Weiran Yao

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EDUCATION

09/2017-Present **Carnegie Mellon University,** Pittsburgh, US
Dept. of Civil and Environmental Engineering
PhD student (Advisor: Prof. Sean Qian)

08/2016-08/2017 **City University of Hong Kong**, Hong Kong, HK
Dept. of Systems Engineering and Engineering Management (SEEM)
Research Assistant (Supervisor: Prof.Lishuai Li)

04/2016-07/2016 **Kyushu University**, Fukuoka, JAPAN
Dept. of Mechanical Engineering
Exchange Student (Supervisor: Prof. Jumpei Arata) with CSC Scholarship

09/2012-07/2016 **Beihang University**, Beijing, CHINA
Dept. of Aircraft Airworthiness Engineering
B.Eng. in Aerospace Engineering

TEACHING EXPERIENCE

09/2018-Present **Teaching Assistant**, Carnegie Mellon University
Data Analytics for Engineered Systems (Instructor: Prof. Scott Matthew)
Helped course assessment and assignment grading and led weekly TA office hours

09/2017-12/2017 **Teaching Assistant**, Carnegie Mellon University
Data Analytics for Engineered Systems (Instructor: Prof. Scott Matthew)

- Helped develop course materials (new course)
- Full responsible for all homework designs
- Led weekly TA office hours and held recitations as needed.

10/2018 **Guest Lecturer**, Carnegie Mellon University
Data analytics, visualization and sharing with Tableau. Data Analytics for Engineered Systems (Instructor: Prof. Scott Matthew)

PROFESSIONAL SERVICES

Journal reviews: Transportation Research Record (TRR)

RESEARCH INTERESTS

- Network effects, optimization in transportation network
- Reinforcement learning, approximate dynamic programming
- Microtransit and ridesharing

RESEARCH EXPERIENCE

10/2018-Present **Real-time traffic prediction using spatiotemporal features of network traffic flow, weather and incidents**
PhD student, Carnegie Mellon University

Advisor: Prof. Zhen (Sean) Qian, Department of Civil and Environmental Engineering, Carnegie Mellon University, US

- Apply linear models (LASSO) to engineer features from multi-sourced data including network traffic flow, RCRA incidents and weather data and build a deep learning sequential prediction architecture to predict the traffic conditions in the next thirty minutes.
- Develop a web-based platform to visualize the real-time traffic predictions and recommend contingency traffic signal plans.

06/2018-Present **Design and optimization of microtransit system in suburban areas**
PhD student, Carnegie Mellon University

Advisor: Prof. Zhen (Sean) Qian, Department of Civil and Environmental Engineering, Carnegie Mellon University, US

- Develop a general-purpose tool to evaluate the performance of last-mile microtransit services, with special focus on its feeder performance to nearby public transit terminals.
- Optimize in real time the departure and route choices of last-mile microtransit shuttles under uncertainty with approximate dynamic programming approach, considering stochasticity in both supply and demand side, such as network traffic flow, public transit schedules and passenger demand.
- Design and examine possible service improvement brought by candidate service operation plans

10/2017-Present **Prediction of morning freeway traffic congestions using social media data**
PhD student, Carnegie Mellon University

Advisor: Prof. Zhen (Sean) Qian, Department of Civil and Environmental Engineering, Carnegie Mellon University, US

- Learn typical morning congestion patterns from probe-based traffic sensing data using unsupervised clustering methods. Extract people's work and rest features during last evening and night from posted Twitter messages and correlate those features with morning congestion patterns in the next morning.
- Develop a novel prediction framework that makes use of such relationships to forecast morning congestion hours ahead with people's tweeting activity features extracted before the start of morning periods at 5 AM.

02/2017-08/2017 **Condition monitoring of wheel wear and suspension systems of high-speed trains** (Cooperation with Southwest Jiaotong University, CHINA)
Research Assistant, City University of Hong Kong, HK

Advisor: Prof. Lishuai Li, Department of SEEM, City University of Hong Kong, HK

- Developed data-driven analytics tools and methods for condition monitoring using sensor data.
- A supervised learning method, using LASSO, is proposed to monitor the wheel wear of high-speed trains using spectrogram features generated from onboard vibration sensors. An unsupervised learning method, using Principle Component Analysis and DBSCAN, is proposed to monitor the health of suspension system on high speed trains using multiple vibration sensors mounted on different levels of the train structure.

Grant: Research Grants Council Theme-based Research Scheme. (Grant No. T32-101/15-R)

08/2016-Present **Re-examining Transit-Oriented-Development Theories Using Geo-Coded Social Media Data** (Cooperation with **Cardiff** and **HKU**)

Research Assistant, Department of Systems Engineering and Engineering Management (SEEM), City University of Hong Kong, HK

Advisor: Prof. Lishuai Li, Department of SEEM, City University of Hong Kong, HK

- Developed a Twitter-based Opinion Mining System for sentiment measurement and topic modeling
- Developed an analytics framework for characterizing Transit Oriented Developments (TODs) around transport stations in central cities using Hierarchical Agglomerative Cluster Analysis
- Assessed the impacts of TOD attributes on residents' sentiment and activity patterns regarding various cluster characteristics

Grant:

- Research Grants Council of the Hong Kong Special Administrative Region, China (T32-101/15-R)
- HKUrban SEED Grant from the UKurban Lab of the University of Hong Kong and SEED Funding from One-Belt One-Road (OBOR) Initiatives from Center for Urban Studies and Planning (CUSUP)

10/2015-05/2016 **Aerodynamic Effects of the Cranial Crest in Pterosaurs**

Graduation Research Project for Undergraduates

Advisor: Prof. Jianghao Wu, Department of Aircraft Airworthiness Engineering, Beihang University, CN

- Established three typical aerodynamic Pteranodon head models with sexual and ontogeny differences
- Computed the aerodynamic forces and moments on the head and the gravity center using CFD
- Quantified the aerodynamic effects of the crest on flight by comparing aerodynamic characteristics of the crest models with crestless benchmarks

04/2014-09/2015 **Designing Smartphone-based Taxi Sharing System for Large Transport Terminals**

Undergraduate Training Program for Innovation and Entrepreneurship

Advisor: Prof. Ying Wang, Department of Transportation Engineering, Beihang University, CN

- Developed the special taxi-sharing system platform with Android smartphone applications
- Established dynamic and static models that predicted the system performance based on collected passenger data and online surveys with passenger willingness taken into account
- Optimized the service satisfaction using an iterative model based on cooperative game theory

Grant:

- National Project Fund for Undergraduate Training Program for Innovation and Entrepreneurship (201410006079) and the National Natural Science Foundation of China (71401004)
- School Fund for Participating in Major International Academic Conference from School of Transportation Science and Engineering, Beihang University, China

Awards:

- The 2nd Prize of the Fourth Beijing Competition of Transport Science and Technology (6/30+)
- Excellent Prize of the 25th Beihang University "Feng Ru Cup" Competitions in specifically themed projects of Energy Saving and Emission Cutting (7/20+)

04/2014-08/2014 **Fast Air Vehicle Accident Localization System (FAVALS)**

International Collegiate Design and Innovation Competition (ICDIC)

- Proposed the system architecture that described the electronics and communication components, and the autopilot that carried sense-and-avoid and autonomous landing systems
- Investigated various UAV attachment approaches to the fuselage and optimized the ejection path
- Explored the system prototype cost regarding different system configurations

Awards:

The 2nd Prize of 2014 International Collegiate Design and Innovation Competition in Aviation (3/40+)

PUBLICATIONS

PUBLISHED/ACCEPTED

Peer Reviewed Journal Articles

Yao, W., Wang, Y.*, Wang, N., Yang, G, Zhang, C. (2016), Prediction of Benefits of Special Taxi-Pooling Design for Large Transport Terminals: Case Study of Beijing West Railway Station, *Transportation Research Record.* http://dx.doi.org/10.3141/2542-05.

Peer Reviewed Conference Articles

Xu, P., **Yao, W.**, Zhao Y., Yi C., Li, L., Lin J., Tsui KL.* (2018) Condition monitoring of wheel wear for high-speed trains: A data-driven approach, In 2018 IEEE International Conference on Prognostics and Health Management (ICPHM).

Yao, W., Wang, Y.*, Wang, N., Yang, G, Zhang, C. (2016). Predicting Benefits of Special Taxi Pooling Design for Large Transport Terminals: Case Study of Beijing West Railway Station, In *Compendium of Transportation Research Board 95th Annual Meeting*. http://amonline.trb.org/1.2982016.

Book Chapter

Yao, W., Sun, Y., Li, L*, Huang, J., Yang, Y. (2016), Re-examining Transit-Oriented-Development via Opinion Mining of Geo-Coded Media Data. Abstract Accepted by *Planning Support Systems for Smarter Urban Futures*, Springer Berlin Heidelberg.

Presentations

Yao, W., Sun, Y., Li, L*, Huang, J., Yang, Y. (2016), Re-examining Transit-Oriented-Development via Opinion Mining of Geo-Coded Media Data. Abstract Accepted by *15th International Conference on Computers in Urban Planning and Urban Management.* Adelaide, Australia, July 11-14, 2017.

Adrian, C.*, Sean, R., **Yao, W.**, Hu, X. (2014). Fast Air Vehicle Accident Localization System (FAVALS). In *2014 International Collegiate Design and Innovation Competition*. Beihang University, Beijing, August, 2014. http://www.icdic.org/article/73.

Yao, W., Li, L.* (2016), Re-examining Transit-Oriented-Development via Opinion Mining of Geo-Coded Media Data. In Workshop on High-speed Rail Operation for Safety and Reliability. Hong Kong, November 24-25, 2016.

Yao, W., Wang, Y.*, Wang, N., Yang, G, Zhang, C. (2016). Predicting Benefits of Special Taxi Pooling Design for Large Transport Terminals: Case Study of Beijing West Railway Station, In Transportation Research Board 95th Annual Meeting, Washington D.C., January 8-11, 2016. http://amonline.trb.org/16-2572-1.2989896.

Patent

UNIV BEIHANG: Wang, Y., Zhang C., Yang, G., **Yao, W.**, Wang, N. (2015). Transportation Hub-based Method for Designing and Achieving Taxi Carpooling Mechanism. *China Patent CN104715296A*. http://www.google.com/patents/CN104715296A.