Jingao Xu | Ph.D.

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Research Interests

📱 Mobile Computing   🖥 Edge Computing   ➤ Wireless Localization

📷 Visual SLAM Systems   ✈ Drone-based Applications

Education

Aug. 2017 – July 2022	**Tsinghua University**, School of Software. Ph.D. in Software Engineering with **Excellent Thesis & Graduation Award** Thesis: *Edge-assisted Real-time Localization with Multi-modal Fusion* Supervisor: Prof. Yunhao Liu & Prof. Zheng Yang
Aug. 2013 – July 2017	**Tsinghua University**, School of Software. B.E. in Software Engineering with **Excellent Thesis & Graduation Award** Thesis: *Wireless Indoor Localization via Multi-modal Fusion.* Supervisor: Prof. Yunhao Liu & Prof. Zheng Yang

Academic & Industry Experience

July 2024 – present	**Carnegie Mellon University**, Computer Science Department. Postdoctoral Researcher Advisor: Prof. Mahadev Satyanarayanan
July 2022 – June 2024	**Tsinghua University**, School of Software, TNList. Postdoctoral Researcher Advisor: Prof. Zheng Yang & Prof. Yunhao Liu
Oct. 2016 – Feb. 2017	**Microsoft Research Asia**, Cloud & Mobile Group. Research Intern Mentor: Dr. Yuanchao Shu

Representative Publications

Jingao Xu, Zheng Yang, Yunhao Liu, Hao Cao, "*Edge Assisted Mobile Visual SLAM*", **Springer Book**, ISBN: 978-981-97-3572-3, 2024.

Jingao Xu, Danyang Li, Longfei Shangguan, Yishujie Zhao, Hao Cao, Yunhao Liu, Zheng Yang, "*Taming Event Cameras with Bio-Inspired Architecture and Algorithm: A Case for Drone Obstacle Avoidance*", The

Annual International Conference On Mobile Computing And Networking (**ACM MobiCom'23**), Madrid, Spain, Oct 2-6.

🔖 **Jingao Xu**, Hao Cao, Zheng Yang, Longfei Shangguan, Jialin Zhang, Xiaowu He, Yunhao Liu, "*SwarmMap: Scaling Up Real-time Collaborative Visual SLAM at the Edge*", USENIX Symposium on Networked Systems Design and Implementation (**USENIX NSDI'22**), Renton, USA, April 4-6, 2022.

🔖 **Jingao Xu**, Guoxuan Chi, Zheng Yang, Danyang Li, Qian Zhang, Qiang Ma, Xin Miao, "*FollowUpAR: Enabling Follow-up Effects in Mobile Applications*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys'21**), 2021, Virtual Online, 24 June-2 July, 2021.

🔖 **Jingao Xu**, Hao Cao, Danyang Li, Kehong Huang, Chen Qian, Longfei Shangguan, Zheng Yang, "*Edge Assisted Mobile Semantic Visual SLAM*", IEEE Conference on Computer Communications (**IEEE INFOCOM'20**), Beijing, China (Virtual Online), 5-8 July, 2020 (**Best-in-session Presentation Award**).

🔖 **Jingao Xu**, Hengjie Chen, Kun Qian, Erqun Dong, Min Sun, Chenshu Wu, Li Zhang, Zheng Yang, "*iVR: Integrated Vision and Radio Localization with Zero Human Effort*", Proceedings of ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**ACM IMWUT/UbiComp'19**), London, UK, Sep 11 - Sep 13, 2019.

Full Publications

📄 Conference Papers

[**C1**] Chenyu Zhao, Ciyu Ruan, **Jingao Xu**, Haoyang Wang, Shengbo Wang, Jirong Zha, Jiaqi Li, Zheng Yang, Yunhao Liu, Xiao-Ping Zhang, and Xinlei Chen, "*Foes or Friends: Embracing Ground Effect for Edge Detection on Lightweight Drones*", The Annual International Conference On Mobile Computing And Networking (**ACM MobiCom**), Washington, D.C., USA, Nov 18-22, 2024.

[**C2**] Guoxuan Chi, Zheng Yang, Chenshu Wu, **Jingao Xu**, Yuchong Gao, Yunhao Liu, and Tony Xiao Han, "*RF-Diffusion: Radio Signal Generation via Time-Frequency Diffusion*", The Annual International Conference On Mobile Computing And Networking (**ACM MobiCom**), Washington, D.C., USA, Nov 18-22, 2024.

[**C3**] Yuxuan Liu, Haoyang Wang, Fanhang Man, **Jingao Xu**, Fan Dang, Yunhao Liu, Xiao-Ping Zhang, and Xinlei Chen, "*MobiAir: Unleashing Sensor Mobility for City-scale and Fine-grained Air-Quality Monitoring with AirBERT*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys**), Tokyo, Japan, Jun 3-7, 2024.

[**C4**] Danyang Li, Yishujie Zhao, **Jingao Xu**†, Shengkai Zhang, Longfei Shangguan, and Zheng Yang, "*edgeSLAM2: Rethinking Edge-Assisted Visual SLAM with On-Chip Intelligence*", IEEE Conference on Computer Communications (**IEEE INFOCOM**), Vancouver, Canada, May 20-23, 2024.

[**C5**] Haoyang Wang, **Jingao Xu**, Chenyu Zhao, Zihong Lu, Yuhan Cheng, Xuecheng Chen, Xiao-ping Zhang, Yunhao Liu, and Xinlei Chen, "*TransformLoc: Transforming MAVs into Mobile Localization*

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*indicates co-primary author. <u>Students</u> mentored by me. †indicates corresponding author.

Infrastructures in Heterogeneous Swarms", IEEE Conference on Computer Communications (**IEEE INFOCOM**), Vancouver, Canada, May 20-23, 2024.

[**C6**] <u>Hao Cao</u>, **Jingao Xu**†, Danyang Li, Zheng Yang, and Yunhao Liu, "*EventBoost: Event-based Acceleration Platform for Real-time Localization and Tracking*", IEEE Conference on Computer Communications (**IEEE INFOCOM**), Vancouver, Canada, May 20-23, 2024.

[**C7**] **Jingao Xu**, Danyang Li, Longfei Shangguan, Yishujie Zhao, Hao Cao, Yunhao Liu, Zheng Yang, "*Taming Event Cameras with Bio-Inspired Architecture and Algorithm: A Case for Drone Obstacle Avoidance*", The Annual International Conference On Mobile Computing And Networking (**ACM MobiCom**), Madrid, Spain, Oct 2-6, 2023.

[**C8**] <u>Zeyu Wang</u>, **Jingao Xu**, Xu Wang, Xiangwen Zhuge, Xiaowu He, Zheng Yang, "*Industrial Knee-jerk: In-Network Simultaneous Planning and Control on a Switch*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys**), Helsinki, Finland, June 18-22, 2023.

[**C9**] <u>Yue Wu</u>, **Jingao Xu**, Yadong Xie, Danyang Li, Hao Cao, Fan Li, Zheng Yang, "*FlyTracker: Motion Tracking and Obstacle Detection for Drones Using Event Cameras*", IEEE Conference on Computer Communications (**IEEE INFOCOM**), New York, USA, May 17-20, 2023.

[**C10**] **Jingao Xu**, Hao Cao, Zheng Yang, Longfei Shangguan, Jialin Zhang, Xiaowu He, Yunhao Liu, "*SwarmMap: Scaling Up Real-time Collaborative Visual SLAM at the Edge*", USENIX Symposium on Networked Systems Design and Implementation (**USENIX NSDI**), Renton, USA, April 4-6, 2022.

[**C11**] <u>Danyang Li</u>, **Jingao Xu**, Zheng Yang, Qian Zhang, Qiang Ma, Li Zhang, Pengpeng Chen, "*Motion Inspires Notion: Self-supervised Visual-LiDAR Fusion for Environment Depth Estimation*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys**), Portland, Oregon, June 27-July 1, 2022.

[**C12**] Guoxuan Chi, Zheng Yang, **Jingao Xu**, Chenshu Wu, Jialin Zhang, Jianzhe Liang, Yunhao Liu, "*Wi-Drone: Wi-Fi-based 6-DoF Tracking for Indoor Drone Flight Control*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys**), Portland, Oregon, June 27-July 1, 2022.

[**C13**] Jialin Zhang, <u>Xiang Huang</u>, **Jingao Xu**, Yue Wu, Qiang Ma, Xin Miao, Li Zhang, Pengpeng Chen, Zheng Yang, "*Edge Assisted Real-time Instance Segmentation on Mobile Devices*", IEEE International Conference on Distributed Computing Systems (**IEEE ICDCS**), Bologna, Italy, July 10-13, 2022.

[**C14**] **Jingao Xu**, Guoxuan Chi, Zheng Yang, Danyang Li, Qian Zhang, Qiang Ma, Xin Miao, "*FollowUpAR: Enabling Follow-up Effects in Mobile Applications*", ACM International Conference on Mobile Systems, Applications, and Services (**ACM MobiSys**), 2021, Virtual Online, 24 June-2 July, 2021.

[**C15**] <u>Danyang Li</u>, **Jingao Xu***, Zheng Yang, Yumeng Lu, Qian Zhang, Xinglin Zhang, "*Train Once, Locate Anytime for Anyone: Adversarial Learning Based Wireless Localization*", IEEE Conference on Computer Communications (**IEEE INFOCOM**), Virtual Online, 10-13 May, 2021.

[**C16**] Li Zhang, Yi Xu, Jinhui Bao, Qiuyu Wang, **Jingao Xu**, Danyang Li, Yaodong Yang, Min Zhang, "*Multi-Region Indoor Localization Based on The WVP System*", IEEE International Conference on Parallel and Distributed Systems (**IEEE ICPADS**), Beijing, China, 12-14 December, 2021.

[**C17**] Erqun Dong, Jianzhe Liang, Zeyu Wang, **Jingao Xu**, Longfei Shangguan, Qiang Ma, Zheng Yang, "*Improving the Applicability of Visual Peer-to-Peer Navigation with Crowdsourcing*", IEEE International Conference on Parallel and Distributed Systems (**IEEE ICPADS**), Hong Kong, China (Virtual Online), 2-4 December, 2020.

[**C18**] **Jingao Xu**, Hao Cao, Danyang Li, Kehong Huang, Chen Qian, Longfei Shangguan, Zheng Yang, "*Edge Assisted Mobile Semantic Visual SLAM*", IEEE Conference on Computer Communications (**IEEE INFOCOM**), Beijing, China (Virtual Online), 5-8 July, 2020 (**Best-in-session Presentation Award**).

[**C19**] Liang Dong, **Jingao Xu**, Guoxuan Chi, Danyang Li, Xinglin Zhang, Jianbo Li, Qiang Ma, Zheng Yang, "*Enabling Surveillance Cameras to Navigate*", International Conference on Computer Communications and Networks (**IEEE ICCCN**), Singapore (Virtual Online), 3-6 Auguest, 2020.

[**C20**] Erqun Dong*, **Jingao Xu***, Chenshu Wu, Yunhao Liu, Zheng Yang, "*Pair-Navi: Peer-to-Peer Indoor Navigation with Mobile Visual SLAM*", IEEE Conference on Computer Communications (IEEE INFOCOM), Paris, France, 29 April-2 May, 2019 (**Best-in-session Presentation Award**).

[**C21**] **Jingao Xu**, Zheng Yang, Hengjie Chen, Yunhao Liu, Xiancun Zhou, Jianbo Li, Nicholas Lane, "*Embracing Spatial Awareness For Reliable WiFi-based Indoor Location Systems*", IEEE International Conference on Mobile Ad-hoc and Sensor Systems (**IEEE MASS**), Chengdu, China, Oct 8 - Oct 11, 2018.

[**C22**] Hengjie Chen, **Jingao Xu**[†], Erqun Dong, Zheng Yang, "*Push the Limit of Multi-module Localization with Enhanced Particle Filter*", China Conference on Internet of Things (**CWSN**), Dunhuang, China, Sep 18 - Sep 21, 2020.

✉ Journal Articles

[**J1**] <u>Danyang Li</u>, <u>Yishujie Zhao</u>, **Jingao Xu**[†], Shengkai Zhang, Longfei Shangguan, and Zheng Yang, "*Reshaping Edge-Assisted Visual SLAM by Embracing On-Chip Intelligence*", IEEE Transactions on Mobile Computing (**IEEE TMC**), 2024.

[**J2**] <u>Xuecheng Chen</u>, Zijian Xiao, Yuhan Cheng, Chen-Chun Hsia, Haoyang Wang, **Jingao Xu**, Susu Xu, Fan Dang, Xiao-Ping Zhang, and Xinlei Chen, "*SOScheduler: Toward Proactive and Adaptive Wildfire Suppression via Multi-UAV Collaborative Scheduling*", IEEE Internet of Things Journal (**IEEE IoTJ**), 2024.

[**J3**] <u>Hao Cao</u>, **Jingao Xu***, Zheng Yang, Longfei Shangguan, Jialin Zhang, Xiaowu He, Yunhao Liu, "*Scaling Up Edge-assisted Real-time Collaborative Visual SLAM Applications*", ACM/IEEE Transactions on Networking (**ACM/IEEE ToN**), 2024.

[**J4**] <u>Danyang Li</u>, **Jingao Xu***, Zheng Yang, Qian Zhang, Qiang Ma, Li Zhang, Pengpeng Chen, "*Motion Inspires Notion: Self-supervised Visual-LiDAR Fusion for Environment Depth Estimation*", IEEE Transactions on Mobile Computing (**IEEE TMC**), 2024.

[**J5**] **Jingao Xu**, Hao Cao, Danyang Li, Longfei Shangguan, Yunhao Liu, Zheng Yang, "*Edge Assisted Mobile Semantic Visual SLAM*", IEEE Transactions on Mobile Computing (**IEEE TMC**), 2023.

[J6] Guoxuan Chi, **Jingao Xu**, Jialin Zhang, Qian Zhang, Qiang Ma, Zheng Yang, "*Locate, Tell, and Guide: Enabling Public Cameras to Navigate the Public*", IEEE Transactions on Mobile Computing (**IEEE TMC**), 2021.

[J7] Danyang Li, **Jingao Xu**, Zheng Yang, Chenshu Wu, Jianbo Li, Nicholas D.Lane,"*Wireless Localization with Spatial-Temporal Robust Fingerprints*", ACM Transactions on Sensor Networks (**ACM TOSN**), 2021.

[J8] **Jingao Xu**, Erqun Dong, Qiang Ma, Chenshu Wu, Zheng Yang, "*Smartphone-based Indoor Visual Navigation with Leader-Follower Mode*", ACM/IEEE Transactions on Sensor Network (**ACM TOSN**), 2021.

[J9] Liang Dong, **Jingao Xu**, Guoxuan Chi, Danyang Li, Xinglin Zhang, Jianbo Li, Qiang Ma, Zheng Yang, "*Enabling Surveillance Cameras to Navigate*", ACM/IEEE Transactions on Sensor Network (**ACM TOSN**), 2021.

[J10] **Jingao Xu**, Hengjie Chen, Kun Qian, Erqun Dong, Min Sun, Chenshu Wu, Li Zhang, Zheng Yang, "*iVR: Integrated Vision and Radio Localization with Zero Human Effort*", Proceedings of ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**ACM IMWUT/UbiComp**), London, UK, Sep 11 - Sep 13, 2019.

[J11] Danyang Li, Yumeng Lu, **Jingao Xu**[†], Qiang Ma, Zhuo Liu, "*iPAC: Integrate pedestrian dead reckoning and computer vision for indoor localization and tracking*",IEEE ACCESS, 2019.

[J12] Chenshu Wu, **Jingao Xu**, Zheng Yang, Nicholas D. Lane, Zuwei Yin, "*Gain Without Pain: Accurate WiFi-based Localization with Fingerprint Spatial Gradient*", Proceedings of ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**ACM IMWUT/UbiComp**), 2017, Maui, USA, Sep 11 - Sep 15, 2017.

Honors & Awards

2022	■	**ACM SIGCOMM China Doctoral Dissertation Award**, ACM
2021, 2016	■	**National Scholarship**, China
2019, 2020	■	**Best-in-session Presentation Award**, IEEE INFOCOM
2022 (Ph.D.)	■	**Outstanding Thesis & Outstanding Graduate** of Tsinghua University **Outstanding Graduate** of Beijing
2017 (B.Sc.)	■	**Excellent Thesis & Excellent Graduate** of Tsinghua University **Excellent Graduate** of Beijing
2016	■	**First-class Science and Technology Innovation Scholarship**, Tsinghua University
2014 – 2019	■	**First-class Overall Excellence Scholarship**, Tsinghua University.

Professional Experience

Co-Chair

- **ACM MobiSys Finance Chair** 2025

- **ACM HotMobile Publication Co-Chair, Poster/Demo Chair** 2024

Technical Program Committee Member

- **IEEE ICPADS** 2023, 2024

- **UbiComp-CPD Workshop** 2023

- **EAI MobiQuitous** 2022, 2023, 2024

Journal Reviewer

- **ACM IMWUT/UbiComp, IEEE TMC, IEEE IoTJ, IEEE RA-L, ACM TOSN, IEEE ACCESS, TURC, Sensors**

Teaching

- **Teaching Assist:** The Frontiers of Computer Networking (Graduate Course)

  Spring 2020, Spring 2021, Tsinghua University

- **Teaching Assist:** Software Engineering (Undergraduate Course)

  Fall 2016, kernel course for undergraduates in School of Software, Tsinghua University