Ying Chen

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RESEARCH INTERESTS

☐ My research interests lie in *resource-efficient context-aware augmented reality (AR) and virtual reality (VR) systems*. My research improves AR and VR experiences by drawing upon theories and methods from *edge computing, wireless communications, robotics, machine learning, and human-computer interaction* to achieve the synergy of communication, computation, and sensing in AR and VR systems

EDUCATION

☐ Duke University   Aug. 2019 – May 2024
Ph.D. student, Department of Electrical & Computer Engineering   GPA: **3.94/4**
Advised by Prof. Maria Gorlatova, Intelligent Interactive Internet of Things Lab

☐ Beijing University of Posts and Telecommunications (BUPT)   Sept. 2016 – June 2019
M.S. in Communications Engineering   GPA: **88/100**, Major GPA: **91/100**
Advised by Prof. Hongtao Zhang, Lab of Universal Wireless Communications

☐ Beijing University of Posts and Telecommunications (BUPT)   Sept. 2012 – June 2016
B.Eng. in Communications Engineering   GPA: **90/100** (**Top 5%**), Major GPA: **91/100**

HONORS & SCHOLARSHIPS

☐ EECS Rising Stars Workshop 2023 Invited Attendee   Nov. 2023

☐ Google Networking Research Summit 2023 Invited Attendee   Oct. 2023

☐ Cyber-Physical Systems (CPS) Rising Stars Workshop 2023 Invited Attendee   May 2023

☐ Winner of the NSF Athena 2023 Annual Poster Session   May 2023

☐ IEEE INFOCOM 2023 ComSoc Student Travel Grant   April 2023

☐ IEEE INFOCOM 2022 ComSoc Student Travel Grant   May 2022

☐ ACM SenSys 2019 NSF Student Travel Grant   Nov. 2019

☐ Duke ECE Diversity Fellowship   Sept. 2019

☐ BUPT Outstanding Master's Thesis Award   Jun. 2019

☐ China National Scholarship   Oct. 2018

PUBLICATIONS & PATENTS

☐ Book Chapters

    ○ T. Scargill, S. Eom, **Y. Chen**, M. Gorlatova, Ambient intelligence for next-generation augmented reality, to appear in Springer Handbook of the Metaverse, Springer (**invited book chapter**).

☐ Journal Articles

    ○ **Y. Chen**, S. Omoma, H. Kwon, H. Inaltekin, and M. Gorlatova, Quantifying and exploiting VR frame correlations: An application of a statistical model for viewport pose, submitted to *IEEE Transactions on Mobile Computing*.

    ○ Y. Han, **Y. Chen**, R. Wang, J. Wu, M. Gorlatova, Intelli-AR preloading: A learning approach to proactive hologram transmissions in mobile AR, *IEEE Internet of Things Journal*, vol. 9, no. 18, pp. 17714-17727, Sept. 2022.

- ○ **Y. Chen**, H. Zhang, Exploiting transmission and caching diversity in cache-enabled user-centric network: analysis and optimization, *IEEE Access*, vol. 7, pp. 65934-65943, May 2019.
- ○ H. Zhang, **Y. Chen**, Z. Han, Explicit modelling and performance analysis of cell group selection with backhaul-aware biasing, *IEEE Wireless Communications Letters*, vol. 8, no. 1, pp. 273-276, Feb. 2019.
- ○ H. Zhang, **Y. Chen**, Z. Yang, Hierarchical cache-aided transmission cooperation in 5G user-centric network: Performance analysis and design insights, *Journal of Network and Computer Applications*, vol. 111, pp. 17-27, Jun. 2018.
- ○ H. Zhang, **Y. Chen**, Z. Yang, X. Zhang, Flexible coverage for backhaul-limited ultra-dense heterogeneous networks: throughput analysis and η-optimal biasing, *IEEE Transactions on Vehicular Technology*, vol. 67, no. 5, pp. 4161-4172, May 2018.
- ○ H. Zhang, **Y. Chen**, Y. Liu, Spatial correlation based analysis of power control in user-centric 5G networks, *IET Communications*, vol. 12, no. 3, pp. 326-333, Feb. 2018.
- ○ H. Zhang, **Y. Chen**, D. Li, Y. Wang, Low-complexity sliding window block decoding using bit-flipping for OVFDM systems, *IEEE Access*, vol. 5, pp. 25171-25180, Nov. 2017.

□ Conference Proceedings

- ○ L. Duan, **Y. Chen**, Z. Qu, M. McGrath, E. Ehmke, M. Gorlatova, BiGuide: A bi-level data acquisition guidance for object detection on mobile devices, to appear in *ACM/IEEE IPSN*, May 2024. (**21.5% acceptance rate**)
- ○ L. Duan, T. Scargill, **Y. Chen**, M. Gorlatova, 3D object detection with VI-SLAM point clouds: the impact of object and environment characteristics on model performance, to appear in *IEEE ICRA*, May 2024.
- ○ T. Scargill, **Y. Chen**, T. Hu, M. Gorlatova, SiTAR: Situated trajectory analysis for in-the-wild pose error estimation, in *Proc. IEEE ISMAR*, Oct. 2023.
- ○ **Y. Chen**, H. Inaltekin, and M. Gorlatova, AdaptSLAM: Edge-assisted adaptive SLAM with resource constraints via uncertainty minimization, in *Proc. IEEE INFOCOM*, May 2023. (**19.2% acceptance rate**).
- ○ T. Scargill, **Y. Chen**, N. Marzen, M. Gorlatova, Integrated design of augmented reality spaces using virtual environments, in *Proc. IEEE ISMAR*, Oct. 2022. (**21% acceptance rate**).
- ○ **Y. Chen**, H. Kwon, H. Inaltekin, M. Gorlatova, VR viewport pose model for quantifying and exploiting frame correlations, in *Proc. IEEE INFOCOM*, May 2022. (**19.9% acceptance rate**).
- ○ **Y. Chen**, H. Zhang, Outage probability and average rate analysis of user-centric ultra-dense networks, in *Proc. IEEE ICC*, May 2019.
- ○ **Y. Chen**, H. Zhang, Matérn-like model based analysis for power control in user-centric 5G networks, in *Proc. IEEE PIMRC*, Oct. 2017.
- ○ **Y. Chen**, Z. Yang, H. Zhang, Opportunistic-based dynamic interference coordination in dense small cells deployment, in *Proc. IEEE PIMRC*, Oct. 2017.

□ Workshop Proceedings

T. Scargill, **Y. Chen**, S. Eom, J. Dunn, M. Gorlatova, Environmental, user, and social context-aware augmented reality for supporting personal development and change, in *Proc. IEEE Workshop for Building the Foundations of the Metaverse*, Mar. 2022 (co-located with *IEEE VR*'22).

□ Poster and Demo Presentations

- ○ T. Hu, T. Scargill, **Y. Chen**, G. Lan, M. Gorlatova, DNN-based SLAM tracking error online estimation, in *Proc. ACM MobiCom*, Oct. 2023. Video of the demo: https://sites.duke.edu/tianyihu/publications/demo/mobicom23/.

- L. Duan, **Y. Chen**, M. Gorlatova, Demo Abstract: BiGuide: A bi-level data acquisition guidance for object detection on mobile devices, in *Proc. ACM/IEEE IPSN*, May 2023. Video of the demo: https://sites.duke.edu/linduan/.
- **Y. Chen**, J. Sarik, H. Inaltekin, M. Gorlatova, Demo: Demonstrating resource-efficient SLAM in virtual spacecraft environments, in *Proc. IEEE INFOCOM*, May 2023. Video of the demo: https://sites.duke.edu/marialabyingchen/spacecraftwalk/.
- **Y. Chen**, H. Inaltekin, M. Gorlatova, Demo: Pixel similarity-based content reuse in edge-assisted virtual reality, in *Proc. IEEE INFOCOM*, May 2022. Video of the demo: https://youtu.be/MK3w8jvgVNE.
- **Y. Chen**, M. Gorlatova, Poster: A statistical model for device poses in virtual reality, *CRA-WP Grad Cohort for Women*, Apr. 2021.
- **Y. Chen**, Poster: Performance analysis for cache-enabled user-centric networks, *Networking Networking Women Workshop (N2Women)*, Nov. 2019.

- Datasets and Codebases
  - **Y. Chen**, H. Inaltekin, M. Gorlatova, AdaptSLAM codebase, Aug. 2022. Available at https://github.com/i3tyc/AdaptSLAM/. Accompanies *IEEE INFOCOM'23* paper AdaptSLAM: Edge-assisted adaptive SLAM with resource constraints via uncertainty minimization.
  - **Y. Chen**, H. Kwon, H. Inaltekin, M. Gorlatova, VR viewport pose dataset, Dec. 2021. Available at https://github.com/VRViewportPose/VRViewportPose. Accompanies *IEEE INFOCOM'22* paper VR viewport pose model for quantifying and exploiting frame correlations.

- Technical Reports
  - **Y. Chen**, H. Inaltekin, M. Gorlatova, AdaptSLAM: Edge-Assisted Adaptive SLAM with Resource Constraints via Uncertainty Minimization, arXiv: 2301.04620, Jan. 2023.
  - **Y. Chen**, H. Kwon, H. Inaltekin, M. Gorlatova, VR viewport pose model for quantifying and exploiting frame correlations, arXiv: 2201.04060, Feb. 2022.

- Patents
  - **5 patents were granted** on resource conflict resolving, user-centric edge caching, and user-centric mobility management.

RESEARCH EXPERIENCE

- Project: Edge-Assisted Simultaneous Localization and Mapping (SLAM) for AR   Aug. 2021 – present
  Research Assistant   **Duke University Intelligent Interactive Internet of Things Lab**
  - Led the development of analytical models to characterize how each keyframe contributes to the overall localization and mapping performance.
  - In our collaboration with the **NSF AI Athena Institute**, I led the design of an adaptive method for the uplink keyframe offloading and downlink map update, in order to maximize the SLAM performance for mobile AR under realistic wireless environments.
  - We are developing deep learning models for predicting pose estimation errors under different user behavior patterns and environmental conditions.
  - Results were presented in IEEE INFOCOM 2023 (with an accompanying demo). The codes are open-sourced via GitHub: https://github.com/ i3tyc/AdaptSLAM/.

- Project: Adaptive Environmental Sensing and Monitoring for Mobile Systems   Jan. 2022 – Aug. 2023
  Research Assistant   **Duke University Intelligent Interactive Internet of Things Lab**
  - We are building a mobile data acquisition system that performs real-time data quality assessment and provides data acquisition guidance for users to collect informative and diverse image data for training object detection models.

- In our collaboration with **Nanohmics** in a **NASA SBIR** program, we are designing autonomous scene detection systems where a swarm of drones localize changes inside the Gateway, a small space station in lunar orbit.
- We are using **Unity and Unreal** game engines to create an emulator for testing the performance of a wide range of algorithms for mobile AR.
- Results were presented in IEEE ISMAR 2022, and ACM/IEEE IPSN 2024.

☐ Project: Exploiting View Similarity in VR Systems   Sept. 2019 – Sept. 2022
Research Assistant   **Duke University Intelligent Interactive Internet of Things Lab**

- Led the analysis, design, and evaluation of edge-assisted VR systems considering view similarity among frames.
- Led the development of new statistical models for 6 degrees of freedom pose of VR users with the experimental data of user pose in VR systems. Obtained the analytical results of the view similarity based on the proposed pose model.
- Led the implementation of the view similarity-based content reuse mechanism on Meta Quest 2-based edge-assisted VR systems.
- Results were presented in IEEE INFOCOM 2022 (with an accompanying demo). The data and codes are open-sourced via GitHub: https://github.com/VRViewportPose/VRViewportPose.

INTERNSHIPS

☐ **NTT DOCOMO** Beijing Labs   Mar. 2019 – Apr. 2019

- Evaluated the coverage of **high frequency mmWave systems** considering practical path-loss, atmosphere absorption model, antenna configuration, antenna element pattern, and beamforming.

☐ **Qualcomm** Inc., Beijing   July 2018 – Sept. 2018

- Debugged the **power-consumption-related problems independently** (**# of cases >5**), through analyzing waveforms and the power breakdown, and analyzing log prints of the modem clock power management (MCPM) module and L1 layer.
- Developed **visualization tools** in Python for log analysis, and automatically obtained the timeline diagrams of MCPM config/deconfig, paging, cell selection/reselection and L1 wakeup.

PROFESSIONAL ACTIVITIES

☐ Invited Talks

- "Resource-efficient IoT-supported mobile augmented reality," Invited talk at Hitachi R&D   Oct. 2022

☐ Teaching Experience

- Advanced Topics in ECE/CS: Edge Computing   Spring 2023
  Teaching Assistant, Duke University
- Computer Network Architectures   Fall 2021
  Lead Teaching Assistant, Duke University
- Introduction to Electronic Systems   Spring 2017
  Teaching Assistant, Beijing University of Posts and Telecommunications
- Computer Networks and the Internet   Fall 2016
  Teaching Assistant, Beijing University of Posts and Telecommunications

☐ Mentoring: Master Students

- Owen Gibson, ECE, Duke University   Fall 2022

☐ Mentoring: Undergraduate Students

- Alice Hu, ECE, Duke University — Fall 2023 - present
- Muchang Bahng, Mathematics, Duke University — Spring 2023 - present
- Ashish Murthy, EE, Indian Institute of Technology. Visting REU student at Duke University. — Summer 2023
- Sasamon Omoma, CS, Duke University — Fall 2021 - Spring 2022
- Ashley Kwon, CS, Duke University. **B.S. Honors and Graduation with Distinction projects.** — Summer 2020 - Fall 2021
- Aining Liu, CS, Duke University — Fall 2021
- Rohit Raguram, CS, Duke University — Fall 2021
- Maria Christenbury, ME, Clemson University. Visiting REU student at Duke University — Summer 2021
- Brianna Butler, CS, Duke University — Fall 2020 - Spring 2021
- Achintya Kumar, CS, Duke University — Fall 2020
- Daisy Ferleger, CS, Duke University — Spring 2020
- Grace Patel, ME, Duke University — Spring 2020

☐ Mentoring: High School Students
  - Jonathan Zeng, North Carolina School of Science and Mathematics — Summer 2023 - present

☐ Conference Review Service
  - ACM IMWUT 2023
  - IEEE INFOCOM 2020, 2021, 2024
  - ACM MobiCom 2023
  - ACM SIGCOMM 2023
  - ACM HotMobile 2023
  - ACM/IEEE IPSN 2021, 2022, 2024
  - ACM MobiHoc 2021, 2022, 2023
  - ACM SenSys 2020, 2021, 2022, 2023
  - IEEE ICNP 2020, 2021
  - IEEE ICDCS 2020, 2022

☐ Journal Review Service
  - IEEE Transactions on Wireless Communications 2023
  - IEEE Network Magazine 2023
  - IEEE Wireless Communications Letters 2018

TECHNICAL SKILLS

☐ Languages: C, C++, C#, Matlab, Python, Java, SQL

☐ Platforms and Applications: Mathematica, NI LabVIEW, USRP, Android Studio

☐ Game Engines and Plugins: Unity, Unreal, AirSim

☐ AR and VR SDKs: Google VR, Oculus Integration, ARCore, ARKit

☐ Computer Vision and Graph Optimization Libraries: OpenCV, g2o, Sophus