

# Kai Huang

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

On-Device AI, AI for Systems, Knowledge-guided Neural Network Design

## EDUCATION

**University of Pittsburgh, Pittsburgh, PA** On-going  
**Ph.D. student**, Electrical and Computer Engineering  
**Advisor:** Prof. Wei Gao  
  
**University of Science and Technology of China (USTC), Hefei, Anhui,** July 2019  
**B.E.**, Electronic Information Engineering

## RESEARCH EXPERIENCE

**Research Assistant** 2019-present  
Dept. of Electrical and Computer Engineering, University of Pittsburgh

- Designing a selective training scheme that can accelerate on-device neural network training.
- Developed and implemented an offloading scheme that allows extremely weak devices (e.g., MCUs with <1MB memory) to achieve real-time (<20ms) neural network inference. It is the first work that leverages Explainable AI to speed up neural network inference on weak devices.
- Developed and implemented a backscatter system that leverages neural network inference to improve its RF energy efficiency by up to 3.5x. The neural network is tailored based on the domain knowledge of backscatter communication, and hence is very lightweight and can be effectively trained even with a limited amount of data.

## PUBLICATIONS

### Conference Papers

\* indicates equal contributions

1. **[MobiSys'23]** Xiangyu Yin, Kai Huang, Erick Forno, Wei Chen, Heng Huang, Wei Gao. "PTEase: Objective Airway Examination for Pulmonary Telemedicine using Commodity Smartphones." In Proceedings of the 21st International Conference on Mobile Systems, Applications, and Services (to appear)
2. **[MobiSys'23]** Kai Huang, Boyuan Yang, Wei Gao. "ElasticTrainer: Speeding Up On-Device Training with Runtime Elastic Tensor Selection." In Proceedings of the 21st International Conference on Mobile Systems, Applications, and Services (to appear)
3. **[SenSys'22]** Chen Ruihong, Kai Huang, Wei Gao. "AiFi: AI-Enabled Interference Cancellation in WiFi Networks with Commodity PHY-Layer Information." Proceedings of the 20th ACM Conference on Embedded Networked Sensor Systems, pp. 134-148. 2022.
4. **[CML-IOT'22]** Xiangyu Yin, Kai Huang, Erick Forno, Wei Chen, Heng Huang, Wei Gao. "Out-Clinic Pulmonary Disease Evaluation via Acoustic Sensing and Multi-Task Learning on Commodity Smartphones." The Fourth Workshop on Continual and Multimodal Learning for Internet of Things (**Best Paper Award**)
5. **[MobiCom'22]** Kai Huang, Wei Gao. "Real-time Neural Network Inference on Extremely Weak Devices: Agile Offloading with Explainable AI." In Proceedings of the 28th Annual International Conference on Mobile Computing and Networking, pp. 200-213. 2022.
6. **[IoT'DI'22]** Kai Huang, Ruihong Chen, Wei Gao. "RAScatter: Achieving Energy-Efficient Backscatter Readers via AI-Assisted Power Adaptation." In 2022 IEEE/ACM Seventh International Conference on Internet-of-Things Design and Implementation, pp. 1-13. IEEE, 2022.

7. **[IPSN'22]** Song, Xingzhe, Kai Huang, Wei Gao. "FaceListener: Recognizing Human Facial Expressions via Acoustic Sensing on Commodity Headphones." In 2022 21st ACM/IEEE International Conference on Information Processing in Sensor Networks, pp. 145-157. IEEE, 2022.
8. **[ASPLOS'22]** Boyuan Yang, Ruirong Chen, Kai Huang, Jun Yang, Wei Gao. "Eavesdropping user credentials via GPU side channels on smartphones." In Proceedings of the 27th ACM International Conference on Architectural Support for Programming Languages and Operating Systems, pp. 285-299. 2022.
9. **[MobiSys'20]** Yihao Liu\*, Kai Huang\*, Xingzhe Song, Boyuan Yang, Wei Gao. "MagHacker: eavesdropping on stylus pen writing via magnetic sensing from commodity mobile devices." In Proceedings of the 18th International Conference on Mobile Systems, Applications, and Services, pp. 148-160. 2020.

#### PUBLIC SPEAKING **Presentations**

1. "AiFi: AI-Enabled WiFi Interference Cancellation with Commodity PHY-Layer Information." In Proceedings of the 20th ACM Conference on Embedded Networked Sensor Systems (SenSys), Boston, USA, Nov 2022.
2. "Real-time neural network inference on extremely weak devices: agile offloading with explainable AI." In Proceedings of the 28th Annual International Conference on Mobile Computing And Networking (MobiCom), InterContinental Sydney, Australia, Oct 2022
3. "RAScatter: Achieving Energy-Efficient Backscatter Readers via AI-Assisted Power Adaptation." In 2022 IEEE/ACM Seventh International Conference on Internet-of-Things Design and Implementation (IoTDI), Virtual, May 2022
4. "Towards Real-time Neural Network Inference on Extremely Weak Devices", Elijah Group Meeting, Dept. of Computer Science, Carnegie Mellon University, November 2021
5. "Tailoring Neural Network Designs to Computing System Domains", Elijah Group Meeting, Dept. of Computer Science, Carnegie Mellon University, March 2021

#### TEACHING AND MENTORING EXPERIENCE

##### **Teaching:**

- **Teaching Assistant**, ECE1175 - Embedded Systems Design Spring 2021  
Dept. of Electrical and Computer Engineering, University of Pittsburgh
- **Teaching Assistant**, ECE1175 - Embedded Systems Design Fall 2020  
Dept. of Electrical and Computer Engineering, University of Pittsburgh
- **Teaching Assistant**, ECE0202 - Embedded Processors and Interfacing Spring 2020  
Dept. of Electrical and Computer Engineering, University of Pittsburgh

#### PROFESSIONAL ACTIVITIES

##### **Journal Reviewer**

- IEEE Transactions on Mobile Computing

##### **Conference Reviewer**

- IEEE International Conference on Mobile Ad-Hoc and Smart Systems (MASS) 2022,
- IEEE Conference on Computer Communications (INFOCOM), 2022, 2023