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 distributed multi-modal sensing.

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 smartphones 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.
- Assured product function, reliability, and safety through test and qualification.

Spring 2013   **Frank Melville Jr. Memorial Library Main Circulation**, *Stony Brook, NY*
Student Assistant
- Assisted students and faculties.
- Processed and scanned books and video materials.

TEACHING EXPERIENCE

Graduate Teaching Assistant:

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

2013 - 2015	IEEE Stony Brook Student Branch, Instructor
Fall 2012	Teaching Assistant for AMS 151

PUBLICATIONS

Journal & Conference

1. **Shiwei Fang**, Ketan Mayer-Patel, and Shahriar Nirjon. "Exploiting Scene and Body Contexts in Controlling Continuous Vision Body Cameras." *Ad Hoc Networks Journal, Elsevier*, Volumn 113, Mar. 2021.
2. **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,* May 2020.
3. **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.
4. **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*.
5. **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

1. **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.
2. **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.
3. **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.

INVITED TALKS & CONFERENCE PRESENTATIONS

Oct. 2020	UC Merced Electrical Engineering and Computer Science Technical Seminar
Feb. 2020	Conference presentation, EWSN 2020
Nov. 2019	Conference presentation, DFHS 2019
May 2019	Conference presentation, DCOSS 2019
June 2017	Conference presentation, WearSys 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
   - Autonomous robot mouse solves a 16x16 maze. The robot needs to find its way from a predetermined starting position to the central area of the maze unaided.

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

The Graduate and Professional Student Federation (GPSF), *UNC-Chapel Hill*

2020 - 2021	*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*

Institute of Electrical and Electronics Engineers (IEEE), *Stony Brook Branch*

2014 - 2015	*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

Technical Program Committee (TPC)
- SenSys/BuildSys Workshop on Data: Acquisition to Analysis (DATA), 2020, 2021
- BuildSys Posters and Demos Session, 2020
- SenSys Posters and Demos Session, 2019

Reviewer
- INFOCOM, 2020
- Data in Brief, 2020
- MMSys, 2018
- NSysS, 2018

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