

Shiwei Fang

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EDUCATION

- 2015 - 2021 **University of North Carolina at Chapel Hill, Chapel Hill, NC**
Doctor of Philosophy (Ph.D.) in Computer Science
Advisor: *Shahriar Nirjon*
Dissertation Title: *Using Radio Frequency and Motion Sensing to Improve Camera Sensor Systems*
- 2011 - 2015 **SUNY, Stony Brook University, Stony Brook, NY**
Bachelor of Engineering in Computer Engineering with Departmental Honors
Minor in Computer Science
Cumulative GPA: 3.82/4.00, Magna Cum Laude

AWARDS & HONORS

- Nov. 2020 **UNC Horizon Award, UNC - Chapel Hill**
- Sept. 2019 **Device-Free Human Sensing (DFHS '19) Workshop Travel Grant, UNC - Chapel Hill**
- May 2019 **Best Paper Award, 2019 International Conference on Distributed Computing in Sensor Systems (DCOSS '19), UNC - Chapel Hill**
- May 2015 **Provost Award for Academic Excellence, Stony Brook University**
- Mar. 2015 **Undergraduate Recognition Award for Academic Excellence, Stony Brook University**
- 2013 - 2015 **Computer Engineering Honors Program, Stony Brook University**
- 2013 - 2014 **Ruskin, Moscou, Evans & Faltischek, P.C. High Technology Scholarship, Stony Brook University**
- 2012 - 2015 **Dean's List, Stony Brook University**

PROFESSIONAL EXPERIENCE

- 2021 - Present **University of Massachusetts Amherst, Amherst, MA**
Postdoctoral Research Associate
- Conducting research on edge computing and multi-modal sensing.
 - Mentoring Ph.D. Students.
 - Helping with research grant proposals.
- 2018 - 2021 **UNC Chapel Hill, Chapel Hill, NC**
Research Assistant
- Led and worked on five research projects in the areas of Cyber-Physical Systems, Multimodal Sensing, Sensor Systems, Robotics, and Applied Machine Learning, which resulted in nine publications in top Computer Science workshops and conferences.
 - Helped with research grant proposals.
- Summer 2020 **Bosch Research and Technology Center, Pittsburgh, PA**
AI for Multimodal Sensor Fusion Research Intern
- Collecting WiFi signals from multiple environments and developing an AI-based approach for automotive application.
- Summer 2019 **Bosch Research and Technology Center, Pittsburgh, PA**
AI for Multimodal Sensor Fusion Research Intern
- Deployed multiple sensors and collected camera images and WiFi traffic generated by smart-phones carried by humans.
 - Developed novel AI algorithms for the detection and identification of people by fusing WiFi and camera data.
- Summer 2013 **LSI Computer Systems, Inc., Melville, NY**
Internship
- Operated semiconductor wafer probers and package handlers.
- Spring 2013 **Frank Melville Jr. Memorial Library Main Circulation, Stony Brook, NY**
Student Assistant
- Assisted students and faculties.

PUBLICATIONS

Journal & Conference

1. **Shiwei Fang**, Jin Huang, Colin Samplawski, Deepak Ganesan, Benjamin Marlin, Tarek Abdelzaher, and Maggie B. Wigness. "Optimizing Intelligent Edge-clouds with Partitioning, Compression and Speculative Inference." *Military Communication Conference (MILCOM)*. IEEE, Dec. 2021.
2. **Shiwei Fang**, Ketan Mayer-Patel, and Shahriar Nirjon. "Exploiting Scene and Body Contexts in Controlling Continuous Vision Body Cameras." *Ad Hoc Networks Journal, Elsevier*, Volume 113, Mar. 2021.
3. **Shiwei Fang**, Md Tamzeed Islam, Sirajum Munir, Shahriar Nirjon. "EyeFi: Fast Human Identification Through Vision and WiFi-based Trajectory Matching." *In Proceedings of the 16th International Conference on Distributed Computing in Sensor Systems (DCOSS)*, IEEE, June 2020.
4. **Shiwei Fang**, Shahriar Nirjon. "SuperRF: AI-Enhanced Fast 3D RF Representation Using Low-Cost mmWave Radar." *In Proceedings of the International Conference on Embedded Wireless Systems and Networks (EWSN)*, ACM, Feb. 2020.
5. **Shiwei Fang**, Ketan Mayer-Patel, and Shahriar Nirjon. "ZenCam: Context-Driven Control of Autonomous Body Cameras." *In Proceedings of the 15th International Conference on Distributed Computing in Sensor Systems (DCOSS)*, IEEE, May 2019. **Best Paper Award**.
6. **Shiwei Fang**, Emre Salman, "Low Swing TSV Signaling using Novel Level Shifters with Single Supply Voltage," *In Proceedings of the IEEE International Symposium on Circuits and Systems (ISCAS)*. IEEE, May 2015.

Workshop & Preprint

1. Sirajum Munir*, Hongkai Chen*, **Shiwei Fang***, Mahathir Monjur, Shan Lin, Shahriar Nirjon. "CarFi: Rider Localization Using Wi-Fi CSI." *arxiv*, Dec. 2022. (* equal contribution)
2. **Shiwei Fang**, Ankur Sarker, Ziqi Wang, Mani Srivastava, Benjamin Marlin, and Deepak Ganesan. "Design and Deployment of a Multi-Modal Multi-Node Sensor Data Collection Platform." *In The Fifth International Workshop on Data: Acquisition To Analysis (DATA)*. ACM, Nov. 2022.
3. **Shiwei Fang**, Sirajum Munir, Shahriar Nirjon. "Dataset: Person Tracking and Identification using Cameras and Wi-Fi Channel State Information (CSI) from Smartphones." *In Proceedings of the 3rd Workshop on Data Acquisition To Analysis (DATA)*. ACM, Nov. 2020.
4. **Shiwei Fang**, Ron Alterovitz, Shahriar Nirjon. "Non-Line-of-Sight Around the Corner Human Presence Detection Using Commodity WiFi Devices." *In Proceedings of the 2019 Workshop on Device-Free Human Sensing (DFHS)*. ACM, Nov. 2019.
5. **Shiwei Fang**, Ketan Mayer-Patel, and Shahriar Nirjon. "Distributed Adaptive Model Predictive Control of a Cluster of Autonomous and Context-Sensitive Body Cameras." *In Proceedings of the 2017 Workshop on Wearable Systems and Applications (WearSys)*. ACM, June 2017.

Poster & Demo

1. **Shiwei Fang**, Sirajum Munir, Shahriar Nirjon. "Demo Abstract: Fusing WiFi and Camera for Fast Motion Tracking and Person Identification." *In Proceedings of the 18th ACM Conference on Embedded Networked Sensor Systems (SenSys)*. ACM, 2020.
2. **Shiwei Fang**, Shahriar Nirjon. "Demo Abstract: AI-Enhanced 3D RF Representation Using Low-Cost mmWave Radar." *In Proceedings of the 16th ACM Conference on Embedded Networked Sensor Systems (SenSys)*. ACM, 2018.

Patents

1. Sirajum Munir, **Shiwei Fang**, Yunze Zeng, Vivek Jain. "Apparatus and Methods for Rider Proximity Estimation using Wireless Signals", Patent Pending

MENTORSHIP EXPERIENCE

1. **Mohammad Rastikerdar**, PhD Student, UMass Amherst
2. **Yue Zhang**, PhD Student, UC Merced
3. **Mahathir Monjur**, PhD Student, UNC Chapel Hill
4. **Aritro Deb Sarker**, Undergraduate, WPI
5. **Krish Patel**, Undergraduate, WPI

TEACHING EXPERIENCE

Co-Teaching (UMass Amherst):

Spring 2023 CS328: Mobile Health Sensing and Analytics

Graduate Teaching Assistant (UNC Chapel Hill):

Fall 2017 COMP 581: Introduction to Robotics

Fall 2017 COMP 430: Mobile Computing Systems

Spring 2017 COMP 520: Compiler

Fall 2016 COMP 411: Computer Organization

Spring 2016 COMP 590: Mobile Computing Systems

Undergraduate (Stony Brook University):

2013 - 2015 IEEE Stony Brook Student Branch, Instructor

Fall 2012 Teaching Assistant for AMS 151

INVITED & CONFERENCE TALKS

- Nov. 2022 *Design and Deployment of a Multi-Modal Multi-Node Sensor Data Collection Platform*, International Workshop on Data: Acquisition To Analysis (DATA '22) (SenSys + BuildSys), 2022
- Dec. 2021 *Optimizing Intelligent Edge-clouds with Partitioning, Compression and Speculative Inference*, IEEE Military Communications Conference (MILCOM), 2021
- Mar. 2021 *Multimodal Sensing with Vision and WiFi*, GE Research
- Oct. 2020 *Improved Camera Sensing Systems using Multimodal Sensor Fusion*, UC Merced Electrical Engineering and Computer Science (EECS)
- June 2020 *EyeFi: Fast Human Identification Through Vision and WiFi-based Trajectory Matching*, IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS), 2020
- Feb. 2020 *SuperRF: AI-Enhanced Fast 3D RF Representation Using Low-Cost mmWave Radar*, ACM International Conference on Embedded Wireless Systems and Networks (EWSN), 2020
- Nov. 2019 *Non-Line-of-Sight Around the Corner Human Presence Detection Using Commodity WiFi Devices*, ACM Workshop on Device-Free Human Sensing (DFHS), BuildSys 2019
- May 2019 *ZenCam: Context-Driven Control of Autonomous Body Cameras*, IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS), 2019 **Best Paper Award**
- June 2017 *Distributed Adaptive Model Predictive Control of a Cluster of Autonomous and Context-Sensitive Body Cameras*, ACM Workshop on Wearable Systems and Applications (WearSys), MobiSys 2017

SELECTED PROJECTS

Sensing with Camera, RF, and IMU

1. **Human Identification Through Vision and WiFi-based Trajectory Matching**
 - Using a teacher-student model, a neural network is trained to estimate the motion trajectory of people by leveraging fine-grained WiFi signals (CSI) generating from their smartphones.
 - By performing cross-modal (camera, WiFi) trajectory matching, individuals are identified by using the WiFi MAC addresses of their smartphones.
 - Collected real-world data by deploying multiple sensors and released the dataset. (Dataset URL: <https://zenodo.org/record/3882104>)
2. **AI-Enhanced 3D RF Representation Using Low-cost mmWave Radar**
 - Designed a deep learning model to increase the angular resolution of mmWave radar scans to simulate Synthetic Aperture Radar (SAR) operation.
 - By proposing an improved compressed sensing pipeline, angular resolution is further enhanced by reducing blurriness.
 - Collected real-world data by deploying multiple sensors and released the dataset. (Dataset URL: https://bitbucket.org/embedded_intelligence/superrf_dataset/src/master/)

3. **Non-invasive Around the Corner Human Presence Detection**
 - Proposed a model to estimate WiFi multipath profile representation from WiFi CSI information.
 - By using the proposed multipath model and other features in a Random Forest classifier, human presence in the around-the-corner situation is estimated.
4. **Context-Driven Control of Autonomous Body Cameras**
 - Proposed a framework to automatically control a body camera to achieve the same image quality while significantly reduce power and storage consumption.
 - Using information from encoded video domain to estimate scene dynamics, and estimate user activity from IMU data.
 - Using a model predictive controller to control body cameras.

Robotics: Motion Planning and NLP

1. **Learning Motion Properties by Demonstration and Language**
 - Designed and implemented a model to learn motion properties like “higher” and “level” for Baxter robot arms through a single demonstration using statistic methods.
 - Implemented a simple natural language command interface using Stanford CoreNLP.
2. **Motion Planning for 2D Point Robot Using Neural Network**
 - Implemented and experimented motion planning for 2D point robot using a neural network trained on data generated from a random sampling motion planning algorithm.
3. **Motion Planning with Sequential Convex Optimization on Concentric Tube Robot**
 - Implemented and experimented a sequential convex optimization algorithm using random sampling points as seed on a three-stage concentric tube robot.
4. **Safer Motion Planning Through Cost Map Generation**
 - Designed and implemented a cost map generation technique based on environment map and sensing capability for safer motion planning in ROS environment.
5. **Micromouse**
 - 2015 IEEE Region 1 Student Conference, Team Leader*
 - 2014 IEEE Region 1 Student Conference, Third Place, Team Leader*

Virtual Reality, Vision, and Hardware

1. **Immersive Virtual Reality Experience with Kinect and OptiTrack**
 - Implemented a virtual reality system with Microsoft Kinect and OptiTrack to allow the user to control the avatar through body movement or show the user’s body in the virtual environment.
2. **Automatic Landmarking**
 - Implemented an automatic landmarking system for human airways using Haar-like 3D descriptors and Random Forest algorithm.
3. **Gray-level Image Processing and Stereo Matching**
 - Histogram equalization, convolution with LSI filter, and edge detection with Gaussian filter for gray-level image processing. Stereo matching by using Sum-of-Squared-Difference (SSD) minimization method and detect depth.
4. **Three-stage Pipelined Multimedia Cell-Lite Unit**
 - A three-stage pipelined multimedia Cell-Lite unit with a reduced set of multimedia instructions similar to those in the Sony Cell SPU architecture. Designed and implemented by using VHDL.

TECHNICAL SKILLS

Coding: Python, C/C++, C#, Java, MATLAB, Assembly Language, VHDL, SystemVerilog

Tools: PyTorch, Keras, Git

Sensors: Camera, TI mmWave Radar, WiFi, IMUs, Kinect, Intel RealSense, LIDAR, OptiTrack

OSs: Windows, Linux, Familiarity with Android and ROS

Bilingual: English, Mandarin Chinese

LEADERSHIP DEVELOPMENT & ACTIVITIES

- 2020 - 2021 **The Graduate and Professional Student Federation (GPSF), UNC-Chapel Hill**
Special Advisor for International Student Affairs
- Summer 2020 *Summer Governance*
- 2019 - 2020 *Senator, and Vice Chair of Finance Committee*
- 2019 - 2020 *Student Fee Audit Committee, GPSF Appointee*
- 2014 - 2015 **Institute of Electrical and Electronics Engineers (IEEE), Stony Brook Branch**
Vice President
- 2013 - 2014 *Web-master*
- 2013 - Present **IEEE-Eta Kappa Nu (IEEE-HKN Honor Society)**
- 2012 - 2015 **Sigma Beta Honor Society**
- 2012 - 2013 **Stony Brook Robotics Design Team**

PROFESSIONAL SERVICES

Co-Chair

- SenSys/BuildSys Workshop on Data: Acquisition to Analysis (DATA), 2022

Technical Program Committee (TPC)

- IEEE/ACM CHASE 2023
- IEEE ICC SAC E-Health, 2023
- BuildSys, 2022
- SenSys/BuildSys Workshop on Data: Acquisition to Analysis (DATA), 2020, 2021
- BuildSys Posters and Demos Session, 2020
- SenSys Posters and Demos Session, 2019

Session Chair

- ACM BuildSys 2022
- ACM Workshop on Intelligent Acoustic Systems and Applications (IASA), MobiSys 2022

Primary Reviewer

- IEEE Radar Conference (RadarConf), 2023
- ACM Transactions on Sensor Networks (TOSN), 2022
- ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT), 2022
- International Journal of Wireless Information Networks, 2022
- Digital Signal Processing, 2021, 2022
- INFOCOM, 2020, 2021
- Data in Brief, 2020
- MMSys, 2018
- NSysS, 2018

Publicity Chair

- IEEE MASS 2023

Web Chair

- SenSys/BuildSys Workshop on Data: Acquisition to Analysis (DATA), 2020, 2021