

(Ethan) Yuqiang Heng | CV

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Graduate electrical & computer engineering student pursuing PhD at UT Austin WNCG. Passionate about research at the intersection of wireless technologies and machine learning, with solid electrical engineering background, strong technical and interpersonal skills.

Academic Research

- **Learning Site-specific Probing Beams for Fast mmWave Beam Alignment** **UT Austin WNCG**
Jianhua Mo, Prof. Jeffrey G. Andrews *Dec 2020–Dec 2021*
I propose a beam alignment method for millimeter-wave (mmWave) systems that uses the beam sweeping measurements of a small site-specific probing codebook to predict the optimal beam in a large narrow-beam codebook. The proposed method can outperform the hierarchical or even the exhaustive search in terms of accuracy and SNR while reducing the beam sweeping overhead by $10\times$. The probing codebook is learned jointly with a neural network beam predictor and is adapted to capture characteristics of the propagation environment.
- **Machine Learning-Assisted Beam Alignment for mmWave Systems** **UT Austin WNCG**
Prof. Jeffrey G. Andrews *Sept 2017–May 2019*
I proposed a machine-learning (ML) assisted beam training scheme for mmWave initial access (IA) that can accurately select optimal APs and beams without exhaustively searching all APs and beams. The ML algorithm can accurately predict the optimal beam and recommend a set of candidate beams just using GPS feedback from UEs, even with noisy GPS feedback and in a dynamic environment. The proposed method can reduce the search space by approximately 4x for AP selection and over 10x for beam selection while achieving over 95% accuracy.
- **Experience-Centric Mobile Video Scheduling Through ML** **Samsung Research America**
Dr. Vikram Chandrasekhar, Prof. Jeffrey G. Andrews *May 2018–Aug 2018*
I proposed ML traffic classification models to enable experience-centric scheduling. The proposed ML algorithms extract simple features from downlink TCP/IP packet headers to classify network traffic and to detect buffer state for video streaming traffic. System-level simulation results show that by differentiating different user services through ML and by modifying a proportional fair (PF) scheduler accordingly, we can reduce buffering time and improve video-user experience without significantly affecting conventional FTP users. We obtained 2 patents through this project.
- **Public Dataset for Network Traffic Classification** **UT Austin WNCG**
Prof. Jeffrey G. Andrews *Aug 2018–May 2019*
I led an undergraduate senior design team to design and implement an automated platform for collecting network traffic data generated by various mobile applications. This project is motivated by the lack of up-to-date network traffic datasets. This dataset can be used to study network traffic classification, malicious attack detection, etc. The dataset is available to the public.

Education

- **University of Texas at Austin** **Austin, TX, USA**
PhD. in Electrical and Computer Engineering *2017–Fall 2022 (expected)*
- **University of Texas at Austin** **Austin, TX, USA**
M.S. in Electrical and Computer Engineering (GPA 4.0/4.0) *2017–Spring 2021*

- **Rice University** **Houston, TX, USA**
B.S. in Electrical and Computer Engineering, magna cum laude (GPA 3.97/4.0) *2013–2017*
- **Hwa Chong Institution** **Singapore**
A levels, Graduate with distinction *2008–2012*

Employment

- **Research Intern** **Plano, TX, USA**
Samsung Research America *May 2021 –July 2021*
 1. Studied 3GPP specifications on multiple transmission and reception points (multi-TRP) in 5G
 2. Designed and implemented a simulator to evaluate multi-TRP performance according to 3GPP specifications
- **Research Intern** **Plano, TX, USA**
Samsung Research America *May 2020 –August 2020*
 1. Studied 3GPP specifications on beam management for multi-panel UEs
 2. Optimized beam management parameters for mobile multi-panel UEs through extensive system level simulations
- **Research Intern** **Plano, TX, USA**
Samsung Research America *May 2019 –August 2019*
 1. Studied 3GPP NR standards on beam management, including the overall procedure and signalling process
 2. Implemented a beam management simulator following the 3GPP standards
- **Research Intern** **Mountain View, CA, USA**
Samsung Research America *May 2018 –August 2018*
 1. Designed and tested machine learning algorithms for service classification in network traffic and state and resolution detection in HAS video traffic
 2. Implemented system-level simulations for experience-centric scheduling of video users

Notable Publications

- **Y. Heng** and J. G. Andrews, "Machine learning-assisted beam alignment for mmWave systems", *IEEE Trans. Cognit. Commun. Netw.*, vol. 7, no. 4, pp. 1142-1155, Dec. 2021.
- **Y. Heng**, J. Mo and J. G. Andrews, "Learning site-specific probing beams for fast mmWave beam alignment", *IEEE Trans. Wireless Commun.*, early access, 2022.
- **Y. Heng**, J. G. Andrews, J. Mo, V. Va, A. Ali, B. L. Ng, and J. C. Zhang, "Six Key Challenges for Beam Management in 5.5G and 6G Systems," *IEEE Commun. Magazine*, vol. 59, no. 7, pp. 74-79, July 2021.
- **Y. Heng**, V. Chandrasekhar and J. G. Andrews, "UTMobileNetTraffic2021: A Labeled Public Network Traffic Dataset," *IEEE Networking Letters*, vol. 3, no. 3, pp. 156-160, July 2021.
- V. Chandrasekhar, **Y. Heng**, J. Cho, J. Lee, J. Zhang and J. G. Andrews, "Experience-Centric Mobile Video Scheduling Through Machine Learning," *IEEE Access*, vol. 7, pp. 113017-113030, Aug. 2019.

Technical and Personal skills

- **Programming Languages:** Proficient in: Python, Matlab, Arduino, TeX
 Also basic ability with: C, Assembly, VHDL, Java, SQL.
- **Deep Learning:** I pay close attention to the state-of-the-art in areas including reinforcement learning, meta-learning, self-supervised learning and graph neural networks.
- **Industry Software Skills:** Vivado Design Suite (Intermediate), Lightroom (Advanced), Photoshop (Intermediate), Most MS Office products including MS access (Advanced).
- **Language Skills:** Fluent English, Fluent Chinese.