

HANG QIU

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RESEARCH INTERESTS

Edge ML, ML Systems, Autonomous Driving, Cooperative Perception, 3D Sensing, Mobile Computing, Cyber-physical Systems, Video Analytics Systems, Crowdsourcing Systems.

APPOINTMENTS

Stanford University , <i>Stanford, CA, USA</i> <i>Postdoctoral Scholar, Department of Electrical Engineering</i>	2021~ <i>pres.</i>
Waymo , <i>Mountain View, CA, USA</i> <i>Intern, Perception</i>	<i>summer 2021</i>
Microsoft Research , <i>Redmond, WA, USA</i> <i>Research Intern, Contractor, Mobility and Networking Group</i>	2017~ 2019
IBM Research , <i>Yorktown Heights, NY, USA</i> <i>Research Intern, T.J. Watson Research Center</i>	<i>summer 2015</i>

EDUCATION

Ph.D. <i>Electrical and Computer Engineering</i> <i>University of Southern California, Los Angeles, USA</i> <i>Dissertation: Networked Cooperative Perception: Towards Robust and Efficient Autonomous Driving</i>	2020
M.S. <i>Computer Science</i> <i>University of Southern California, Los Angeles, USA</i>	2020
B.S. <i>Electronic Engineering</i> <i>Shanghai Jiao Tong University, Shanghai, China</i> <i>Thesis: Distributed Channel-Assignment and Throughput Control in Multi-Radio Multi-Channel Wireless Network</i>	2013

HONORS AND AWARDS

Outstanding Research Assistant Award , <i>USC</i>	2021
Qualcomm Innovation Fellowship, Finalist , <i>San Diego, USA</i>	2019
Best Paper Award, runner-up , <i>ACM Mobisys 2018, Munich, Germany</i>	2018
Viterbi Graduate Student Annenberg Fellowship , <i>USC</i>	2013~2017
Outstanding Winner , <i>Interdisciplinary Contest in Modeling (ICM), USA</i>	2012
National Fellowship (Top 1%) , <i>China</i>	2010, 2011, 2012
First-Class (Top 1%) Academic Excellence Fellowship , <i>Shanghai Jiao Tong University</i>	2010, 2011, 2012
Academic Star (Top 1%) , <i>Shanghai Jiao Tong University</i>	2012
NSF/SIGMOBILE Travel Grants , <i>ACM Mobicom'16, ACM Sensys'16, ACM HotMobile'17</i>	

PROFESSIONAL EXPERIENCE

General Motors R&D, Collaborator Warren, MI, 2013~pres.

- Designed Augmented Vehicular Reality (AVR), a collaborative sensing system which enabled live extended 3D vision beyond occlusion and range for better autonomous driving decisions. [Featured in [GetMobile Magazine](#)]
- Built a lightweight self-healing HDMap system, [Carmap](#), which enabled real-time 3D map difference updates, and invented a robust simultaneous localization and mapping (SLAM) approach leveraging map differences.

Waymo LLC., Perception Intern Mountain View, CA, Summer 2021

- Developed a deep learning network for segmentation problems using LIDAR point clouds (details confidential).

Microsoft Research, Research Intern Redmond, WA, Summer 2019

- Built world's largest trans-seasonal detection and tracking dataset, [FourSeasons](#), that captures long term seasonal and diurnal variations with traffic surveillance cameras videos spanning over a year.
- Designed cost-optimal human-machine labeling to reduce large scale annotation cost by involving machine learning models into the labeling loop while balancing training and labeling cost.
- Developed and integrated annotation quality control into Microsoft Azure ML, featured in [Microsoft Ignite 2019](#).

Microsoft Research, Research Intern Redmond, WA, Summer 2017

- Developed automated crowdsourcing platform, [Satyam](#), for machine vision groundtruth collection at scale.
- Designed automated quality control framework for complex vision tasks such as detection, tracking, and segmentation to produce high quality annotations in face of untrained workers, human errors, and spammers.

IBM Research, Research Intern Yorktown Heights, NY, Summer 2015

- Devised collaborative video analytics system, [Kestrel](#), that tracks vehicle in a heterogeneous camera network.
- Optimized deep neural network to execute on mobile devices to detect objects, extract features, and resolve path ambiguities by careful association in real-time, reducing mobile energy budget by an order of magnitude.

TEACHING AND MENTORING

Teaching

Instructor, <i>ML on Embedded Systems (Stanford EE 292D)</i> , Co-Instructor: S.Katti, Z.Asgar, P.Warden	Fall 2021
Teaching Assistant, <i>Wireless Networks (USC ECE 597)</i> , Instructor: B. Krishnamachari	Spring 2020
Teaching Assistant, <i>Computer Communications (USC CSCI 551)</i> , Instructor: R. Govindan	Fall 2017
Guest Lecturer, <i>Wireless Networks (USC ECE 597)</i> , Instructor: K. Psounis	Spring 2020
Guest Lecturer, <i>Wireless Networks (USC ECE 597)</i> , Instructor: K. Psounis	Spring 2015
Panelist, <i>Seminar in Computer Science Research (USC CSCI 697)</i> , Instructor: L. Golubchik	Spring 2019

Mentoring

Elizabeth Ondula (PhD): <i>Distributed clustering, coordination and scheduling in VANET</i>	Sep. 2020 pres.
Ray Eells (Undergrad): <i>Autonomous Vehicle Control using Extended Vision</i>	Aug. 2018 pres.
Meghraj Bendre (Grad): <i>Understanding Computer Vision Robustness under Seasonal Changes</i>	May. 2018 pres.
Fawad Ahmad (PhD): <i>Fast 3D Feature Map Updates for Automobiles (accepted to NSDI'20)</i>	Aug. 2016 pres.
Jens Windau (Grad): <i>Human Pose and Gesture Monitoring using Wearable Sensors</i>	Fall 2016
Bhavana Srinivas (Grad): <i>Improving Campus WiFi Service</i>	Fall 2014

SERVICES

Conference Reviewer

USENIX Symposium on Networked Systems Design and Implementation (*NSDI*)
ACM International Conference on Mobile Systems, Applications, and Services (*Mobisys*)
AAAI Conference on Artificial Intelligence (*AAAI*)
IEEE Conference on Computer Communications (*Infocom*)
ACM/IEEE Symposium on Edge Computing (*SEC*)
ACM International Conference on Information Processing in Sensor Networks (*IPSN*)
IEEE International Conference on Sensing, Communication and Networking (*SECON*)
IEEE Vehicular Networking Conference (*VNC*)

Journal Reviewer

IEEE Transactions on Networking (*TON*)
IEEE Journal on Selected Areas in Communications (*JSAC*)
IEEE Transactions on Vehicular Technology (*TVT*)
IEEE Transactions on Mobile Computing (*TMC*)
IEEE Access
IEEE Transactions on Cloud Computing (*TCC*)
IEEE Robotics and Automation Letters (*RA-L*)

SIGMOBILE YouTube Channel

HotMobile'17, Mobicom'16, Mobihoc'16, Sensys'16

PUBLICATION

Preprints

- [1] [Minimum Cost Active Labeling](#)
Hang Qiu, Krishna Chintalapudi, and Ramesh Govindan
Under submission
- [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. [Featured in Microsoft Ignite 2019](#)

Refereed Publication

- [1] [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
- [2] [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 (NIPS '20), Workshop on Scalability, Privacy, and Security in Federated Learning (NIPS '20-SpicyFL), 2020 - [Best Paper Award](#)

- [3] [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
- [4] [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, Niranjana Suri, and Will Dron
Proceedings of the 37th Military Communications Conference (MILCOM '18), 2018
- [5] [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*
- [6] [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
- [7] [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
- [8] [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
- [9] [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
- [10] [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
- [11] [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

Invited Articles

- [1] [Augmented Vehicular Reality: Enabling Extended Vision for Future Automobiles](#)
Hang Qiu, Fawad Ahmad, Fan Bai, Marco Gruteser, and Ramesh Govindan
GetMobile: Mobile Comp. and Comm., 2019

Invited article (Best Paper runner-up of Mobisys'18)

- [2] [QuickSketch: Building 3D Representations in Unknown Environments using Crowdsourcing](#)
Fawad Ahmad, **Hang Qiu**, Xiaochen Liu, Fan Bai, and Ramesh Govindan
21st International Conference on Information Fusion (Fusion '18), 2018

- [3] [My Story with ICM](#)
Xilun Chen, **Hang Qiu**, and Chunzhi Yang
UMAP Journal 34.2 & 34.3 Summer Fall 2013 Edition - The 2013 MCM ICM Contest Edition, 2013
Invited article (Outstanding Winner of ICM'12)

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] [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

SOFTWARE AND DATASET

- [1] CarMap Github: <https://github.com/USC-NSL/CarMap>
- [2] FourSeasons Dataset and Benchmark: <https://trafficcamedataset.wordpress.com/>
- [3] Satyam Github: <https://github.com/satyamresearch/satyam>
- [4] Scalable Cooperative Perception Github: <https://github.com/hangqiu/AutoCast>
- [5] AVR Github: <https://github.com/hangqiu/AVR16>

INVITED PRESENTATIONS

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*

REFERENCES

Available upon request