Hao Lu

410 Brunswick Drive Apt 10, Troy NY, 12180
518-961-2173 luh6rpi@gmail.com linkedin.com/in/hao-lu-364683173 https://haolu123.github.io

My research is focused on human activation detection using motions sensors, low-resolution point cloud analysis, indoor occupancy detection systems, sensor placement and multi-modality vision sensor fusion.

Education

Rensselaer Polytechnic Institute **Sep. 2018 – Now**
PhD in Electrical Engineering, Adviser: Prof. Richard J. Radke *Troy, NY*

Harbin Institute of Technology **Sep. 2016 – July. 2018**
Master of Electronic and Communication Engineering, Adviser: Prof. Jiayan Zhang *Harbin, China*

Harbin Institute of Technology **Sep. 2012 – July. 2016**
Bachelor of Telecommunication Engineering *Harbin, China*

Experience

Amazon **Jun 2022 – Aug 2022**
Internship *Cambridge, MA*

- Designed the wake-word free wake up system for Amazon Alexa. The critical task is to detect if any user is talking to the device using video and audio streams.
- Extracted and analyzed the video, audio, semantics feature and social relation features related to the core task.
- Proposed a fusion network to combine video, audio and transcription information and analyzed the performance.

United Imaging Intelligence **Feb 2022 – May 2022**
Internship *Cambridge, MA*

- Designed a deep architecture able to segment the patients from complex background.
- Developed a backbone network to fuse multi-modality vision sources (like RGB images, depth images, thermal images) by self-attention for improved generalizability of multi-modality fusion.

Troy Sensor Company **Jan 2021 – present**
Co-technical leader *Troy, NY*

- Developed a pose detection and health monitoring system by a sparse network of privacy-preserving sensors using indoor-LiDAR. A sparse network of privacy-preserving sensors using indoor-LiDAR enabled technology for real-time occupancy monitoring and pose detection with predictive ML algorithms for people and patients to experience better health outcomes from falling less.
- Joined the I-Corps program as Co-technical leader for market research and will apply STTR Phase I in summer 2023.

Rensselaer Polytechnic Institute **May 2018 – present**
Graduate Research and Teaching Assistant *Troy, NY*

- Substantial experience in human activation detection using motions sensors, wireless sensor deployment and vision based source separation.
- Developed an indoor zone-level occupancy detection wireless sensor network using motion sensors for smart building.
- designed Hardware sensor system using STM-VL53L5 time-of-flight sensors and raspberry pi zero built detecting pods and WiFi+MQTT as IoT communication protocol.
- Built virtual indoor environment simulation using Unity 3D game engine.
- Developed an occupancy tracking algorithm using low-resolution point-cloud video for the occupancy counting system.
- Developed an occupancy trajectory prediction algorithm for our system by learning the human behavior using maximum causal entropy inverse reinforcement learning.
- Designed a falling detection system using STM-VL53L5 ToF sensors and r-pi 4. Proposed a falling detection algorithm using low-resolution point cloud video stream.
- Developed the optimal sensor placement strategy for our tracking algorithm and occupancy trajectory prediction algorithm by formulating it as an ILP problem
- Proposed a sensor wake-up strategy using the occupancy trajectory prediction result to save the energy consumption of our WSN.
- Developed a pose detection and health monitoring algorithm to extend our system to the field of health care and elder care.

Harbin Institute of Technology **Sep. 2016 – July. 2018**

Graduate Research *Harbin, China*

- Developed a TPC Coding and Decoding System on FPGA Platform for the UAV video transmission channel, with a throughput of over 32Mbps .
- Developed a QC-LDPC channel coding system with a throughput of more than 300Mbps for 5G mobile transmission technology.
- Developed a 2.5Gsps vector signal source on FPGA platform.

Publications

Jiayan Zhang, Shuai Wang, Hao Lu and Hongchao An, A Method for Reducing the Complexity of Meggitt Decoder , The 6th International Conference on Communications, Signal Processing, and Systems, Jul.2017,Harbin China.

H. Lu, A. Tuzikas, and R.J. Radke, A Zone-Level Occupancy Counting System for Commercial Office Spaces Using Low-Resolution Time-of-Flight Sensors, Energy and Buildings, Volume 252, 1 December 2021, 111390.

H. Lu, and R.J. Radke, Optimizing Occupancy Sensor Placement in Smart Environments, IEEE Systems Man and Cybernetics, submitted.

Technical Skills

Programming and Scripting Languages: Python, C, C#, matlab, Verilog HDL
Deep Learning Libraries: Pytorch, Tensorflow
Math tools: Convex optimization, Linear Integer Optimization, Machine Learning Algorithms, Multivariate Statistical Analysis, and Spatio-temporal Signal Analysis