Moh Sabbir Saadat

Ph.D. - Computer Engineering
University of South Carolina

Columbia, SC
(702) 273-8617
msaadat@email.sc.edu
https://mohsaadat.github.io
https://github.com/MohSaadat

Highlights

6 years of experience leading novel ideas in sensing and imaging. Explored the potential of FMCW radar for fine-grained perception, including imaging and identification of hidden objects, human pose reconstruction, and activity recognition. Background in deep learning, signal processing, and the development of multi-modal prototypes. Collaborative and multidisciplinary research, partnering with an external team.

Experience

Graduate Research Assistant — **January, 2019 — Present**
SyReX Lab - University of South Carolina — *Columbia, SC, USA*

- Develop and publish novel ideas in ubiquitious sensing and imaging under challenging conditions. *(9 publications, 1 patent).*
- Build large-scale data pipelines with finely synchronized multi-modal sensors (radar, camera, audio, vital sign sensors).
- Execute large-scale signal processing, point cloud processing, filtering, and distributed training on CUDA-based GPU backend.
- Fine-tune complex ML models and benchmark them for various tasks.
- Assisted a 400+ level class on computer networks with 100+ students *(Socket programming with Java, Python, and C).*

Executive Engineer — **October, 2016 — November, 2018**
Siemens Healthcare Limited — *Dhaka, Bangladesh*

- Oversaw the technical requirements of potential clients in the medical imaging domain.
- Built liaison between the engineering department and the existing clientele.

Education

Ph.D. in Computer Engineering, *University of South Carolina* — **December, 2025**
M.Sc. in Computer Engineering, *University of South Carolina* — **August, 2024**
B.Sc. in Electrical & Electronics Engineering, *Bangladesh University of Engineering & Technology* — **March, 2016**

Skills

Software Engineering: Python, C++, MATLAB, Java, HTML, Git version control, Shell scripting, Linux.
ML libraries: PyTorch, TensorFlow, Keras, TensorBoard, Ray Tune, Scikit-learn, MATLAB Deep Learning.
ML models: Graph Neural Network, Vision Transformers, Generative Adversarial Network (GAN), Autoencoder, Few-shot Learning, LSTM.
Foundation ML models: MobileNet, ResNet, Mediapipe, HRNet, Whisper, WhisperX, BERT, Sentence-BERT.
Computational skills: Range-angle, Micro-doppler, Antenna array (FMCW radar), PCD processing, Clustering, STFT, Wavelet, DTW.
Tools: TI mmWave Studio, RTAB-Map (SLAM), Robot Operating System (ROS), FFmpeg, OpenCV.

Projects

- **Imaging hidden objects with handheld millimeter-wave devices** *(SAR, Compressed sensing, Clustering, GAN, Ray-tracing)*
  - Leverage Synthetic Aperture Radar (SAR) principle to enable imaging from a small antenna array.
  - Overcome sparse sampling and motion non-linearity with signal processing methods. *(compressed sensing, unsupervised clustering)*
  - Overcome information loss in reflected wireless signal through cGAN-based image super-resolution.
  - Overcome the lack of ground truth data through ray-tracing based simulation of wireless signal reflections.

- **Co-existence of human-activity sensing on indoor wireless system** *(3D pose, Range-angle, μ-doppler, Graph Neural Network, Xformer)*
  - Graph neural network pipeline to overcome low-rate sensing signal due to co-existing networking.
  - Graph and Recurrent neural network (LSTM) to estimate 3D posture sequence of a human body as joints' coordinates.
  - Deployment of activity recognition model on a real-time system ($\sim$98% prediction accuracy with $\sim$2s initial latency).
  - Explored the Transformer model to develop an end-to-end system leveraging range-angle-doppler heatmaps sequence.

- **Automated NIH stroke scale segmentation from multiple sensors** *(Multi-modal sensors, Pose from images, Audio Speech Recognition)*
  - Built multi-sensor prototype with fine hardware-software synchronization *(4k camera, microphone array, smartwatch, wireless)*.
  - Posture analysis through body joints tracking with Mediapipe and HRNet.
  - Speech assessments through Audio Speech Recognition (ASR) with Whisper and WhisperX.
  - Cognitive assessments through Large Language Models (LLM), BERT and Sentence-BERT.

- **Two-stage facial palsy scoring from single images** *(Image processing (OpenCV), CNN, Health AI)*
  - Mapping facial keypoints with Mediapipe to create Regions of Interest (ROI) for pathologic assessments.
  - Proposed an image pre-processing pipeline to mask identity and lighting condition from image inputs.
  - Achieves high recall ($\sim$95%) but low precision ($\sim$ 70%) in the identification of healthy individuals.

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Recent Publications

- **Moh Sabbir Saadat**, Sanjib Sur. "Enabling Coexistence of Indoor Millimeter-Wave Networking and Human Activity Sensing." *2024 IEEE/ACM International Conference on Connected Health: Applications, Systems, and Technologies (June 2024)* **[CHASE 2024]**
- **Moh Sabbir Saadat**, Sanjib Sur. "Human Activity Sensing from Low-rate Samples under Integrated Networking." *2024 IEEE/ACM International Conference on Connected Health: Applications, Systems, and Technologies (June 2024)* **[CHASE 2024]**
- **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi. "Aquilo: Temperature-Aware Scheduler for Millimeter-Wave Devices and Networks." *The Elsevier High Confidence Computing journal* **[Elsevier HCC 2024]**
- Edward Sitar, **Moh Sabbir Saadat**, Sanjib Sur. "A Millimeter-Wave Wireless Sensing Approach for At-Home Exercise Recognition." *Proceedings of the ACM International Conference on Mobile Systems, Applications, and Services (June 2022)* **[MobiSys 2022]**
- Hem Regmi, **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi. "SquiggleMilli: Approximating SAR Imaging on Mobile Millimeter-Wave Devices." *Proceedings of the ACM on Interactive, Mobile, Wearable, and Ubiquitious Technologies (September 2021)* **[IMWUT 2021]**
- Hem Regmi, **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi. "ZigZagCam: Pushing the Limits of Hand-held Millimeter-Wave Imaging." *ACM International Workshop on Mobile Computing Systems and Applications (February 2021)* **[HotMobile 2021] (Best Poster Runner-up Award)**
- **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi. "A Case for Temperature-Aware Scheduler for Millimeter-Wave Devices and Networks." *The 28^{th} IEEE International Conference on Network Protocols (October 2020)* **[ICNP 2020]**
- **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi. "Bringing Temperature-Awareness to Millimeter-Wave Networks." *ACM International Conference Mobile Computing and Networking (September 2020)* **[MobiCom 2020]**
- **Moh Sabbir Saadat**, Sanjib Sur, Srihari Nelakuditi, Parmesh Ramanathan. "MilliCam: Hand-held Millimeter-Wave Imaging." *The 29^{th} IEEE Conference on Computer Communications and Networks (August 2020)* **[ICCCN 2020]**

Accepted abstracts

- **Moh Sabbir Saadat**, Ryan Titus, Haley Verkuilen, Phil Fleming, Sanjib Sur, Souvik Sen. "A Contactless and Automated Approach to the Acute Stroke Assessment." *AHA International Stroke Conference (February 2025)*

Patent

Sanjib Sur, Moh Sabbir Saadat, Srihari Nelakuditi, *"Heat Dissipation for Millimeter-wave Devices with Antenna Switching"* (Granted: February 2023)

Awards

- **Student travel grant, CHASE'24**: *Presenting work on enabling sensing on integrated networking system*
- **Best poster runner-up at ACM HotMobile'21**: *For early work on hand-held millimeter-wave imaging*
- **Saluting the Nation Builders of Tomorrow 2008/2010, The Daily Star** : *For outstanding achievement in GCE O/A level*

Professional services

- **External Reviewer** → Pervasive and Mobile Computing 2025 → IEEE Transactions on Mobile Computing 2022 → IEEE/ACM Transactions on Networking 2023, 2024 → IEEE International Conference on Mobility, Sensing, and Networking (MSN'23) → IEEE/ACM International Conference on Internet of Things Design and Implementation (IoTDI'23) → EAI Mobiquitious 2022
- **Other Services** → Served as the Vice President of Bangladesh Student Association of University of South Carolina 2021-2022 → Served as the General Secretary of Bangladesh Student Association of University of South Carolina 2020-2021 → Served as an adjudicator at the NALSAR University Debating Tournament, Hyderabad, India 2012