!