Feng ZHANG, Ph.D.

Decoding sensor data with deep learning for seamless human-machine interactions

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PROFESSIONAL SUMMARY

- Experienced researcher and engineer specializing in deep learning, RF sensing, and signal processing for IoT and autonomous systems.
- Demonstrated success in integrating advanced radar, lidar, and Wi-Fi CSI technologies into real-world products.
- 2800+ Google Scholar citations, multiple patents, and recognized with best paper awards.

SKILLS

- **Programming:** Python/PyTorch, MATLAB, C++/C
- **Expertise:** Deep Learning, RF Sensing/Imaging, Signal Processing
- **Tools & Platforms:** Lidar, mmWave Radar, WiFi CSI, Embedded Systems

EXPERIENCE

Sr. Applied Scientist, Amazon.com, Inc. May 2024 – Present

LiDAR-Based Gesture Recognition and Multi-Sensor Fusion for Echo Devices

- Developed and validated a deep neural network to recognize human gestures using cost-effective LiDAR sensors.
- Engineered a multimodal fusion framework that combines ultrasound and WiFi CSI data to enhance presence detection.

Sr. Systems Architect Engineer, Apple, Inc. Dec. 2022 – May 2024

Integrated and Evaluated mmWave Radar Signals for Autonomous Systems

- Led improvements in radar data filtering, representation, modeling, and performance bounding.
- Integrated radar data into the perception DNN, boosting system accuracy in challenging scenarios.

Applied Scientist, Amazon.com, Inc. May 2020 – Dec. 2022

Developed Sensing Features for Echo Family Devices

- Built machine learning algorithms to recognize human activity patterns using WiFi CSI, mmWave Radar, and thermal sensors.
- Developed comprehensive test plans to validate performance and ensure product robustness.

Chief Scientist, Origin Wireless, Inc. Dec. 2018 – May 2020

Invented a Series of WiFi Sensing Systems

- Created a robust, calibration-free **WiFi motion detector** with near-zero false alarms and through-the-wall coverage.
- Work highlighted by *Engadget*; commercialized on Linksys routers; contributed to CES 2020 Best Innovation Award.
- Developed the first practical **WiFi sleep monitoring system** using machine learning to extract weak vital signals.
- Engineered a high-accuracy **WiFi fall detector** that recognizes motion patterns in WiFi CSI.
- Designed a super-resolution **WiFi imaging system** reusing a single 60GHz WiFi radio as a millimeter wave camera.

EDUCATION

Ph.D. in Electrical & Computer Engineering (GPA: 3.86/4.0) Sep. 2014 – Dec. 2018

University of Maryland, College Park

Advisor: Prof. K.J. Ray Liu

M.E. in Communication & Information Systems Sep. 2011 – Aug. 2014

University of Science and Technology of China

Advisor: Prof. Wenyi Zhang

B.E. in Electronic Information Engineering Sep. 2007 – Aug. 2011

University of Science and Technology of China

Advisor: Prof. Wenyi Zhang

SELECTED PUBLICATIONS

J1. **F. Zhang**, W. Zhang, and Q. Ling, "Non-Cooperative Game for Capacity Offload," IEEE Transactions on Wireless Communications, Vol. 11, No. 4, pp. 1565-1575, April 2012.

J2. **F. Zhang**, C. Chen, B. Wang, and K. J. Ray Liu, "WiSpeed: A Statistical Electromagnetic Approach for Device-Free Indoor Speed Estimation," IEEE Internet of Things, Vol. 5, No. 3, pp. 2163-2177, April 2018. (**Best paper award**)

J3. **F. Zhang**, C. Chen, B. Wang, H. Lai, Y. Han, and K. J. Ray Liu, "WiBall: A Time-Reversal Focusing Ball Method for Decimeter-Accuracy Indoor Tracking," IEEE Internet of Things Journal, Vol. 5, No. 5, pp. 4031-4041, October 2018.
J4. **F. Zhang**, C. Chen, B. Wang, H. Lai, Y. Han, and K. J. Ray Liu, "WiDetect: Robust Motion Detection with a Statistical Electromagnetic Model," Proc. of ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Artical No.: 122, September 2019.
J5. **F. Zhang**, W. Wu, B. Wang, M. Wu, D. Bugos, H. Zhang, and K. J. Ray Liu, "SMARS: Sleep Monitoring via Ambient Radio Signals," IEEE Transactions on Mobile Computing, September Vol. 20, No. 1, pp. 217 – 231, January 2021.
J6. C. Wu, **F. Zhang**, B. Wang, and K. J. Ray Liu, "EasiTrack: Decimeter-Level Indoor Tracking with Graph-based Particle Filtering," IEEE Internet of Things Journal, Vol. 7, No. 3, pp. 2397-2411, March 2020.
J7. C. Wu, **F. Zhang**, Y. Hu, and K. J. Ray Liu, "GaitWay: Monitoring and Recognizing Gait Through the Walls," IEEE Transactions on Mobile Computing, February 2020 (Early Access).
J8. F. Wang, **F. Zhang**, C. Wu, B. Wang, and K. J. Ray Liu, "ViMo: Multi-person Vital Sign Monitoring using Commodity Millimeter Wave Radio", IEEE Internet of Things Journal, Vol. 8, No. 3, pp. 1294-1307, Feburary 2021.
J9. F. Wang, **F. Zhang**, C. Wu, B. Wang, and K. J. Ray Liu, "Respiration Tracking for People Counting and Recognition," IEEE Internet of Things Journal, vol 7, no 6, pp.5233 – 5245, June 2020.
J10. C. Wu, **F. Zhang**, B. Wang, and K.J.R. Liu, "mSense: Towards Mobile Material Sensing with a Single Millimeter Radio," Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), vol 4, no 3, Article 106:1–20, September 2020.
J11. **F. Zhang**, C. Wu, B. Wang, and K. J. Ray Liu, "mmEye: Super-Resolution Millimeter Wave Imaging," IEEE Internet of Things Journal, vol 8, no 8, pp.6995 – 7008, November 2020.
C1. **F. Zhang**, C. Chen, B. Wang, H. Lai, and K. J. Ray Liu, "A Time-Reversal Spatial Hardening Effect for Indoor Speed Estimation," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), New Orleans, US., March 2017.
C2. **F. Zhang**, C. Chen, B. Wang, H. Lai, H. Lai, Y. Han, and K. J. Ray Liu, "WiDetect: A Robust and Low-Complexity Wireless Motion Detector," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Calgary, Canada, April 2018.
C3. C. Wu, **F. Zhang**, Y. Fan, and K. J. Ray Liu, "RF-based inertial measurement," ACM Special Interest Group on Data Communication (SIGCOMM), August 2019.
C4. C. Wu, **F. Zhang**, B. Wang, and K. J. Ray Liu, "mmTrack: Passive Multi-Person Localization Using Commodity Millimeter Wave Radio," IEEE International Conference on Computer Communications (INFOCOM), 2020.

SELECTED PATENTS

P1. "Method, apparatus, and system for object tracking and navigation", (Publication Number: US 2018/0183650).
P2. "Method, apparatus, and systems for wireless event detection and monitoring", (International Publication Number: WO 2017/100706).
P3. "Methods, apparatus, servers, and systems for vital signs detection and monitoring", (International Publication Number: WO 2017/156492).
P4. "Methods, apparatus, servers, and systems for object tracking", (International Publication Number: WO 2017/180698).
P5. "Method, apparatus, server and system for real-time vital sign detection and monitoring", (Patent No.: US 10495725).
P6. "Apparatus, systems and methods for fall-down detection based on a wireless signal", (Patent No.: US 10397039).
P7. "Method, apparatus, and system for wireless motion monitoring", (Patent No.: US 10291460).
P8. "Respiration monitoring based on noisy channel state information (CSI) data", (Patent No.: 12279190).