ZHICHENG LIU

Ph.D. Candidate (Expected Graduation: 2021 Spring)
School of Information Science and Engineering, Southeast University, China
Email: zhichengliu@seu.edu.cn Skype: jackmiemie@yeah.net

RESEARCH INTEREST

Data science and its application in urban system
Spatiotemporal data mining, graph mining, probabilistic modeling

EDUCATION

2014, B.Eng., Southeast University, China, Information Engineering

2014 - present, Ph.D. Student, School of Information Science and Engineering, Southeast University, China, Urban Informatics, Supervisor: Qiao Wang (Data Science), Junyan Yang (Urban Planning)

2018.11 - 2019.10, Visiting Ph.D. Student, New York University, Supervisor: Claudio Silver

INTERNSHIP

2020.7 - 2020.9, Algorithm Engineer, City Brain Lab of Alibaba DAMO Academy, traffic data mining and LiDAR-based object detection

2017.3 - 2017.12, Data Engineer, Shanghai FusionTree (MIT Startup), map service and data analysis

2014.6 - 2016.6, Data Analyst, YIK Data Analytics (Startup), LBS data analysis

PUBLICATIONS

Conference Papers

- Zhicheng Liu, Fabio Miranda, Weiting Xiong, Junyan Yang, Qiao Wang, Claudio T Silva. "Learning Geo-Contextual Embeddings for Commuting Flow Prediction," AAAI Conference on Artificial Intelligence (AAAI). AAAI, 2020.
- Zhicheng Liu, Shuai Yan, Jun Cao, Tanhua Jin, Jiabo Tang, Junyan Yang, Qiao Wang. "A Bayesian Approach to Residential Property Valuation Based on Built Environment and House Characteristics," 2018 IEEE International Conference on Big Data (Big Data). IEEE, 2018: 1455-1464.
- Jiabo Tang, Zhicheng Liu, Yuran Wang, Junyan Yang, Qiao Wang. "Using Geographic Information and Point of Interest to Estimate Missing Second-Hand Housing Price of Residential Area in Urban Space." 2018 IEEE International Smart Cities Conference (ISC2). IEEE, 2018.
- Yuming Qian, Zhicheng Liu, Junyan Yang, Qiao Wang. "A Method of Exchanging Data in Smart City by Blockchain." IEEE 16th International Conference on Smart City (HPCC/ SmartCity/DSS). IEEE, 2018.
- Zhicheng Liu, Jun Cao, Junyan Yang, Qiao Wang. "Discovering dynamic patterns of urban space via semi-nonnegative matrix factorization." 2017 IEEE International Conference on Big Data (Big Data). IEEE, 2017.
- Zhicheng Liu, Jinbin Yu, Weiting Xiong, Jian Lu, Junyan Yang, Qiao Wang. "Using mobile phone data to explore spatial-temporal evolution of home-based daily mobility patterns in Shanghai." 2016 International Conference on Behavioral, Economic and Socio-cultural Computing (BESC). IEEE, 2016.

Journal Papers

- Zhicheng Liu, Jun Cao, Renjie Xie, Junyan Yang, Qiao Wang. "Modeling Submarket Effect for Real Estate Hedonic Valuation: A Bayesian Approach," IEEE Transactions on Knowledge and Data Engineering (2020).

- Zhicheng Liu, Fabio Miranda, Xiaosu Ma, Weiting Xiong, Junyan Yang, Qiao Wang. "Trip Distribution Modeling by Graph Neural Network," Submitted to IEEE Transactions on Intelligent Transportation Systems, Under Review.
- Qinghe Liu, Zhicheng Liu, Deqiang Li, Zefei Gao, Junkai Zhu, Junyan Yang, Qiao Wang. "Assessing the Tendency of 2019-nCoV (COVID-19) Outbreak in China," Under Review.
- Deqiang Li, Zhicheng Liu, Qinghe Liu, Zefei Gao, Junkai Zhu, Junyan Yang, Qiao Wang. "Estimating the Efficacy of Traffic Blockage and Quarantine for the Epidemic Caused by 2019-nCoV (COVID-19)," Under Review.
- Jun Cao, Ke Wang, Renjie Xie, Zhicheng Liu, Song Wang, Junyan Yang, Qiao Wang, "Street Box: Modeling the Rhythm of Street Form," Under Review.
- Yingcheng Li, Nicholas A. Phelps, Zhicheng Liu, Haitao Ma. "The landscape of Chinese invention patents: Quantity, density, and intensity." Environment and Planning A: Economy and Space (2019): 0308518X18824107.

Patents

- Chinese patent 201710101688.6, A Method to Recognize Staying Behavior of Mobile Phone Users, issued to the University of Southeast University on Feb. 24th, 2017.
- Chinese patent 201811188233.3, A Method and System to Automatic Urban Form Partitioning, issued to the University of Southeast University on Oct. 12th, 2018.
- Chinese patent 201910072439.8, A Method to Automatic Land Use Recognition Based on Point of Interest and Architecture Form, issued to the University of Southeast University on Jan. 25th, 2019.

PROJECT EXPERIENCE

Data Science and Its Application in Urban Planning, 2016 - present

This is my Ph.D. project which is collaborated with urban planners and supported by several NSF fundings. It aims at modeling spatiotemporal human behavior and spatial interactions between human behavior and built environment to help city planners and managers to gain insights from massive urban dataset. I have :

- led a data science team participating in dozens of governmental planning projects including Shanghai, Guangzhou, Shenzhen, Nanjing.
- developed a graph neural network based model to evaluate the impacts of built environment on commuting flow. (AAAI paper)
- developed a Bayesian approach to real-estate valuation which is interpretable and outperforms traditional valuation methods. (TKDE paper and IEEE BigData paper)
- implemented Nonnegative Matrix Factorization to assist city planners to discover dynamic pattern automatically. (IEEE BigData paper)
- developed sequential modeling method using natural language processing technics to study the mobility correlation of urban space.
- extracted individual mobility motif (network) to study the spatio-temporal mobility patterns. (BESC paper)
- developed prototype of a interactive visualization software.
- proficiency in dealing with spatiotemporal data, e.g. call detail record, taxi trajectory, check-in and POI data.
- experience of collaborating with domain experts, e.g. city planners.
- teamwork experience and project management experience.

Data Analysis in Logistics, 2016

This project is funded by a local logistic service company. It aims at exploiting real-time data collected from sensors embedded on 265 trucks to achieve two goals: eco-driving and risk assessment. The collected information includes GPS trajectory and On-Board-Diagnostic signals. I have:

- proposed a robust stay-point detection algorithm.
- developed algorithm mining the driving patterns of drivers and analyzed the correlation between driving pattern and fuel consumption using GPS data and OBD data.
- designed algorithm to predict time expense, total fuel consumption and road toll fee so as to develop data-driven transport plan.
- developed algorithm mining the fuel-efficient routes.
- developed driver's KPI ranking method.
- being in charged of developing online cloud service system.
- proficiency in using Cassandra database system.
- teamwork experience and project management experience.

Parameterized Vector-based Map of Jiangsu Highway, 2014-2015

This project is funded by Traffic Police Office of Jiangsu Province. It aims at developing a parameterized vector-based map service system of Jiangsu Highway. I have:

- designed the browser/server system framework (most of the codes are written in JavaScript).
- applied butterfly subdivision algorithm to parameterize vector-based map of Jiangsu Highway.
- applied Douglas-Peucker algorithm to realize multi-resolution display mechanism.
- proposed a robust map-matching algorithm.
- software developing experience.

Multi-agent Traffic Simulation, 2014

This project aims at implementing multi-agent traffic simulation system to model the traffic of Nanjing. I have:

- implemented MITSIMLab platform on Nanjing traffic.
- designed algorithm to transform Open Street Map (OSM) data format to MITSIMLab-tolerated data format.
- proficiency in map data such as OSM.

TECHNICAL SKILLS

Data Modeling

- Machine Learning, e.g. Probabilistic Graphical Model and Graph Neural Network.
- Multi-agent Simulation, e.g. MATSim and MITSIMLab.

Data Processing

- Pandas, PySpark

Data Visualization

- JavaScript and PHP

Database

- PostgreSQL, MySQL, MongoDB, Cassandra