

MINGDIAN LIU

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Education

Iowa State University

Ph.D in Electrical Engineering

Sep. 2017 - Aug. 2023

Ames, Iowa

Iowa State University

Master in Computer Science

Aug. 2020 - May 2022

Ames, Iowa

Shandong University

Bachelor of Science in Physics

Sep. 2012 - June 2016

Jinan, China

Technical Skills

Research Skills: Computer Vision, Signal Processing, Perception, Tracking, Localization, Simulation, Sensor

Deep Learning: CNN, ResNet, RNN/LSTM, GAN, Wavenet, Transformer

Programming Language: Python, Java, C/C++, R, Matlab

Platform and Tools: Pytorch, TensorFlow/Keras, OpenCV, AWS, CUDA, Linux

Work Experience

Amazon Alexa AI, Natural Understanding

Applied Scientist Intern

May 2022 - current

Palo Alto, California

- Designed a Multimodal Deep Learning model for music-to-dance generation. This model will be deployed for avatar application.
- Proposed a novel model based on CLIP (a Vision Language Pretrained Model) and VQ-VAE model to make dance motion editable by text guidance. The results are being summarized for publication.
- Also preparing two patents on this project.

OPPO US Research Center, XR Interaction Lab

Research Intern

June 2021 - Dec. 2021

Palo Alto, California

- Developed a DL-based hand gesture recognition system for AR glass using 0.4 million data of IMU and PPG sensors.
- Improved system robustness (averaged 96% recall and 94% precision for each type of gesture) and reduce 35% power consumption over existing methods. Also submitted two patents on it.
- Composed code of 3-DoF hand tracking with IMU sensor for AR glass.

Research Projects

Interpretation of Physics-Based System With Unsupervised Learning

Feb. 2021 - current

- Developed an unsupervised learning (i.e. combining VAE and WaveNet) model to extract interpretable hidden physical parameters of Gaussian pulse.
- Modified Transformer neural network to extract interpretable physical parameters from spatiotemporal systems.
- Trying to extend the model to solve the Maxwells' equation and apply it for EM wave simulation. Ongoing.

Indoor Activities Recognition with Radar Sensor

Oct. 2020 - current

- Deployed TI mmWave sensor for real-time point cloud generation of human beings.
- Developed an integrated algorithm of range-FFT, Doppler-FFT and Angle Estimation for moving people tracking and reduced the position error into 0.11 m.
- Utilized LSTM and RNN for user identification with the accuracy of 90.2% for 5 people.
- Proposed a fused CNN and Transformer neural network for human pose estimation and reached a high classification accuracy of 92.3%.
- Built up a sensor fusion system by mmWave sensor and depth camera to monitor indoor human activities. Ongoing.

- Developed a pipeline to automate model build-up and data collection on Ansys HFSS simulation software.
- Designed a Tandem Neural Networks for the antenna design to converge in cases of nonuniqueness without sacrificing degenerate solutions.
- Proposed an Active Learning framework to automatically generate the antenna shape according to customer's requirement meanwhile reducing 29% dataset to reach the same accuracy of the old system.

Publications

- X. Li, M. Liu, Z. Yang, et al. “*Novel Finger Swipe-based Smart Watch User Interface Control.*”US Patent App. (Submitted)
- M. Liu, Y. Zhao, et al. “*An IoT-enabled paper sensor platform for real-time analysis of isothermal nucleic acid amplification tests.*”Published in Biosensors and Bioelectronics (Impact Factor: 10.257).
- M. Liu, H. Monshat, et al. “*Paper based isothermal DNA amplification and real-time analysis.*”Published in Lecture Notes in 2019 IEEE SENSORS.