Bai LI

+86 15802186296**,** bai_li@sjtu.edu.cn
https://scholar.google.com/citations?user=82HMzoIAAAAJ
School of Naval Architecture, Ocean and Civil Engineering, Shanghai Jiao Tong University

EDUCATION

Shanghai Jiao Tong University Shanghai, China
Ph.D., Traffic Information Engineering (Affiliated to the Department of Civil Engineering) Expected December 2022

- Supervisor: Prof. Zhong-Ren Peng, Cheung Kong Scholar
- Research Interests: Data-Driven Transportation System Analysis, Transportation and Environment, Sustainable and Intelligent Transportation System, Smart City and Urban Computing
- Dissertation: "*Research on Macroscopic Vertical Distribution Patterns and Microscopic Three-dimensional Diffusion Mechanism of Black Carbon in the Underlying Surfaces of Sea, Land and Sea-Land Junction Areas of Shanghai Metropolitan Area Based on the Unmanned Aerial Vehicle Platform Monitoring*"

Southwest Jiao Tong University Chengdu, China
B.A., Automation, School of Information Science and Technology June 2015

- GPA: 3.6 / 4.0 (Top 1)
- Thesis: "*Design and Implementation of a Short-Range Quadcopter with Wi-Fi Video Transmission Function*"

SELECTED AWARDS AND HONORS

1st Prize in the 1st "Energy, Intelligence, and Future" National Innovation and Entrepreneurship Competition for College Students	2018
4th Prize in China's (Xiaoguwei) "Internet + Transportation" Innovation and Entrepreneurship Competition	2018
2nd Prize in National Mathematical Modeling Contest for Graduate Students in China	2017, 2018
Seeds Award, Shanghai Open Data Applications Competition	2017
3rd Prize in China's (Xiaoguwei) "Internet + Transportation" Innovation and Entrepreneurship Competition	2017
1st Prize in National College Competition on Internet of Things, Southwest Region	2014
3rd Prize in National University Student Social Practice and Science Contest on Energy Saving & Emission Reduction	2014
3rd Prize in "Freescale Cup" - National Undergraduate Smart Car Contest, Sichuan Region	2014
3rd Prize in "TI Cup" - National Undergraduate Electronics Design Contest, Sichuan Region	2013 - 2014
National Scholarship	2014
Tang Li-Xin's Scholarship	2014 - 2020
National Inspirational Scholarship	2013
Southwest Jiao Tong University Scholarship	2011 - 2015

PUBLICATIONS AND PATENTS

Journal Papers

- **Li, B.,** Cao, R., He, H. D., Peng, Z. R., Qin, H., & Qin, Q. (2022). Three-dimensional diffusion patterns of traffic-related air pollutants on the roadside based on unmanned aerial vehicles monitoring. *Building and Environment,* 219, 109159. **(JCI Q1, IF=7.093)**
- **Li, B.,** Li, X. B., Li, C., Zhu, Y., Peng, Z. R., Wang, Z., & Lu, S. J. (2019). Impacts of wind fields on the distribution patterns of traffic emitted particles in urban residential areas. *Transportation Research Part D: Transport and Environment*, 68, 122-136. **(JCI Q1, IF=7.041)**
- **Li, B.,** Cao, R., Wang, Z., Song, R. F., Peng, Z. R., Xiu, G., & Fu, Q. (2019). Use of Multi-Rotor Unmanned Aerial Vehicles for Fine-Grained Roadside Air Pollution Monitoring. *Transportation Research Record*, 2673(7), 169-180.
- **Li, B.,** Zhu, Y., Wang, Z., Li, C., Peng, Z. R., & Ge, L. (2018). Use of multi-rotor unmanned aerial vehicles for radioactive source search. *Remote Sensing*, 10(5), 728. **(JCI Q1, IF=5.349)**

- Jiang, Y. H., **Li, B.,** Li, X. B., Wang, D. S., & Peng, Z. R. (2022). Identification of the atmospheric boundary layer structure through vertical distribution of PM2.5 obtained by unmanned aerial vehicle measurements. *Atmospheric Environment*, 278, 119084. **(JCI Q1, IF=5.755)**
- Zheng, T., **Li, B.,** Li, X. B., Wang, Z., Li, S. Y., & Peng, Z. R. (2021). Vertical and horizontal distributions of traffic-related pollutants beside an urban arterial road based on unmanned aerial vehicle observations. *Building and Environment*, 187, 107401. **(JCI Q1, IF=7.093)**
- Cao, R., **Li, B.,** Wang, Z., Peng, Z. R., & Lou, S. (2020). Using a distributed air sensor network to investigate the spatiotemporal patterns of PM2.5 concentrations. *Environmental Pollution*, 264, 114549. **(JCI Q1, IF=9.988)**
- Cao, R., **Li, B.,** Wang, H. W., Tao, S., Peng, Z. R., & He, H. D. (2020). Vertical and Horizontal Profiles of Particulate Matter and Black Carbon Near Elevated Highways Based on Unmanned Aerial Vehicle Monitoring. *Sustainability*, 12(3), 1204. **(JCI Q2, IF=3.889)**
- Li, C., Wang, Z., **Li, B.,** Peng, Z. R., & Fu, Q. (2019). Investigating the relationship between air pollution variation and urban form. *Building and Environment*, 147, 559-568. **(JCI Q1, IF=7.093)**
- Li, J., Li, X. B., **Li, B.,** & Peng, Z. R. (2018). The effect of nonlocal vehicle restriction policy on air quality in Shanghai. *Atmosphere*, 9(8), 299.
- Song, R. F., Wang, D. S., Li, X. B., **Li, B.,** & Peng, Z. R. (2021). Characterizing vertical distribution patterns of PM2.5 in low troposphere of Shanghai city, China: Implications from the perspective of unmanned aerial vehicle observations. *Atmospheric Environment*, 265, 118724. **(JCI Q1, IF=5.755)**
- Li, X. B., Peng, Z. R., Wang, D., **Li, B.,** Huangfu, Y., Fan, G., ... & Lou, S. (2021). Vertical distributions of boundary-layer ozone and fine aerosol particles during the emission control period of the G20 summit in Shanghai, China. *Atmospheric Pollution Research*, 12(1), 352-364. **(JCI Q2, IF=4.831)**
- Chen, Q., Wang, D., Li, X., **Li, B.,** Song, R., He, H., & Peng, Z. (2019). Vertical characteristics of winter ozone distribution within the boundary layer in Shanghai based on hexacopter unmanned aerial vehicle platform. *Sustainability*, 11(24), 7026. **(JCI Q2, IF=3.889)**
- Lu, S. J., Wang, D., Wang, Z., **Li, B.,** Peng, Z. R., Li, X. B., & Gao, Y. (2019). Investigating the role of meteorological factors in the vertical variation in PM2.5 by unmanned aerial vehicle measurement. *Aerosol and Air Quality Research*, 19(7), 1493-1507+. **(JCI Q2, IF=4.530)**
- Chen, Q., Li, X. B., Song, R., Wang, H. W., **Li, B.,** He, H. D., & Peng, Z. R. (2020). Development and utilization of hexacopter unmanned aerial vehicle platform to characterize vertical distribution of boundary layer ozone in wintertime. *Atmospheric Pollution Research*, 11(7), 1073-1083. **(JCI Q2, IF=4.831)**
- Li, X. B., Peng, Z. R., Lu, Q. C., Wang, D., Hu, X. M., Wang, D., **Li, B.,** ... & He, H. (2020). Evaluation of unmanned aerial system in measuring lower tropospheric ozone and fine aerosol particles using portable monitors. *Atmospheric Environment*, 222, 117134. **(JCI Q1, IF=5.755)**
- Li, X. B., Wang, D., Lu, Q. C., Peng, Z. R., Fu, Q., Hu, X. M., ... & Li, C., **Li, B.,** Wang, D. S. (2018). Three-dimensional analysis of ozone and PM2.5 distributions obtained by observations of tethered balloon and unmanned aerial vehicle in Shanghai, China. *Stochastic Environmental Research and Risk Assessment*, 32(5), 1189-1203. **(JCI Q2, IF=3.821)**
- Li, X. B., Wang, D. S., Lu, Q. C., Peng, Z. R., Lu, S. J., **Li, B.,** & Li, C. (2017). Three-dimensional investigation of ozone pollution in the lower troposphere using an unmanned aerial vehicle platform. *Environmental Pollution*, 224, 107-116. **(JCI Q1, IF=9.988)**

Conference Papers

- **Li, B.,** Cao, R., Wang Z., Peng, Z. R. (2021). High Temporal Resolution Variations of Atmospheric Vertical Profiling and Their Relationship with Changes in Atmospheric Boundary Layer and Atmospheric Stability Based on Unmanned Aerial Vehicles Monitoring. *Transportation Research Board 101st Annual Meeting*.
- **Li, B.,** Cao, R., Peng, Z. R. (2019). Use of Multi-Rotor Unmanned Aerial Vehicles for Hazardous Materials Transport Leakage Monitoring. *Transportation Research Board 99th Annual Meeting*.
- **Li, B.,** Cao, R., Wang, Z., Song, R. F., Peng, Z. R., Xiu, G., & Fu, Q. (2018). Use of Multi-Rotor Unmanned Aerial Vehicles for Fine-Grained Roadside Air Pollution Monitoring. *Transportation Research Board 98th Annual Meeting*.
- **Li, B.,** Zhu, Y., Wang, Z., Li, C., Peng, Z. R., & Ge, L. (2017). Use of multi-rotor unmanned aerial vehicles for radioactive source search. *Transportation Research Board 97th Annual Meeting*.
- Cao R., **Li B.,** Wang Z.Y., Peng Z.R., Tao S.K. (2020). Lou S.R. Using Distributed Air Sensor Network to Investigate the

Spatiotemporal Patterns in PM2.5 Concentrations. *Transportation Research Board 99th Annual Meeting*.

- Cao R., **Li B.,** Peng Z.R., He H.D. (2020). Vertical and Horizontal Profiles of Particulate Matter and BC Near Elevated Highway Based on Unmanned Aerial Vehicle Monitoring. *Transportation Research Board 99th Annual Meeting*.

Patents

- He, H.-D., **Li, B.,** Cao, R., Lu, K.-F., & Luo, Z.-G. (2021). Smart nacelle system for 3D monitoring of the atmospheric environment based on UAVs. Utility model. *Grant No. ZL202120898540.1*. China: State Intellectual Property Office of the People's Republic of China.
- Peng, Z.-R., **Li, B.,** & Ge, L.-X. (2018). A UAV system for locating and grabbing nuclear radiation sources. Utility model. *Grant No. ZL201721012785.X*. China: State Intellectual Property Office of the People's Republic of China.
- Peng, Z.-R., **Li, B.,** Li, C., Zhu, Y., & Wang, D.-S. (2018). A UAV system for real-time monitoring and controlled air sampling of the atmospheric environment. Utility model. *Grant No. 201721012784.5*. China: State Intellectual Property Office of the People's Republic of China.
- He, H.-D., **Li, B.,** Cao, R., Lu, K.-F., & Luo, Z.-G. (2021). Smart nacelle system for 3D monitoring of the atmospheric environment based on UAVs. Invention publication. *Disclosure No. CN113075897A*. China: State Intellectual Property Office of the People's Republic of China.
- Peng, Z.-R., **Li, B.,** & Ge, L.-X. (2018). A UAV system for locating and grabbing nuclear radiation sources. Invention publication. *Disclosure No. CN107521678A*. China: State Intellectual Property Office of the People's Republic of China.
- Peng, Z.-R., **Li, B.,** Li, C., Zhu, Y., & Wang, D.-S. (2018). A UAV system for real-time monitoring and controlled air sampling of the atmospheric environment. Invention publication. *Disclosure No. CN107422747A*. China: State Intellectual Property Office of the People's Republic of China.
- He, H.-D., Li, X.-B., **Li, B.,** (2021). Active atmospheric ozone vertical observation system based on multi-rotor UAV platforms. Invention publication. *Disclosure No. CN113030402A*. China: State Intellectual Property Office of the People's Republic of China.

WORKS IN PROGRESS

- "Investigation on the Impact of Emission Control Measures of 2016 G20 Hangzhou Summit on Air Quality in Jinshan District, Shanghai Based on Unmanned Aerial Vehicle Monitoring" Article manuscript in progress, to be submitted for publication in fall/winter 2022.
- "Implementation of the Unmanned Aerial Vehicle-Based Three-Dimensional Controlled Air Sampling Platform and Its Application in the Investigation of the Vertical Distribution Patterns of Lower Tropospheric Volatile Organic Compounds." Article manuscript and data analysis in progress.
- "Investigation on the Three-Dimensional Diffusion Patterns of Expressway Traffic-Related Air Pollutants in the Roadside Environment Based on Unmanned Aerial Vehicle Monitoring." Article manuscript and data analysis in progress.
- "Investigation on the Vertical Distribution Patterns of Black Carbon in the Yangtze River Delta Region and Its Impact of Radiative Forcing on the Local Climate." Article manuscript and data analysis in progress.

TEACHING AND MENTORING

- Mentored three Shanghai Jiao Tong University postgraduates in Prof. Peng's group (2020 – now)
- Teaching Assistant, *Transportation and Environment Engineering*, Shanghai Jiao Tong University (Fall 2020)
- Thesis Advisor for a Shanghai Jiao Tong University undergraduate (2017)
- Mentored three Shanghai Jiao Tong University undergraduates for a Participation in Research Program (2017)

SKILLS

- Proficient in programming (C/C++, Python, JavaScript) and Print Circuit Board (PCB) fabrication (Altium Designer, Proteus)
- Proficient in Linux-based embedded system development (ROS)
- Proficient in Geographic Information Systems and related software (ArcGIS)
- Passed National Computer Rank Examination (Rank 2 – C Programming) and National Computer Rank Examination (Rank 3 – Computer Network Technology)
- Proficient in English and native in Chinese

SELECTED PROJECT EXPERIENCE

Study on the Evaluation of the Impact of Urban Transport Policies and Facilities Construction on the Atmospheric Environment Shanghai, China

Associate Grant Writer & Full-Stack Developer Nov. 2016 – Mar. 2021

- A national key project funded by the National Planning Office of Philosophy and Social Science (16ZDA048).
- Combined theoretical simulation (fluid simulation, air quality model, etc.) and field experiment (3D monitoring by UAV) to explore the impact of traffic conditions and urban form on the urban atmospheric environment.
- Implemented the UAV 3D monitoring platform based on the embedded technology and front-end and back-end separate architecture. The embedded development was based on C/C++, the back-end was based on Python & MySQL and the front-end was based on Python & Flask.
- 3D simulation and UAV monitoring experiments of different urban built environment forms were carried out in Shanghai, Guangzhou, Dezhou, Cangzhou, etc.
- Based on the results of theoretical simulation and field experiment, several universal patterns of the interaction between urban arterial roads and the surrounding atmospheric environment were obtained, and the corresponding policy suggestions were also given.

Atmospheric Vertical Structure Detection Technology Based on UAVs and High-Payload Tethered Balloons Shanghai, China

Associate Grant Writer & Student Leader & Full-Stack Developer Aug. 2016 – Mar. 2021

- A National Key R&D Program of China (2016YFC0200502) funded by the Ministry of Science and Technology of the People's Republic of China.
- Implemented a UAV 3D monitoring platform to conduct three-dimensional monitoring of the atmospheric environment and controlled air sampling based on the embedded technology and front-end and back-end separation architecture.
- The embedded development was based on C/C++, the back-end was based on Python & MySQL & C++ and the front-end was based on Python & Flask.
- Conducted plenty of wind tunnel experiments to validate platform stability and atmospheric environment 3D monitoring experiments in different cities of China (Shanghai, Xi'an, Nanjing, Dezhou, Guangzhou, Hangzhou, Cangzhou, etc.) to validate measurement accuracy.
- Applied this platform to both atmospheric environment monitoring and traffic emission monitoring and wrote two SCI papers and two patents based on this project.

Vehicular and Airborne Observation Technology for Air Pollution in Complex Terrain Areas Shanghai, China

Associate Grant Writer & Embedded Developer Aug. 2016 – Mar. 2021

- A National Key R&D Program of China (2016YFC0200402) funded by the Ministry of Science and Technology of the People's Republic of China.
- Implemented an atmospheric environment monitoring UAV platform that can take off and land vertically in all-terrain, including high-temperature and high-humidity mountain environments based on mechanical design and manufacturing, electronic equipment development, embedded development, etc.
- Responsible for the development of flight control algorithm based on cascade PID and sensor data integration algorithm based on multithreading as an embedded C/C++ developer.
- Conducted plenty of atmospheric environment 3D monitoring experiments in different cities of Southwestern China (Chengdu, Chongqing, etc.) to validate platform stability and measurement accuracy.

Bridge Cracks & Wind Turbine Blades Cracks Inspection Based on A Quadcopter Shanghai, China

Associate Grant Writer & Embedded Developer & Database Interface Developer Apr. 2016 – Aug. 2017

- In charge of the development of the UAV-side flight control software (C++ & ROS based on the DJI OnboardSDK) and the front-end database interface software (Qt & MySQL).
- Fusion positioning algorithm based on UWB, vision, GNSS and IMU were utilized to achieve the real-time centimeter-level positioning of the UAV flying under bridges.
- According to whether the wind turbine blades are rotating or not, two different UAV orbiting monitoring algorithms were designed and implemented.
- The identification of cracks on bridges and blades was based on the high-resolution photos shot by the UAV PTZ camera

and processed by the OpenCV-based & YOLO-based detection algorithm.

- Experimental flights were conducted in both Shanghai and Hunan to validate the performance of the monitoring platform.

Research on UAV Technology Applied to Searching for Uncontrolled Radioactive Sources Shanghai, China

Student Leader & Full-Stack Developer Sep. 2015 – Dec. 2016

- A project funded by the Shanghai Municipal Bureau of Ecology and Environment for automatic search of lost radioactive sources based on UAV.
- Implemented a UAV platform that automatically searches and locates lost radioactive sources in a designated area based on the embedded technology and front-end and back-end separate architecture and implemented three search algorithms on this platform.
- The embedded development was based on C/C++, the back-end was based on MongoDB & C++ and the front-end was based on Qt (C++).
- Wrote an SCI paper and a patent based on this project which received praise from the department head.

PROFESSIONAL EXPERIENCE

Bytedance Technology Co., Ltd. Shanghai, China

Front-end Development Intern, Feishu Technology Nov. 2020 – Dec. 2020

- Developed a 2048 game web application with an online multiplayer combat function.
- Adopted the front-end and back-end separation architecture, the front-end part was based on React & Redux and the back-end part was based on Node & Express & MySQL.
- The communication between the front and back ends was based on Axios & socket.io.
- Responsible for the development of advanced functional components, back-end development, database access, and project deployment.
- Served as the team leader, responsible for the information coordination of the team while developing the program.

REFERENCES

Zhong-Ren Peng, Ph.D.
Professor
College of Design, Construction and Planning
University of Florida
Gainesville, FL 32611-5706
+1 (352) 294-1491
zpeng@ufl.edu

Jian-Kang Zhao, Ph.D.
Professor
School of Electronic Information and Electrical Engineering
Shanghai Jiao Tong University
Shanghai 200240, China
+86 13816861697
zhaojiankang@sjtu.edu.cn

Hong-Di He, Ph.D.
Associate Professor
School of Naval Architecture, Ocean and Civil Engineering
Shanghai Jiao Tong University
Shanghai 200240, China
+86 (021) 34206674
hongdihe@sjtu.edu.cn

Zhanyong Wang, Ph.D.
Assistant Professor
College of Transportation and Civil Engineering
Fujian Agriculture and Forestry University
Fuzhou City 350002, China
+86 13802966792
wangzy1026@163.com