CS 672: Data Science for Smart Cities

Rutgers University-Spring 2020

Information

Instructor:	Desheng Zhang
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Lectures:	Monday, 1:40-4:40 pm
Classroom:	Busch Science and Engineering Resource Center (SEC) 208
Office Hours:	Monday, 12:30-1:30pm
Textbooks:	No books are required, and links for references and papers are provided.
Grading:	10% for Class Participation; 20% for Reading Summaries; 20% for Topic Participation; 50% for Team Project (10% for Proposal Report; 20% for Final Report; 20% for Presentation)

New Announcements

Week	Date	Topics and Reading Assignments
1	Jan 27	General Class Introduction
2	Feb 3	Summary Writing and Presentation Introduction Suggested Reading: ▢ Urban Computing: Concepts, Methodologies, and Applications

3	Feb 10	Topic 1. Urban Sensing Reading: - 0. A Systematic Review for Smart City Data Analytics - 1. MAC: Measuring the Impacts of Anomalies on Travel Time of Multiple Transportation Systems - 2. coSense: Collaborative Urban-Scale Vehicle Sensing based on Heterogeneous Fleets - 3. EXIMIUS: A Measurement Framework for Explicit and Implicit Urban Traffic Sensing - 4. MutliCell: Urban Population Modeling based on Multiple Cellphone Networks - 5. CellTrans: Private Car or Public Transportation? Infer Users' Main Transportation Modes - 6. SharedEdge: GPS-Free Fine-Grained Travel Time Estimation in State-Level Highway Systems
4	Feb 17	Topic 2. Data-Driven Modeling: Human Mobility Reading: - 0. Urban Human Mobility: Data-Driven Modeling and Prediction - 1. Human Mobility Modeling at Metropolitan Scales - 2. Mobility Modeling and Prediction in Bike-Sharing Systems - 3. Inferring human mobility patterns from taxicab location traces - 4. BuSCOPE: Fusing Individual & Aggregated Mobility Behavior for "Live" Smart City Services - 5. Route Prediction for Instant Delivery - 6. Returners and explorers dichotomy in human mobility
5	Feb 24	Topic 3. Data-Driven Modeling: Urban Phenomena Reading: - 0. Data-driven Human Mobility Modeling: A Survey and Engineering Guidance for Mobile Networking - 1. Understanding Long-Term Evolving Patterns of Shared Electric Vehicle Fleets

		• 2. Discovering Regions of Different Functions in a City Using Human Mobility and POIs
		• 3. Inferring Gas Consumption and Pollution Emissions of Vehicles throughout a City
		• 4. U-Air: When Urban Air Quality Inference Meets Big Data
		• 5. CityGuard: Citywide Fire Risk Forecasting Using A Machine Learning Approach.
		• 6. Hard to Park? Estimating Parking Difficulty at Scale
6	Mar 2	Topic 4. Data-Driven Modeling: Data Fusion Reading: • 0. Methodologies for Cross-Domain Data Fusion: An Overview • 1. coMobile: Real-time Human Mobility Modeling at Urban Scale by Multi-View Learning • 2. Detecting Urban Anomalies Using Multiple Spatio-Temporal Data Sources • 3. Diagnosing New York City Noises with Ubiquitous Data • 4. Hydra: A Personalized and Context-Aware Multi-Modal Transportation Recommendation System • 5. PrivateHunt: Multi-Source Data-Driven Dispatching in For-Hire Vehicle Systems • 6. The Role of Urban Mobility in Retail Business Survival
7	Mar 9	Topic 5. Data Visual Analytics Reading: • 0. Visual Analytics in Urban Computing: An Overview • 1. SmartAdP: Visual Analytics of Large-scale Taxi Trajectories for Selecting Billboard Locations • 2. Narrative Visualization: Telling Stories with Data • 3. Data Changes Everything: Challenges and Opportunities in Data Visualization Design Handoff • 4. What is Interaction for Data Visualization? • 5. TelCoVis: Visual Exploration of Co-occurrence in Urban Human Mobility Based on Telco Data

		• 6. AirVis: Visual Analytics of Air Pollution Propagation
Spring Break		
8	Mar 23	Project Proposal Presentation No Reading Assignment
9	Mar 30	Topic 6.Data-Driven Decision Making Reading: • 0. Data Sets, Modeling and Decision Making in Smart Cities: A Survey • 1. A Deep Reinforcement Learning-Enabled Dynamic Redeployment System for Mobile Ambulances • 2. Towards Efficient Sharing: A Usage Balancing Mechanism for Bike Sharing Systems • 3. Planning bike lanes based on Sharing-bike's trajectories. • 4. sharedCharging: Data-Driven Shared Charging for Large-Scale Heterogeneous Electric Vehicles • 5. Addressing the minimum fleet problem in on-demand urban mobility • 6. Exploiting Heterogeneous Human Mobility Patterns for Intelligent Bus Routing
10	Apr 6	Topic 7.Novel Services Reading: • 0. Urban Computing Leveraging Location-Based Social Network Data: A Survey • 1. Catch Me If You Can: Detecting Pickpocket Suspects from Large-Scale Transit Records • 2. A Taxi Driving Fraud Detection System • 3. Learning to Generate Maps from Trajectories • 4. Growing the Charging Station Network for Electric Vehicles with Trajectory Data Analytics • 5. Alleviating Users' Pain of Waiting: Effective Task Grouping for Online-to-Offline Food Delivery • 6. Detecting Vehicle Illegal Parking Events using Sharing Bikes' Trajectories

11	Apr 13	Topic 8. Transferability and Dependency Analyses Reading: • 0. A Survey on Transfer Learning • 1. pg-Causality: Identifying Spatiotemporal Causal Pathways for Air Pollutants with Urban Big Data. • 2. Transfer Knowledge between Cities • 3. Learning from Hometown and Current City: Cross-city POI Recommendation via Interest Drift • 4. Cityresolver: a decision support system for conflict resolution in smart cities • 5. CellRep: Usage Representativeness Modeling and Correction Based on Multiple Cellular Networks • 6. Understanding the Evolution of City-Scale Ridesharing Services: A Perspective of EV Penetration
12	Apr 20	Topic 9. Human-in-the-loop Reading: • 0. People-Centric Urban Sensing • 1. Taxi Driving Behavior Analysis in Latent Vehicle-to-Vehicle Networks: A Social Influence Perspective • 2. Understanding User Behavior in Online Car Sharing Services Through the Lens of Mobility • 3. Human Mobility, Social Ties, and Link Prediction • 4. Friendship and Mobility: User Movement in Location-Based Social Networks • 5. Community Interaction and Conflict on the Web • 6. DeepAPP: A Deep Reinforcement Learning Framework for Mobile Application Usage Prediction
13	Apr 27	Topic 10.Privacy and Security Reading: • 0. The Long Road to Computational Location Privacy: A Survey

		• 1. PrivateBus: Privacy Identification and Protection in Large-Scale Bus WiFi Systems • 2. Anonymization of Location Data Does Not Work: A Large-Scale Measurement Study • 3. Elastic Pathing: Your Speed is Enough to Track You • 4. "Why Are They Collecting My Data?": Inferring the Purposes of Network Traffic in Mobile Apps • 5. CrowdPOI: A Crowdsourcing System for POI Location Fraud Corrections • 6. TrajGuard: A Comprehensive Trajectory Copyright Protection Scheme
14	May 4	Final Project Presentation No Reading Assignment
	May 11	Final project papers are due on May 11th 11:59PM EST.

"How to" List

1. [How to Read a Paper](#) by S. Keshav.
2. [How to Read a Research Paper](#) by Michael Mitzenmacher.
3. [Writing Reviews for Systems Conferences](#) by Timothy Roscoe.
4. [How to Read an Engineering Research Paper](#) by William Griswold.
5. [How to Read a Research Paper](#) by Spencer Rugaber.
6. [How to write a great research paper](#) by Simon Peyton Jones.
7. [How to give a great research talk](#) by Simon Peyton Jones.