MD FARHAN TASNIM OSHIM

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Work Authorization: U.S. Permanent Resident (Green Card under EB2 NIW)

EDUCATION

UNIVERSITY OF MASSACHUSETTS AMHERST, MA, USA **May 2025** (Expected)
Ph.D. in Computer Science
Advisor: Prof. Tauhidur Rahman
Thesis: Towards High-Fidelity Motion Characterization via Radar Vibrometry - Applications in Vital Sign Monitoring and Human-Object Interaction.

RWTH AACHEN UNIVERSITY, NW, Germany (Top Engineering School in Germany)
M.Sc. in Electrical and Computer Engineering
Advisor: Prof. Peter Vary
Thesis: Optimized Signal Constellations for Hierarchical Modulations with Iterative Decoding.

ISLAMIC UNIVERSITY OF TECHNOLOGY, Dhaka, Bangladesh
B.Sc. in Electrical and Electronic Engineering
Advisor: Prof. Mohammad Rakibul Islam
Thesis: Efficient Design of Decoding Algorithms using Low Density Parity Check (LDPC) Codes for Wireless Networks.
CGPA: 3.96/4.00 (Top 5% of the class)

RESEARCH EXPERIENCE

UNIVERSITY OF MASSACHUSETTS AMHERST, MA, USA **2018 – Present**
Research Assistant, Mobile Sensing and Ubiquitous Computing Laboratory (MOSAIC)
- Conducted cutting-edge research on RADAR-based contactless vital sign estimation, vibration-based tagging, motion magnification, NeRF-based SAR, and indoor localization as a Research Assistant at MOSAIC Lab, with findings published in top-tier HCI and Robotics conferences.

UNIVERSITY OF CALIFORNIA SAN DIEGO, CA, USA **Jun – Aug 2024**
Research Intern, Halıcıoğlu Data Science Institute
- Spearheaded the research project on "Adversarial Perturbations against Unauthorized Radar Sensing," enhancing radar-based gesture recognition and vital sign monitoring. Findings published at ICRA 2025.

QUALCOMM, San Diego, CA, USA **Jun – Aug 2023**
Interim Engineering Intern
- Developed an RNN-based contactless gesture recognition model using FMCW radar data, achieving over 97% classification accuracy.
- Rigorously compared performance against MLP, GMM, and LSTM architectures, resulting in a 18% improvement in accuracy and a 25% reduction in model inference time, significantly enhancing overall system efficiency.

TESLA, Palo Alto, CA, USA **Sep 2022 – Jan 2023**
Research Intern
- Revamped Passive Entry systems research by developing automated data collection robots utilizing machine vision techniques such as OpenCV, CNNs, OCR alongside Raspberry Pi and 3D printing.
- Reduced data collection time by 75%, eliminating manual labor and human errors, and saving the company thousands of dollars in operational costs.

QUALCOMM, San Diego, CA, USA **May – Sep 2022**
Interim Engineering Intern
- Implemented a real-time contactless vital sign system using FMCW radar**,** achieving 0.5 bpm MAE for BR and 1.5 bpm MAE for HR**.**
- Designed and deployed digital filters, ICA, PCA, and the MUSIC algorithm to enhance system accuracy and reliability.

BOSCH, Stuttgart, BW, Germany **Jan – Jul 2015**
Research Intern
- Implemented Software Defined Radio (SDR) for a Continuous Phase Frequency Shift keying (CP-FSK) based system for communication system in GNU Radio for power line communication within battery management systems.
- Designed, evaluated, and tested single and multicarrier modulation schemes with synchronization algorithms through real-channel measurements using USRPs (Universal Software Radio Peripherals).

FRAUNHOFER FKIE, Bonn, NW, Germany **Jan – Jul 2014**
Research Intern
- Designed and implemented a Bit Interleaved Coded Modulation with Iterative Decoding (BICM-ID) based digital communication system that adapts decoding complexity and performance according to the propagation conditions and receiver capabilities.
- Contributed to Software Defined Radio (SDR) activities team in the ongoing research on the topic of future tactical wideband networking waveforms at FKIE facility.

SKILLS

- Machine Learning & Deep Learning (CNNs, Transformers, Object Recognition & Tracking, Image Segmentation, Pattern Recognition, Feature Extraction), Computer Vision & 3D Modeling (Image Analysis, 3D Reconstruction, Motion Magnification, Neural Radiance Fields (NeRF), Gaussian Splatting, Object Pose Estimation), Signal Processing & Radar Imaging (Time-Series Data Analysis, SAR, Statistical Analysis, Algorithm Development), High-Performance Computing & Implementation (CUDA, Parallel Computing, Big Data Analysis), Visualization & Data Interpretation (Data Visualization, Exploratory Data Analysis (EDA))
  - Programming : Python, C++, MATLAB, PyTorch, TensorFlow, OpenCV, R, SQL, Apache (Hadoop, Spark)
  - Hardware : UWB Radar, FMCW Radar, Doppler Radar, Arduino ESP-32, Raspberry Pi, USRP.

PUBLICATION

1. **Md Farhan Tasnim Oshim,** Huaishu Peng, Tauhidur Rahman, "*MetaScatter: Computational Design of 3Dprinted Meta-Reflector Structures Supporting Radar-Based Identification*", MobileHCI 2025 (Under Review).
2. **Md Farhan Tasnim Oshim**, Nigel Doering, Bashima Islam, Tsui-Wei Weng, Tauhidur Rahman, "*Anti-Sensing: Defense against Unauthorized Radar-based Human Vital Sign Sensing with Physically Realizable Wearable Oscillators*", **IEEE ICRA 2025**. [PrePrint]
3. **Md Farhan Tasnim Oshim**, Albert Reed, Suren Jayasuriya, Tauhidur Rahman, "*NeRF-enabled Analysis-Through-Synthesis for ISAR Imaging of Small Everyday Objects with Sparse and Noisy UWB Radar Data*", International Conference on Intelligent Robots and Systems, **IEEE IROS 2024**. [Link] |[PDF]| [Video]
4. Charlotte Goldfine, **Md Farhan Tasnim Oshim**, Brittany Chapman, Deepak Ganesan, Tauhidur Rahman, Stephanie Carreiro, "*Contactless Monitoring System Versus Gold Standard for Respiratory Rate Monitoring in Emergency Department Patients: Pilot Comparison Study*" **JMIR Formative Research 2024**. [Link] | [PDF]
5. **Md Farhan Tasnim Oshim**, Toral Surti, Charlotte Goldfine, Stephanie Carreiro, Deepak Ganesan, Suren Jayasuriya, Tauhidur Rahman, "*Eulerian Phase-based Motion Magnification for High-Fidelity Vital Sign Estimation with Radar in Clinical Settings*", **IEEE Sensors 2022**. [Link] | [PDF]
6. **Md Farhan Tasnim Oshim**, Julian Killingback, Dave Follette, Huaishu Peng, Tauhidur Rahman, "*MechanoBeat: Monitoring Interactions with Everyday Objects using 3D Printed Harmonic Oscillators and Ultra-Wideband Radar*", **ACM UIST 2020**. [Link] | [PDF] | [Video] | [Media Coverage]
7. **Md Farhan Tasnim Oshim***, Charlotte Goldfine*, Stephanie Carreiro, Brittany Chapman, Deepak Ganesan, Tauhidur Rahman, "*Respiratory Rate Monitoring in Clinical Environments with a Contactless Ultra-Wideband Impulse Radar-based Sensor System*", HICSS 2020. [Link] | [PDF] | * Equal Contribution
8. Matthias Tschauner, **Md Farhan Tasnim Oshim**, Marc Adrat, Markus Antweiler, Benedikt Eschbach, Peter Vary, "*Design and analysis of hierarchically modulated BICM-ID receivers with low inter-layer interferences*", **Springer: Journal of Signal Processing Systems 2017**. [Link] | [PDF]
9. Matthias Tschauner, **Md Farhan Tasnim Oshim**, Marc Adrat, Markus Antweiler, Benedikt Eschbach, Peter Vary, "*On the Design of Hierarchically Modulated BICM-ID Receivers with Low Inter Layer Interferences*", **WInnComm Europe 2015**. [Link] | [PDF]
10. Marc Adrat, **Md Farhan Tasnim Oshim**, Matthias Tschauner, Markus Antweiler, Benedikt Eschbach, Peter Vary, "*On hierarchically modulated BICM-ID for receivers with different combinations of Code Rate and Modulation Order*", **WInnComm 2015**. [Link] | [PDF]
11. Mohammad Rakibul Islam, Khandaker Sultan Mahmood, **Md Farhan Tasnim Oshim**, and Md. Moshiur Rahman Farazi, "*Intensity reflection coefficient based Min-Sum decoding for Low Density Parity Check Codes*", **Frequenz**: Journal of RF-Engineering and Telecommunications 2012. [Link] | [PDF]

HONORS AND AWARDS

- *Dr. Dave Lomet Graduate Scholarship* at CICS, UMass Amherst (*$5,000*) 2025
- *CICS UMass Amherst Travel Grant* for attending IROS 2024 (*$800*) 2024
- *IEEE Robotics & Automation Society Travel Grant* for attending IROS 2024 (*$1,000*) 2024
- *Graduate Teaching Fellowship* by CICS, UMass Amherst AY 2023 – 2024
- *Krithi Ramamritham Computer Science Scholarship* at CICS, UMass Amherst (*$1,600*) 2022
- *Organization of Islamic Cooperation (OIC) Scholarship* for Undergraduate studies (*$7,500*) 2011

SERVICE

- Reviewer for *ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)* 2024 & 2019
- Hackathon Judge at *HackUMass'24* & *Hack(H)er-413 Hackathon'24* 2024
- Graduate Representative*, CICS, UMass Amherst* AY 2021 – 2022
- Student Volunteer at *34th ACM Symposium on User Interface Software and Technology (UIST)* 2021