Hang Qiu

Assistant Professor
Electrical and Computer Engineering
Computer Science and Engineering
University of California, Riverside
Email: hangq@ucr.edu Web: hangqiu.github.io

Research Interests

Collaborative Autonomous Systems, Cyber-physical Systems, Systems for ML, Edge ML, 3D Sensing, Cooperative Perception, Mapping and Localization, Mobile Computing, Wireless Networking.

Appointments

University of California, Riverside, *Riverside, CA, USA* *2023 ∼ pres.*
Assistant Professor, Department of ECE and CSE

Waymo, *Bellevue, WA, USA* *2022 ∼ 2023*
Software Engineer, Perception

Stanford University, *Stanford, CA, USA* *2021 ∼ 2022*
Postdoctoral Scholar, Department of Electrical Engineering

Waymo, *Mountain View, CA, USA* *2021*
Intern, Perception

Microsoft Research, *Redmond, WA, USA* *2017 ∼ 2019*
Research Intern, Contractor, Mobility and Networking Group

IBM Research, *Yorktown Heights, NY, USA* *2015*
Research Intern, T.J. Watson Research Center

Education

Ph.D. | *Electrical and Computer Engineering* *2020*
University of Southern California, Los Angeles, USA
Dissertation: Networked Cooperative Perception: Towards Robust and Efficient Autonomous Driving

M.S. | *Computer Science* *2020*
University of Southern California, Los Angeles, USA

B.S. | *Electronic Engineering* *2013*
Shanghai Jiao Tong University, Shanghai, China
Thesis: Distributed Channel-Assignment and Throughput Control in Multi-Radio Multi-Channel Wireless Network

Honors and Awards

SoCal OASIS™ IFA Award, *Medium, UCR* *2025*

SoCal OASIS™ IFA Award, *Small, UCR* *2024*

Outstanding Paper Award, *MLSys 2022, Santa Clara, USA* *2022*

Outstanding Research Assistant Award, *USC* *2021*

Qualcomm Innovation Fellowship, *Finalist, San Diego, USA* *2019*

Best Paper Award, *Runner-up, ACM Mobisys 2018, Munich, Germany* *2018*

Viterbi Graduate Student Annenberg Fellowship, *USC* *2013 ∼ 2017*

Outstanding Winner, *Interdisciplinary Contest in Modeling (ICM), USA* *2012*

National Fellowship (Top 1%), *China* *2010, 2011, 2012*

First-Class (Top 1%) Academic Excellence Fellowship, *Shanghai Jiao Tong University* *2010, 2011, 2012*

Academic Star (Top 1%), *Shanghai Jiao Tong University* *2012*

PUBLICATION

Refereed Publication | **** Equal contribution / advising***

[1] SEE-V2X: C-V2X Direct Communication Dataset: An Application-Centric Approach
Ruoshen Mo, Bo Wu, Zhaowei Tan*, and **Hang Qiu***
Proceedings of the 23rd ACM Conference on Embedded Networked Sensor Systems (SenSys '25), 2025

[2] CMP: Cooperative Motion Prediction with Multi-Agent Communication
Zehao Wang, Yuping Wang, Zhuoyuan Wu, Hengbo Ma, Zhaowei Li, **Hang Qiu***, and Jiachen Li*
IEEE Robotics and Automation Letters (RA-L). 2025

[3] Pillar Attention Encoder for Adaptive Cooperative Perception
Zhengwei Bai, Guoyuan Wu, Matthew J. Barth, **Hang Qiu**, Yongkang Liu, Emrah Akin Sisbot, and Kentaro Oguchi
IEEE Internet of Things Journal (IOT-J). 2024

[4] WOMD-LiDAR: Raw Sensor Dataset Benchmark for Motion Forecasting
Kan Chen, Runzhou Ge, **Hang Qiu**, Rami Ai-Rfou, Charles R. Qi, Xuanyu Zhou, Zoey Yang, Scott Ettinger, Pei Sun, Zhaoqi Leng, Mustafa Mustafa, Ivan Bogun, Weiyue Wang, Mingxing Tan, and Dragomir Anguelov
Proceedings of 2024 IEEE International Conference on Robotics and Automation (ICRA '24), 2024

[5] ReplayAR: A Tool for Visual Evaluation of Mixed Reality
Zijian Huang, Cary Shu, **Hang Qiu**, and Jiasi Chen
Proceedings of the 30th Annual International Conference on Mobile Computing and Networking, Immersive Computing Workshop (ACM MobiCom '24, ImmerCom Workshop), 2024

[6] Embodied Understanding of Driving Scenarios
Yunsong Zhou, Linyan Huang, Qingwen Bu, Jia Zeng, Tianyu Li, **Hang Qiu**, Hongzi Zhu, Minyi Guo, Yu Qiao, and Hongyang Li
Proceedings of The 18th European Conference on Computer Vision (ECCV '24), 2024

[7] Boosting Collaborative Vehicular Perception on the Edge with Vehicle-to-Vehicle Communication
Ruiyang Zhu, Xiao Zhu, Anlan Zhang, Xumiao Zhang, Jiachen Sun, Feng Qian, **Hang Qiu**, Z. Morley Mao, and Myungjin Lee
Proceedings of the 22nd ACM Conference on Embedded Networked Sensor Systems (SenSys '24), 2024

[8] MCAL: Minimum Cost Human-Machine Active Labeling
Hang Qiu, Krishna Chintalapudi, and Ramesh Govindan
Proceedings of the Eleventh International Conference on Learning Representations (ICLR '23), 2023

[9] AutoCast: Scalable Infrastructure-less Cooperative Perception for Distributed Collaborative Driving

Hang Qiu, Pohan Huang, Namo Asavisanu, Xiaochen Liu, Konstantinos Psounis, and Ramesh Govindan
Proceedings of the 20th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '22), 2022

[10] Coopernaut: End-to-End Driving with Cooperative Perception for Networked Vehicles

Hang Qiu*, Jiaxun Cui*, Dian Chen, Peter Stone, and Yuke Zhu
Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR '22), 2022

[11] ML-EXray: Visibility into ML Deployment on the Edge

Hang Qiu, Ioanna Vavelidou, Jian Li, Evgenya Pergament, Pete Warden, Sandeep Chinchali, Zain Asgar, and Sachin Katti
Proceedings of Machine Learning and Systems (MLSys '22), 2022 - Outstanding Paper Award

[12] Sensing the Sensor: Estimating Camera Properties with Minimal Information

Pradipta Ghosh, Xiaochen Liu, **Hang Qiu**, Marcos A. M. Vieira, Gaurav S. Sukhatme, and Ramesh Govindan
ACM Transactions on Sensor Networks (TOSN '22). 2022

[13] Optimal Resource Allocation for Crowdsourced Image Processing

Kristina Sorensen Wheatman, Fidan Mehmeti, Mark Mahon, **Hang Qiu**, Kevin S. Chan, and Thomas F. La Porta
IEEE Transactions on Mobile Computing (TMC '22). 2022

[14] CarMap: Fast 3D Feature Map Updates for Automobiles

Fawad Ahmad, **Hang Qiu**, Ray Eells, Fan Bai, and Ramesh Govindan
Proceedings of the 17th Symposium on Networked Systems Design and Implementation (NSDI '20), 2020

[15] FedML: A Research Library and Benchmark for Federated Machine Learning

Chaoyang He, Songze Li, Jinhyun So, Mi Zhang, Hongyi Wang, Xiaoyang Wang, Praneeth Vepakomma, Abhishek Singh, **Hang Qiu**, Li Shen, et al.
Proceedings of the 34th Conference on Neural Information Processing Systems (NeurIPS '20), Workshop on Scalability, Privacy, and Security in Federated Learning (NeurIPS '20-SpicyFL), 2020 - Best Paper Award

[16] Optimal Resource Allocation for Crowdsourced Image Processing

Kristina Sorensen Wheatman, Fidan Mehmeti, Mark Mahon, **Hang Qiu**, Kevin Chan, and Thomas La Porta
Proceedings of the 17th Annual IEEE International Conference on Sensing, Communication, and Networking (SECON '20), 2020

[17] On Tracking Realistic Targets in a Megacity with Contested Air and Spectrum Access

Jongdeog Lee, Tarek Abdelzaher, **Hang Qiu**, Ramesh Govindan, Kelvin Marcus, Reginald Hobbs, Niranjan Suri, and Will Dron
Proceedings of the 37th Military Communications Conference (MILCOM '18), 2018

[18] AVR: Augmented Vehicular Reality

Hang Qiu, Fawad Ahmad, Fan Bai, Marco Gruteser, and Ramesh Govindan
Proceedings of the 16th Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '18), 2018 - Best Paper Runner-up Award

[19] Kestrel: Video analytics for augmented multi-camera vehicle tracking

Hang Qiu, Xiaochen Liu, Swati Rallapalli, Archith J Bency, Kevin Chan, Rahul Urgaonkar, BS Manjunath, and Ramesh Govindan
Proceedings of the 3rd IEEE/ACM International Conference on Internet-of-Things Design and Implementation (IoTDI '18), 2018

[20] Augmented Vehicular Reality: Enabling Extended Vision for Future Vehicles

Hang Qiu, Fawad Ahmad, Ramesh Govindan, Marco Gruteser, Fan Bai, and Gorkem Kar
Proceedings of the 18th International Workshop on Mobile Computing Systems and Applications (HotMobile '17), 2017

[21] Towards Robust Vehicular Context Sensing

Hang Qiu, Jinzhu Chen, Shubham Jain, Yurong Jiang, Matt McCartney, Gorkem Kar, Fan Bai, Donald K Grimm, Marco Gruteser, and Ramesh Govindan
IEEE Transactions on Vehicular Technology (TVT). 2017

[22] High-Rate WiFi Broadcasting in Crowded Scenarios via Lightweight Coordination of Multiple Access Points

Hang Qiu, Konstantinos Psounis, Giuseppe Caire, Keith M. Chugg, and Kaidong Wang
Proceedings of the 17th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc '16), 2016

[23] CARLOC: Precise Positioning of Automobiles

Yurong Jiang, **Hang Qiu**, Matthew McCartney, Gaurav Sukhatme, Marco Gruteser, Fan Bai, Donald Grimm, and Ramesh Govindan
Proceedings of the 13th ACM Conference on Embedded Networked Sensor Systems (SenSys '15), 2015

[24] CARLOG: A Platform for Flexible and Efficient Automotive Sensing

Yurong Jiang, **Hang Qiu**, Matthew McCartney, William G. J. Halfond, Fan Bai, Donald Grimm, and Ramesh Govindan
Proceedings of the 12th ACM Conference on Embedded Network Sensor Systems (SenSys '14), 2014

Technical Reports

[1] On Localizing a Camera from a Single Image

Pradipta Ghosh, Xiaochen Liu, **Hang Qiu**, Marcos AM Vieira, Gaurav S Sukhatme, and Ramesh Govindan
ArXiv, 2020

[2] Satyam: Democratizing Groundtruth for Machine Vision

Hang Qiu, Krishna Chintalapudi, and Ramesh Govindan
Integrated into Microsoft Azure ML. Used by UCSB, USC, UIUC, ARL., 2018
Featured in Microsoft Ignite 2019

[3] Flexible and Efficient Sensor Fusion for Automotive Apps

Yurong Jiang, **Hang Qiu**, Matthew McCartney, William GJ Halfond, Fan Bai, Donald Grimm, and Ramesh Govindan
Citeseer, 2013

PATENTS

[1] Method and Apparatus for a Context-aware Crowd-sourced Sparse High Definition Map
Fawad Ahmad, **Hang Qiu**, Ramesh Govindan, Donald K Grimm, and Fan Bai
- *Worldwide Patent: US20200278217 / CN111638536 / DE102020102725*

[2] Crowd-sensed Point Cloud Map
Fawad Ahmad, **Hang Qiu**, Fan Bai, and Ramesh Govindan
- *Worldwide Patent: US20190266748 / CN110186467 / DE102019104482*

[3] Method and Apparatus of Networked Scene Rendering and Augmentation in Vehicular Environments in Autonomous Driving Systems
Hang Qiu, Ramesh Govindan, Marco Gruteser, and Fan Bai
- *Worldwide Patent: US20180261095 / CN108574929 / DE102018105293*

[4] Energy-efficient Cooperative Sensing Schedule for Heterogeneous Users in Cognitive Radio Network
Xin Huang, Xinxin Feng, **Hang Qiu**, Gaofei Sun, Xiaohua Tian, Feng Yang, and Xinbing Wang
- *Patent: CN102905381*

[5] Greedy Channel-allocation in Multi-radio Multi-channel Multi-hop Wireless Network
Hang Qiu, Xin Huang, Qi Shi, Xinbing Wang, and Jun Tian
- *Patent: CN103634846*

[6] Automatic Line-tracking Floor Waxing Machine
Hang Qiu and Xin Huang
- *Patent: CN202458213*

TEACHING

Instructor, University of California, Riverside — *Spring 2025*
CS 135: Virtual/Augmented Reality

Instructor, University of California, Riverside — *Winter 2025*
CS/EE 131: Edge Computing

Instructor, University of California, Riverside — *Fall 2024*
EE 260B: Introduction to Self-driving Stack

Instructor, University of California, Riverside — *Spring 2024*
EE 260C: Introduction to Self-driving Stack

Instructor, University of California, Riverside — *Winter 2024*
CS/EE 131: Edge Computing

Co-instructor, Stanford University — *Fall 2021*
EE 292D: ML on Embedded Systems, Co-Instructor: S.Katti, Z.Asgar, P.Warden

Teaching Assistant, University of Southern California — *Spring 2020*
ECE 597: Wireless Networks, Instructor: B. Krishnamachari

Guest Lecturer, University of Southern California — *Spring 2020*
ECE 597: Wireless Networks, Instructor: K. Psounis

Panelist, University of Southern California *Spring 2019*
CSCI 697: Seminar in Computer Science Research, Instructor: L. Golubchik

Teaching Assistant, University of Southern California *Fall 2017*
CSCI 551: Computer Communications, Instructor: R. Govindan

Guest Lecturer, University of Southern California *Spring 2015*
ECE 597: Wireless Networks, Instructor: K. Psounis

SERVICES

Organizing Committee

Sponsor Chair, ACM Conference on Embedded Network Sensor Systems, *Sensys'25*

Poster Chair, International Conference on Mobile Systems, Applications, and Services, *Mobisys'25*

Local Chair, International Workshop on Mobile Computing Systems and Applications, *HotMobile'25*

Co-organizer, SoCal Robotics Symposium, *SCR'24*

Session Chair, ACM International Conference on Mobile Systems, Applications, and Services, *MobiSys'24*

Session Chair, IEEE Conference on Computer Communications, *INFOCOM'24*

Co-chair, Workshop on Adaptive AIoT Systems, *ACM Mobisys '24*

Co-organizer, Workshop on Foundation Models for Autonomous Systems, *CVPR '24*

Chair, Tutorial on 3D sensing for autonomous robots and smart infrastructure, *IEEE SmartComp '21*

Technical Program Committee

USENIX Symposium on Networked Systems Design and Implementation *(NSDI'25)*

ACM International Conference on Mobile Computing and Networking *(MobiCom'25)*

ACM International Conference on Mobile Systems, Applications, and Services *(MobiSys'25)*

ACM Conference on Embedded Network Sensor Systems *(Sensys'25)*

USENIX Symposium on Vehicle Security and Privacy *(VehicleSec'25)*

IEEE Conference on Computer Communications *(INFOCOM'25)*

ACM International Conference on Mobile Systems, Applications, and Services *(MobiSys'24)*

NDSS Symposium on Vehicle Security and Privacy *(NDSS VehicleSec'24)*

IEEE Conference on Computer Communications *(INFOCOM'24)*

ACM International Conference on Mobile Systems, Applications, and Services *(MobiSys'23)*

IEEE International Conference on Parallel and Distributed Systems *(ICPADS'22)*

Editorial Board

Guest Editor, IEEE Vehicular Technology Magazine, *VTM*

Standardization

Member, *IEEE Standard Association, Autonomous Agent Alignment Working Group* *2024 ∼ pres.*

Conference Reviewer

USENIX Symposium on Networked Systems Design and Implementation *(NSDI)*

ACM International Conference on Mobile Systems, Applications, and Services *(MobiSys)*

IEEE/CVF Computer Vision and Pattern Recognition Conference *(CVPR)*

IEEE/CVF International Conference on Computer Vision *(ICCV)*

Conference on Robotic Learning *(CoRL)*

IEEE International Conference on Robotics and Automation *(ICRA)*

AAAI Conference on Artificial Intelligence *(AAAI)*

IEEE Conference on Computer Communications *(INFOCOM)*

ACM International Conference on Measurement and Modeling of Computer Systems *(SIGMETRICS)*

International Conference for High Performance Computing, Networking, Storage, and Analysis *(SC)*

ACM/IEEE Symposium on Edge Computing *(SEC)*

Usenix Symposium on Vehicle Security and Privacy *(VehicleSec)*

ACM International Conference on Information Processing in Sensor Networks *(IPSN)*

IEEE International Conference on Sensing, Communication and Networking *(SECON)*

IEEE Vehicular Networking Conference *(VNC)*

IEEE International Conference on Parallel and Distributed Systems *(ICPADS)*

Journal Reviewer

IEEE Transactions on Networking *(TON)*

IEEE Network Magazine

IEEE Journal on Selected Areas in Communications *(JSAC)*

IEEE Transactions on Vehicular Technology *(TVT)*

IEEE Robotics and Automation Letters *(RA-L)*

IEEE Transactions on Mobile Computing *(TMC)*

IEEE Access

IEEE Transactions on Cloud Computing *(TCC)*

Department and University Committee

University Librarian Search Committee *2025*

ECE Colloquium Committee *2024 ∼ pres.*

Mobility MS Program Founding Committee *2024 ∼ 2025*

Outreach Program

Mentor, *UCR R'STEM Find Your Research Match Program* *2024 ∼ pres.*

Advisor, *DOE EcoCar EV Challenge* *2023 ∼ pres.*

Team Host, *STEM Academy Robotics Challenge* *2024*

Advisor, *DOT Intersection Safety Challenge* *2024*

PRESENTATIONS

Towards Networked Cooperative Autonomy

RAISE AI Center, University of California, Riverside, USA *Nov 2024*
University of North Dakota, Grand Forks, USA, Virtual *Nov 2024*
California State Polytechnic University, Pomona, USA *Oct 2024*
Beijing Jiao Tong University, Beijing, China *Sep 2024*
University of Science and Technology Beijing, Beijing, China *Sep 2024*
Shanghai Jiao Tong University, Shanghai, China *Sep 2024*
Shanghai University, Shanghai, China *Sep 2024*
Shandong University, Qingdao, China *Sep 2024*
DS-PATH program, University of California, Riverside, USA *Aug 2024*

Scene Understanding beyond the Visible

ECE Colloquium, University of California, Los Angeles, USA *Mar 2024*
International Workshop on Trustworthy Autonomous CPS, San Diego, USA *Jan 2024*
Center for Environmental Research and Technology, Riverside, USA *Dec 2023*
ECE Colloquium, University of California, Riverside, USA *Oct 2023*
International Conference on ICT Convergence (ICTC), Jeju Island, Korea, Virtual *Oct 2023*
International Conference on Learning Representations (ICLR), Kigali, Rwanda, Virtual *May 2023*

MCAL: Minimum-Cost Human Machine Active Labeling

International Conference on Learning Representations (ICLR), Kigali, Rwanda, Virtual *May 2023*

ML-EXray: Visibility into ML Deployment on the Edge

University of California, San Diego, California, USA *Sep 2022*
MLSys Conference, Santa Clara, USA *Aug 2022*
University of California, Irvine, California, USA *Mar 2022*
Stanford University, Stanford, California, USA *Feb 2022*

AutoCast: Scalable Infrastructure-less Cooperative Perception for Distributed Collaborative Driving

IEEE MFI, 1st Cooperative Perception Workshop, Virtual *Sep 2022*
ACM Mobisys, Portland, USA *Jun 2022*

Towards Ultra-reliable Cooperative Autonomous Systems

Center for Robotics and Intelligent Systems, Riverside, USA *Oct 2023*
Meta, Reality Lab, Menlo Park, Virtual *Apr 2022*
University of California, Riverside, California, USA *Mar 2022*
Yale University, Virtual *Feb 2022*
University of California, San Diego, Virtual *Feb 2022*
University of California, Irvine, Virtual *Apr 2020*
Duke University, Virtual *Mar 2020*

3D Sensing for Autonomous Robots and Smart Infrastructure

IEEE SmartComp Tutorial, Virtual *Aug 2021*

AVR: Augmented Vehicular Reality

Intel's Autonomous Driving CoP Workshop, Santa Clara, California, USA *Oct 2018*

Semiconductor Research Corporation (SRC), TechCon, Austin, Texas, USA *Sep 2018*

John Hopcroft Center, Shanghai Jiao Tong University, Shanghai, China *Jun 2018*

ACM Mobisys, Munich, Germany *Jun 2018*

CONIX Research Center Workshop, San Diego, California, USA *Jan 2018*

ACM HotMobile, Sonoma, California, USA *Feb 2017*

Kestrel: Video Analytics for Augmented Multi-Camera Vehicle Tracking

ACM/IEEE IoTDI, Orlando, Florida, USA *Apr 2018*

High-Rate WiFi Broadcasting in Crowded Scenarios via Lightweight Coordination of Multiple APs

ACM MobiHoc, Paderborn, Germany *Jul 2016*