Xiao Hu, Ph.D.

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Education

Nov. 2017 – Feb. 2021 **Ph.D., Technical University of Denmark**, Lyngby, Denmark.
Thesis title: *Vision-based Positioning for UAVs.*
GPA: 12/12, Full Scholarship from Innovation Funds Denmark.

Sep. 2011 – Oct. 2013 **Master in Computer and Communication Science, Université de Technologie de Compiègne, Alliance Sorbonne Université**, Compiègne, France.
GPA: B/A, Full Scholarship.

Sep. 2010 - Jul. 2011 **Master in Navigation, Guidance and Control, Northwestern Polytechnical University**, Xi'an, China.

Sep. 2006 - Jul. 2010 **Bachelor in Control Engineering, Northwestern Polytechnical University**, Xi'an, China.
GPA: 91.87/100, Rank: 2/343.

Employment History

Aug. 2024 – · · · · **Adjunct Assistant Professor**, Thrust of Intelligent Transportation, Hong Kong University of Science and Technology (Guang Zhou).
• Student supervision.

Jan. 2024 – · · · · **Team Leader (10+ direct reports), Senior Researcher**, Lower Airspace Economy Research Institute, International Digital Economy Academy.
• Develop the Smart Integrated Lower Airspace System (SILAS).
• Research on city-scale reconstruction, multi-agent planning, and other topics related to lower airspace economy.

Sep. 2023 – Dec. 2023 **Independent Researcher**, Collaborate with Beijing Jiaotong University (Prof. Wei Jiang).
• Coauthor the Handbook on wireless positioning, Springer.
• Derive a new satellite selection algorithm based on power series expansion.
• Consulting service for two robotics companies.

Dec. 2021 – Aug. 2023 **Algorithm Expert**, Autonomous Driving Lab, CaiNiao & DAMO Academy, Alibaba Group.
• IMU sensor data processing and fusion using the complementary filter on SO_3.
• GNSS SPP positioning.
• Factor graph-based sensor calibration.
• Automatic fault identification of sensors calibration parameters using deep learning.
• Online self-calibration for multi-sensors on autonomous vehicles using deep learning.
• Establish a cloud calibration platform from scratch that can provide calibration service 7x24.

Employment History (continued)

Jul. 2021 – Sep. 2021 — **Computer Vision Algorithm Developer**, Vision Section, TrackMan A/S.
- Setup a docker image for training/evaluating Deep learning models on GPU servers.
- Training and testing FasterRCNN on collected datasets.
- Develop a visual tracker for golf ball tracking.
- Evaluate the performance of a pre-trained golf ball detector.
- Develop a trajectory generation algorithm for fusing radar/vision measurements to reconstruct golf ball's trajectory.

Feb. 2021 - Jun. 2021 — **PostDoc**, Technical University of Denmark.
- Stereo Vision Odometry and some staff related to MSCKF.
- Building a GNSS tutorial GUI software for lecturing.

Feb. 2020 - Jul. 2020 — **Visiting PhD Student**, Image Analysis, Computational Modelling and Geometry Section, DIKU, University of Copenhagen.
- Pose estimation and 3D reconstruction under refraction.
- Absolute and relative pose estimation under refraction, derive theories and implementation.
- Refractive Structure from Motion: the whole pipelines.

Dec. 2013 - Oct. 2017 — **Senior Algorithm Engineer**, Lead a team of 3 junior algorithm engineers, DJI Innovation Technology.
- 3D Grid Map algorithm development.
- Motion Planning algorithm development: A*, RRT*, DWA, VFH, minimum snap trajectory generation, motion primitive.
- Sensor fusion algorithm development: AHRS, ESKF, UKF.
- Visual Odometry algorithm development.
- Stereo dense matching algorithm development.
- Some developed algorithms have been integrated in DJI commercial products including DJI Phantom 4, 4 pro, Mavic 2, Inspire 2, etc.

Apr. 2013 - Sep. 2013 — **Master Thesis Intern**, Laboratory Autonomous System, CNRS UMR 8622, Université Paris-Saclay.
- Camera/LiDAR fused road plane detection algorithm.
- HOG/SVM based car detection system.
- tilize scene context information for reducing false positives.

Jul. 2012 - Sep. 2012 — **Summer Intern**, Laboratory Heudiasyc, CNRS UMR 7253, Université de Technologie de Compiègne.
- Develop EKF, UKF, PF for integrating information from GPS and wheel odometer.

Research Publications

Under Review

1. *A linear solution for bearing-only cooperative localization*, IEEE Transactions on Aerospace and Electronic Systems.
2. *A multimodal large language model-driven framework for context-aware uav emergency landing site selection*, ICRA 2026.
3. *A novel nlos correction approach for harsh indoor settings*, IEEE IOTJ.
4. *Coarse-to-fine monocular re-localization in openstreetmap via semantic alignment*, IEEE Robotics and Automation Letters.
5. *Cogstereo: Neural stereo matching with implicit spatial cognition embedding*, ICRA 2026.

6. *Enhancing railway localization with vision: An integrated framework for gnss, ins and netvlad-based visual place recognition*, IEEE Transactions on Intelligent Transportation Systems.
7. *Omni-flow: Leveraging semantic knowledge from foundation model for robust optical flow estimation*, IEEE Transactions on Image Processing.
8. *On accurate and robust estimation of 3d and 2d circular center: Method and application to camera-lidar calibration*, IEEE Transactions on Intelligent Transportation Systems.
9. *On unified height standard for low altitude space economy: Challenges and solutions*, IEEE Aerospace and Electronic Systems Magazine.

Journal Articles

1. L. Fang, **X. Hu**, Y. Zou, and H. Zhang, "Cogstereo: Neural stereo matching with implicit spatial cognition embedding," *arXiv preprint arXiv:2510.22119*, 2025.
2. J. Jiang, **X. Hu**, W. Liu, and W. Jiang, "On accurate and robust estimation of 3d and 2d circular center: Method and application to camera-lidar calibration," *arXiv preprint arXiv:2511.06611*, 2025.
3. W. Jiang et al., "A fast layout algorithm for pseudolite positioning system based on rotating partition," *GPS Solutions*, vol. 29, no. 3, pp. 1–14, 2025.
4. L. Liu, **X. Hu**, W. Jiang, G. Meng, Z. Wang, and T. Zhang, "A visual cooperative localization method for airborne magnetic surveying based on a manifold sensor fusion algorithm using lie groups," *IEEE Transactions on Aerospace and Electronic Systems*, pp. 1–16, 2025. DOI: 10.1109/TAES.2025.3585902
5. L. Liu, **X. Hu**, J. Liu, W. Jiang, H. Wang, and Y. Liu, "A super-fast satellite selection algorithm based on power series expansion," *IEEE Transactions on Intelligent Transportation Systems*, vol. 25, no. 11, pp. 17 421–17 431, 2024.
6. **X. Hu**, F. Lauze, and K. S. Pedersen, "Refractive pose refinement: Generalising the geometric relation between camera and refractive interface," *International Journal of Computer Vision*, vol. 131, no. 6, pp. 1448–1476, 2023.
7. F. Bandini et al., "A drone-borne method to jointly estimate discharge and manning's roughness of natural streams," *Water Resources Research*, vol. 57, no. 2, e2020WR028266, 2021.
8. **X. Hu**, D. Olesen, and P. Knudsen, "Toward high-quality magnetic data survey using uav: Development of a magnetic-isolated vision-based positioning system," *GPS Solutions*, vol. 25, no. 1, p. 29, 2021.
9. **X. Hu**, D. Olesen, and K. Per, "Calibration of extrinsic transformation using manifold optimization," *IFAC-PapersOnLine*, vol. 52, no. 8, pp. 124–129, 2019.

Conference Proceedings

1. C. Hua, **X. Hu**, J. Sun, and Z. Yang, "The maximum coverage model and recommendation system for uav vertiports location planning," in *Proceedings of the 33rd ACM International Conference on Advances in Geographic Information Systems*, ser. SIGSPATIAL '25, New York, NY, USA: Association for Computing Machinery, 2025, pp. 931–934, ISBN: 9798400720864. DOI: 10.1145/3748636.3764159
2. Y. Liu, W. Jiang, **X. Hu**, J. Wang, and B. Cai, "A seamless train positioning method based on visual place recognition," in *2024 IEEE 27th International Conference on Intelligent Transportation Systems (ITSC)*, IEEE, 2024, pp. 3197–3202.
3. **X. Hu**, F. Lauze, K. S. Pedersen, and J. Mélou, "Absolute and relative pose estimation in refractive multi view," in *Proceedings of the IEEE/CVF International Conference on Computer Vision*, 2021, pp. 2569–2578.
4. **X. Hu**, D. Olesen, and P. Knudsen, "Vision-aided state estimator for positioning uavs," in *2021 International Conference on Unmanned Aircraft Systems (ICUAS)*, IEEE, 2021, pp. 165–174.

5. **X. Hu**, D. Olesen, and P. Knudsen, "Gyroscope aided video stabilization using nonlinear regression on special orthogonal group," in *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, IEEE, 2020, pp. 2707–2711.

6. **X. Hu**, D. Olesen, and P. Knudsen, "Multistate constrained invariant kalman filter for rolling shutter camera and imu calibration," in *2020 IEEE International Conference on Image Processing (ICIP)*, IEEE, 2020, pp. 56–60.

7. **X. Hu**, D. Olesen, and P. Knudsen, "Trajectory generation using semidefinite programming for multi-rotors," in *2019 18th European Control Conference (ECC)*, 2019, pp. 2577–2582. DOI: 10.23919/ECC.2019.8795662

8. **X. Hu**, D. Olesen, and K. Per, "A novel robust approach for correspondence-free extrinsic calibration," in *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2019, pp. 1–6.

9. **X. Hu**, J. Jakob, K. Per, and W. Jiang, "Accurate fiducial mapping for pose estimation using manifold optimization," in *2018 International Conference on Indoor Positioning and Indoor Navigation (IPIN)*, IEEE, 2018, pp. 206–212.

10. **X. Hu**, C. Huang, and W. Cai, "Road boundary detection based on information entropy," in *The 26th Chinese Control and Decision Conference (CCDC)*, IEEE, 2014, pp. 1520–1525.

11. **X. Hu**, F. S. A. Rodriguez, and A. Gepperth, "A multi-modal system for road detection and segmentation," in *2014 IEEE Intelligent Vehicles Symposium Proceedings (IV)*, IEEE, 2014, pp. 1365–1370.

Books and Chapters

1. **X. Hu**, L. Liu, and W. Jiang, "Advance on pseudolite network selection for optimal positioning," in *Handbook of Wireless Positioning*, Springer, 2024, pp. 1–31.

Patents

1. L. Zhang, **X. Hu**, and A. Liu, "Flight path determination," US Patent 12,235,643, Feb. 2025.

2. **X. Hu**, G. Su, A. Liu, L. Zhang, and P. Zhaoliang, "Gimbal servo control method and control device," US Patent 12,075,159, Aug. 2024.

3. L. Zhang, **X. Hu**, and A. Liu, "Flight path determination," US Patent 11,868,131, Jan. 2024.

4. L. Zhang, **X. HU**, A. Liu, and G. Zhou, "Systems and methods for adjusting uav trajectory," US Patent App. 17/322,527, Feb. 2022.

5. **X. Hu**, A. Liu, L. Zhang, and K. Tang, "Systems and methods for uav path planning and control," US Patent App. 17/111,447, Apr. 2021.

6. H. Zhang, L. Han, and **X. Hu**, "System and method for obstacle avoidance," US Patent 11,151,741, Oct. 2021.

7. L. ZHANG, **X. Hu**, A. Liu, and G. ZHOU, "Systems and methods for adjusting uav trajectory," US Patent 11,008,098, May 2021.

8. T. Zhao, Z. Guyue, A. Liu, **X. Hu**, and L. ZHANG, "Method and device for controlling flight, control terminal, flight system and processor," US Patent 11,186,366, Nov. 2021.

9. **X. Hu**, A. Liu, L. Zhang, M. Shuyuan, and Z. Chengwei, "Method for generating flight path, control device, and unmanned aerial vehicle," US Patent App. 16/407,664, Nov. 2020.

10. **X. Hu**, A. Liu, L. ZHANG, and K. Tang, "Systems and methods for uav path planning and control," US Patent 10,860,040, Dec. 2020.

11. G. Su, C. Zou, M. Shuyuan, **X. Hu**, G. Zhuo, and B. Miao, "Navigation processing method, apparatus, and control device," US Patent App. 16/690,838, May 2020.

12. **X. Hu**, A. Liu, and L. Zhang, "Method for controlling flight of an aircraft, device, and aircraft," US Patent App. 16/384,300, Aug. 2019.
13. L. ZHANG, **X. Hu**, and A. Liu, "Flight path determination," US Patent App. 16/406,887, Aug. 2019.
14. T. Zhao, G. Zhou, A. Liu, **X. HU**, and L. Zhang, "Method and device for controlling flight, control terminal, flight system and processor," US Patent App. 16/119,434, Dec. 2018.
15. **X. Hu**, A. Liu, Z. Guyue, and X. Pan, "Velocity control for an unmanned aerial vehicle," US Patent 9,625,907, Apr. 2017.
16. A. Liu, **X. Hu**, and Z. Guyue, "Systems and methods for surveillance with a visual marker," US Patent App. 15/289,384, Feb. 2017.
17. A. Liu, **X. Hu**, Z. Guyue, and X. Pan, "Context-based flight mode selection," US Patent 9,592,911, Mar. 2017.
18. T. WANG et al., "Systems and methods for uav interactive instructions and control," WO Patent WO/2017/045,251, Mar. 2017.
19. T. ZHAO, G. (CN). ZHOU, A. (CN). LIU, X. (CN). HU, L. (CN). ZHANG, and (. CN), "Flight control method and device, control terminal, flight system, and processor," WO Patent WO2,017,147,784, Aug. 2017.

Skills

Languages	English – Fluent, Mandarin – Native speaker, French – Intermediate.
Coding Related	C/C++, Python, MATLAB, ROS, OpenCV, PCL, GIT, Pytorch, LaTeX, Docker, FastAPI, …

Awards and Achievements

2026	**IEEE TIM Outstanding Reviewer**, IEEE Instrumentation & Measurement Society, IEEE.
2025	**IEEE TIM Outstanding Reviewer**, IEEE Instrumentation & Measurement Society, IEEE.
	National Youth Talents Plan, XX Ministry, China.
2019	**Travel Allowance**, Otto Mønsteds Fond Travel Funds, Denmark.
2010	**Honor Excellent Undergraduate Students**, ShaanXi Province, China.
2009	**National Scholarship**, Chinese Ministry of Education, China.
	NPU-Zoomlion Special Scholarship, Zoomlion Company, China.
2008	**National Scholarship**, Chinese Ministry of Education, China.
	Excellent-Student and Special Class Scholarship, NPU, China.
	NPU-CATIC Special Scholarship, CATIC Company, China.
2007	**National Scholarship**, Chinese Ministry of Education, China.
	NPU-HUAWEI Outstanding Student Scholarship, Huawei Company, China.

Teaching & Supervision & Review

- Supervised > 10 research interns at IDEA.
- Supervised 1 research intern at Alibaba DAMO Academy.
- Supervised 3 master's thesis students at DTU.
- Supervised 2 special course students at DTU.
- Teaching assistant for Satellite Positioning and Aerial Photogrammetry at DTU.

Teaching & Supervision & Review (continued)

- Regular reviewer for IROS (2021–2025), CVPR (2021), ICCV (2021), ROBIO (2018), IEEE Transactions on Instrumentation and Measurement, and IEEE Transactions on Intelligent Vehicles.

References

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