Baoshan Song

Curriculum Vitae

The Hong Kong Polytechnic University PQ502
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Education

2025–present   **Visiting PhD Student - McMaster University**, *Canada*.
Project Title: Certifiable Multi-Sensor Calibration
(Supervised by **Dr. Matthew Giamou**)
Status: In the writing phase

2023–present   **PhD Degree - The Hong Kong Polytechnic University**, *Hong Kong*.
Thesis Title: Certifiable Multi-Sensor Integrated Navigation Based on Factor Graph Optimization for Autonomous Ground Vehicles
(Supervised by **Dr. Li-Ta Hsu** and **Dr. Weisong Wen**)
Status: In the writing phase

2020–2023   **M.Sc. Engineering, Wuhan University**, *China*.
Thesis Title: Multi-Robot Decentralized Mapping Based on Manifold Optimization
(Supervised by **Dr. Xingxing Li** and **Dr. Yun Wu**)
Graduation grade: very-good

2016–2020   **B.C.s Engineering, Wuhan University**, *China*.
Graduation project: Real-time GNSS/INS loosely-coupled localization system
(Supervised by **Dr. Xingxing Li**)
Graduation grade: Distinguished

Professional Interests

Working in the research fields of factor graph optimzation (FGO), convex optimization and their application on simultaneous localization and mapping (SLAM).

Publications

Journals

- **B. Song**, R. Xu and L. Hsu. FGO MythBusters: Explaining how Kalman Filter variants achieve the same perfomance as FGO in navigation applications. *Nature Portfolio journal Wireless Technology 2025* (Under Review).

- **B. Song**, W. Wen, Q. Zhang, B. Xu and L. Hsu. Certifiably Optimal Doppler Positioning With Opportunistic LEO satellites. *IEEE Transactions on Aerospace and Electronic Systems 2025* (Under Review).

- **B. Song**, X. Xia, P. Yan, Y. Zhong, W. Wen and L. Hsu. Online IMU-Odometer Calibration using GNSS Measurements for Unmanned Ground Vehicle Localization. *IEEE Transactions on Intelligent Transportation Systems 2025* (Major Revision).

- P Yan, **B Song**, X Xia, W Wen and LT Hsu. An Efficient Detector for Faulty GNSS Measurements Detection With Non-Gaussian Noises. *NAVIGATION: Journal of the Institute of Navigation 2025* (Under Review).

- X. Li, **B. Song**, et.al. Consistent Localization for Autonomous Robots with Inter-vehicle GNSS Information Fusion. *IEEE communications letters 2022*.

- X. Li, Z. Qin, Z. Shen, X. Li, Y. Zhou and **B. Song**, "A High-Precision Vehicle Navigation System Based on Tightly Coupled PPP-RTK/INS/Odometer Integration. *IEEE Transactions on Intelligent Transportation Systems 2022*

- X. Li, Y. Zhou, Z. Shen, **B. Song** and S. Li. Using a Moving Antenna to Improve GNSS/INS Integration Performance Under Low-Dynamic Scenarios. *IEEE Transactions on Intelligent Transportation Systems 2022*

Conferences

- **B. Song**, W. Wen, L. Hsu. Certifiably Optimal Satellite Orbit Determination Based on Doppler Measurements for Low-Earth-Orbit Satellite. *IEEE/ION PLANS 2025*.

- **B. Song**, W. Wen, L. Hsu. Tightly coupled Low-cost GNSS-RTK/INS/Odometer Integration Via Factor Graph Optimization Aided by GNSS Outlier Mitigation in Urban Canyons. *European Navigation Conference (ENC) 2024*.

Patents

- **B. Song**, et.al. An integrated positioning method based on ArduRover unmanned vehicle. *Chinese Patent ZL202110539154.8, 2021*.

Work Experience

2023-2024 **Teaching Assistant**, *Undergraduate Course: Dynamic systems and control*.
Task: Design teaching materials and teach the PID control experiments using robot operation system (ROS)

2020–2021 **Part-time Engineer**, *Hangzhou Shenhao Technology Co.*.
Task: Develop a simulated rail track irregularity measuring system using tactical IMU.

Supervision

B.C.s **Yuxuan Tan**, *PPP/INS/Vision tightly coupled integration navigation in complex environments*.

Competition	**First Prize in Wuhan university surveying competition (2019)**, *An autonomous navigation system using GNSS/INS/Vision fusion for UGV.*

Skills and Activities

Programming	C/C++, MATLAB, Python, Android
Third-party Library	ROS, Qt, OpenCV, Latex, SOLIDWORKs
Operating System	Windows, Mac, Linux

Languages

Cantonese	Native Speaker
Mandarin	Mandarin (Secondary level-A)
English	English (IELTS)(PhD in English, PhD dissertations written in English, publications and presentations are in English)

Honors and Awards

2020	Wuhan University Outstanding undergraduate graduate
2019	Wuhan University Research Postgraduate Recommendation *(the only one)*
2018–2019	Wuhan University Outstanding Student
2017–2018	National Encouragement Scholarship
2017	Wuhan University Merit Student