Bo Shang
Postdoctoral Scholar

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CV

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Education

- PhD, Civil Engineering (Transportation), City College of New York (CCNY), New York, NY, United States (2025-now)
- PhD, Pattern Recognition and Intelligent Systems, Northeastern University, China (2013-2020)
- Exchange Ph.D. student, University of California at Merced, USA (2015-2017)
- M.E. Pattern Recognition and Intelligent Systems, Northeastern University, China (2011-2013, GPA: 3.53)
- B.E. Automation, Northeastern University, China (2007-2011, GPA: 3.42-3.74)

Work Experiences

- Jun 2025-now: Postdoctoral Scholar @ AI & Mobility Research Lab at CUNY City College of New York
- Jan 2025-Jun 2025: Graduate Research Assistant @ Civil Engineering, CCNY
- Dec 2022-Dec 2024: Post-Doc Researcher @ CCNY Robotics Lab
- Jun 2024-Aug 2024: Instructor for Computer Engineering Summer Academy (AI module) @ Vaughn College
- Jan 2024-May 2024: Adjunct @Vaughn College of Aeronautics and Technology
- Aug 2023-Dec 2023: Adjunct Assistant Professor @ CUNY City College
- Jan 2020-Nov 2022: Post Doctoral Fellow @ Missouri University of Science and Technology
- Jan 2016-Aug 2017: Lecturer @ University of California, Merced
    - Official personal page: https://engineering.ucmerced.edu/content/bo-shang
    - Teaching Assistant for the course of Mechatronics, Engineering Computing (Fortran and MATLAB) and Unmanned Aerial Systems;
    - Initial Designer of the laboratories for the course of Unmanned Aerial Systems.
- Aug 2015-Sep 2017: Junior Specialist @ University of California, Merced

Teaching Experiences

- ME 190: Mechatronics (UC Merced)
- ME 143: Unmanned Aircraft Systems (UC Merced)
- ME 021: Engineering Computing (UC Merced)
- ENGR 204: Electric Circuits (CUNY City College)
- MCE 355: Robotics, Mechanics and Control (Vaughn College of Aeronautics and Technology)
- SBC 012: Principles of AI (Vaughn College of Aeronautics and Technology)
- SBC 014A: Principles of Research-AI (Vaughn College of Aeronautics and Technology)

Project Experiences

- Nov 2024 – Present: Highway Traffic Monitoring using Fixed LiDAR
    - Currently developing an end-to-end pipeline for traffic monitoring with fixed LiDAR systems, including background subtraction, object segmentation, and detection.
    - Working on multi-frame vehicle reconstruction to generate individual vehicle models and classify moving objects such as vehicles, motorcycles, bicycles, and pedestrians.

    - In the process of evaluating various CNN-based networks for object detection from LiDAR traffic data.
    - Designing a flexible mechanism that enables training on one dataset and inference on another, even with different configurations.
- Dec 2022-Present: Advanced Bridge Inspection Automation System
    - Spearheaded the development of a comprehensive automated system for bridge inspection, integrating cutting-edge AI, cloud technologies, and robotics
    - Key Achievements:
        - Engineered and trained sophisticated Convolutional Neural Networks (CNNs) for precise detection of structural damages, including cracks, spalling, and stains
        - Successfully deployed AI models on AWS cloud, ensuring scalability and high-performance processing of inspection data
        - Designed and implemented a custom WebODM-based platform that streamlines the entire inspection workflow, including:
            - Automated damage segmentation
            - 3D reconstruction of bridge structures
            - Interactive visualization of inspection results
            - Precise measurement of cracks in areas of interest
        - Developed a handy iOS application to control and operate a specialized climbing robot, enhancing the reach and efficiency of bridge inspections
- 2020-2022: Bridge Inspection Robot Deployment System
    - Developed an advanced drone system with robotic arms for automated bridge inspections
    - Key Contributions:
        - Engineered a sophisticated PID (Proportional-Integral-Derivative) controller to precisely manage the opening and closing mechanisms of robotic arms, ensuring optimal performance and safety durin[…]
        - Designed and implemented cutting-edge image processing algorithms for accurate girder detection, leveraging the computational power of NVIDIA Jetson platform
        - Created a comprehensive demonstration showcasing the system’s capabilities, including autonomous flight, automatic clamping to bridge structures, and efficient traversal along inspection paths
        - Integrated hardware and software components to deliver a cohesive, fully-functional prototype, significantly enhancing bridge inspection efficiency and safety
- 2020-2022: An Unmanned Aerial System of Visible Light, Infrared and Hyperspectral Cameras with Novel Signal Processing and Data Analytics;
    - Programming language used: Python
    - Development platforms: Ubuntu
    - Technology used: Path Planning
- 2020-2021: Robot-assisted Underwater Acoustic Imaging for Bridge Scour Evaluation;
    - Programming language used: Python, C++
    - Development platforms: Embedded Linux, ROS, Arduino
    - Technology used: Computer Vision, PID controller, etc.
- 2015-2019: Designed and implemented a drone visual servoing control system;
    - Programming language used: Python
    - Development platforms: Embedded Linux, Raspberry Pi
    - Technology used: Computer Vision, Fractional order controller
- 2015-2017: SmarCaveDrone project with Sense-and-avoid and GPS-denied navigation;
- 2013-2014: Object tracking quadrotor UAV system based on AR.Drone and ROS;

- 2012-2013: Indoor quadrotor UAV system with LiDAR;
- 2012: Quadrotor UAV system with a camera;
- 2011: Fixed-wing UAV system with a camera;
- 2010: Line tracking smart car with infrared sensors.

Patents

- Chengdong Wu, Bo Shang, Yunzhou Zhang, Chengxi Gao, Tingting Meng. Data/image transmission device based on TCP/IP (Transmission Control Protocol/Internet Protocol) (CN 102427464 B), [https://patents[…]
- Yunzhou Zhang, Bo Shang, Chengdong Wu, Pengju Si, Internet-based interactive digital media terminal device (CN 102306237 A), [https://patents.google.com/patent/CN102306237A/en] (https://patents.googl[…]
- G Chen, A Reven, B Shang, Z Shi, L Li, etc. Unmanned vehicle having flight configuration and surface traverse configuration (U.S. Patent No. 12,296,994. 13 May 2025), [https://patents.google.com/pat…]

Publications

1. Bo Shang, Yiqiao Li, Arian Golrokh Amin, Camille Kamga and Jie Wei. Sensing Perspectives on Vulnerable Road User Monitoring for Traffic Safety: A Survey. The 22nd International Conference on Mobile[…]
2. Bo Shang, Yiqiao Li, Jie Wei and Camille Kamga. How Many Beams of LiDAR is Enough for Detecting Vulnerable Road Users? The 22nd International Conference on Mobile Systems and Pervasive Computing (M[…]
3. Jinglun Feng, Bo Shang, Ejup Hoxha, César Hernández, Yang He, Weihan Wang, Jizhong Xiao. Robotic Inspection and Data Analytics to Localize and Visualize the Structural Defects of Concrete Infrast[…]
4. Ejup Hoxha, Jinglun Feng, Agnimitra Sengupta, David Kirakosian, Yang He, Bo Shang, Ardian Gjinofci, and Jizhong Xiao. Contrastive Learning for Robust Defect Mapping in Concrete Slabs using Impact E[…]
5. Zhang, Haibin, Zhenhua Shi, Liujun Li, Pu Jiao, Bo Shang, and Genda Chen. “Code-specified early delamination detection and quantification in a RC bridge deck: passive vs. active infrared thermograp[…]
6. L. Li, B. Shang, I. Jayawardana and G. Chen, “Hardware-in-the-loop and Digital Twin Enabled Autonomous Robotics-assisted Environment Inspection [C],” 2023 6th International Symposium on Autonomous […]
7. Genda Chen*, Liujun Li, Haibin Zhang, Zhenhua Shi, Bo Shang, Derek Edwards, Daniel McDonald, Rueil Manzambi, and Joseph Ressel. Robot-assisted, Remote Nondestructive Testing and Evaluation (rNDT&E) […]
8. Haibin Zhang, Pu Jiao, Liujun Li, Zhenhua Shi, Bo Shang, Genda Chen, Delamination detection of concrete bridge slab through UAV-based thermal scanning [C]. 8th World Conference on Structural Contro[…]
9. Zhenhua Shi, Bo Shang, Haibin Zhang, Liujun Li, Genda Chen. Evaluation of User-friendliness of Several UASs in Bridge Inspection [C]. 8th World Conference on Structural Control and Monitoring (8WCS[…]
10. Liujun Li, Genda Chen, Bo Shang. Mixed Reality Enabled Digital Twin for Robot-assisted Bridge element Inspection and maintenance [C]. 8th World Conference on Structural Control and Monitoring (8WC[…]
11. Jiao, P., Shang, B, Li, L., and Chen, G. The ceiling effect and flight insight of unmanned aerial vehicles during proximity inspection of bridges via computational fluid dynamics modeling and simu[…]
12. Bo Shang, Liujun Li, Pu Jiao, Rafael Cardona Huerta, Joseph Ressel, Andrew Rawlings, Buddy Scharfenberg, and Genda Chen. Drone vision-based clamping strategy for bridge inspection [Poster]. INSPIR[…]
13. B Shang, A Reven, P Jiao, B Li, G Chen. Vision-Based Non-GPS UAV Guidance for Bridge Inspection [Poster]. INSPIRE-UTC 2020 Annual Meeting, 2020.
14. A Reven, P Jiao, B Shang, G Chen. Clamping Design for Bridge Inspection Robot Deployment Systems (BIRDS) Prototype II [Poster]. INSPIRE-UTC 2020 Annual Meeting, 2020.
15. A Reven, P Jiao, B Shang, G Chen. Bridge Inspection Robot Deployment Systems (BIRDS) Prototype II [Slides]. INSPIRE-UTC 2020 Annual Meeting, 2020.
16. Bo Shang, Jianxin Liu, Yunzhou Zhang, Chengdong Wu, YangQuan Chen. Fractional Order Flight Control of Quadrotor UAS on Vision-based Precision Hovering with Larger Sampling Period [J]. Nonlinear Dy[…]

17. Bo Shang, Chengdong Wu, YangQuan Chen. Neighborhood optimization method for shaping Bode plot with larger phase margin [C]. Proceedings of the ASME 2019 International Design Engineering Technical […]
18. Bo Shang, Yunzhou Zhang, Chengdong Wu, YangQuan Chen. Fractional Order Flight Control of Quadrotor UAS: an OS4 Benchmark Environment and a Case Study [C]. International Conference on Control, Auto[…]
19. Bo Shang, Chengdong Wu, Yunzhou Zhang, YangQuan Chen. Fractional Order Flight Control of Quadrotor UAS: A Simscape Benchmark Environment and A Case Study [C]. 2018 IEEE Chinese Guidance, Navigatio[…]
20. Bo Shang, et al. Analysis of Maximum Possible Sampling Period for a Real-Time Vision-Based Control System [C]. ASME 2017 International Design Engineering Technical Conferences and Computers and In[…]
21. Zhang, G., Shang, B., Chen, Y., & Moyes, H. SmartCaveDrone: 3D cave mapping using UAVs as robotic co-archaeologists [C]. 2017 International Conference on Unmanned Aircraft Systems (ICUAS), 2017, p[…]
22. B. Shang, J. Liu, T. Zhao and Y. Chen, Fractional order robust visual servoing control of a quadrotor UAV with larger sampling period [C], 2016 International Conference on Unmanned Aircraft System[…]
23. Bo Shang, Chengdong Wu, Yuchao Hu, Jianyu Yang. An Algorithm of Visual Reconnaissance Path Planning for UAVs in Complex Spaces [J]. Journal of Computational Information Systems, 10(19), 2014.
24. Bo SHANG, Chengdong WU, Tingting MENG, Chengxi GAO, Yunzhou ZHANG. A Data/Image Transmission Device Based on TCP/IP Protocol[C]. WiCOM2012 (International Conference on Wireless Communications, Net[…]
25. Tingting Meng, Chengdong Wu, Bo Shang, Chengxi Gao, Yunzhou Zhang. Design of point to multi-point wireless communication system based on ZigBee[C]. WiCOM2011 (International Conference on Wireless […]
26. GAO Chengxi, WU Chengdong, ZHANG Yunzhou, SHANG Bo, MENG Tingting. Research on remote image/data transmission based on TCP/IP protocol [J]. Mechanical & Electrical Engineering Magazine, 2011.

Reviewer Contributions

- https://www.webofscience.com/wos/author/record/38030
- Nonlinear Dynamics http://www.springer.com/engineering/mechanics/journal/11071
- International Conference on Unmanned Aircraft Systems http://www.uasconferences.com/
- Journal of Intelligent & Robotic Systems http://www.editorialmanager.com/jint/default.aspx
- ISA Transactions https://ees.elsevier.com/isatrans/mainpage.html
- IEEE Transactions on Control Systems Technology http://www.ieeecss.org/publications/tcst
- Intelligent Buildings International https://mc.manuscriptcentral.com/inbi
- IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems https://ras.papercept.net/conferences/scripts/start.pl
- International Journal of Advanced Robotic Systems https://us.sagepub.com/en-us/nam/international-journal-of-advanced-robotic-systems/journal202567
- International Conference on Robotics and Automation http://www.ieee-ras.org/conferences-workshops/fully-sponsored/icra
- Control Engineering Practice https://www.journals.elsevier.com/control-engineering-practice
- IET Control Theory and Applications http://digital-library.theiet.org/content/journals/iet-cta
- Mechatronics https://www.journals.elsevier.com/mechatronics

Volunteer Experiences

- 2022: Coach for FIRST Robotics Competition (K-12 level)
- 2024: Judge for VEX Robotics Competition (Middle, high school and college level)
- 2023-2024: Tutor for high school research assistant program at CCNY
- 2016: Session Chair at International Conference on Unmanned Aircraft Systems (ICUAS)

Honors and Awards

- 2025-2030: PhD Fellowship in Civil Engineering (Transportation) at CCNY
- 2021: Teaching Certificate, ACUE
- 2016: Remote Pilot Certificate for Small Unmanned Aircraft Systems, Federal Aviation Administration (FAA)
- 2015–2017: Financial Support ($38.4k) for a two-year exchange program at University of California, Merced, from the Chinese Scholarship Council (CSC)
- 2014: [Team Leader] Best System Control Award, International Aerial Robotics Competition, The Association for Unmanned Vehicle Systems International (AUVSI) Foundation, USA
- 2014: [Team Leader] Best Mission Planning Award, International Aerial Robotics Competition, AUVSI Foundation, USA
- 2010: [Programmer] Meritorious Prize, International Mathematical Contest in Modeling, USA
- 2010: First Prize, Northeastern Region, National Smart Car Competition, Freescale, China