# ZUBAIDAH AL-MASHHADANI

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## ABOUT ME

Ph.D. researcher in tactile sensing, multimodal signal processing, and human–robot interaction, with a focus on real-time decoding of force, motion, and biosignals for dexterous robotic manipulation. My work bridges near-sensor neuromorphic computing and machine learning to enable adaptive edge-AI human–robot collaboration.

## EDUCATION

**Ph.D. Electrical Engineering** 2021 – present
*University of Central Florida* Orlando, FL
Anticipated Graduation: Summer 2026/ Spring 2027 (*flexible*)
- Graduate research assistant, Laboratory for Interaction of Machine and Brain *(LIMB)*, Advisors: Dr. Mohsen Rakhshan and Dr.Di Wu.
- Previous labs : NeuroControl Lab, advisor: Dr. Yuxiao Yang.

**M.S. Robotics Engineering** 2019 – 2021
*Florida Polytechnic University* Lakeland, USA
Graduate teaching assistant, Advisor: Dr. Balasubramaniyan Chandrasekaran.

**B.S. Mechatronics Engineering** 2011 – 2015
*Engineering Technical College Baghdad* Baghdad, Iraq

## SKILLS

**Programming Languages**
Python, MATLAB, R, C, C++, Linux, Assembly Language, Verilog.

**Data Analysis & ML**
High-throughput Signal Processing, SLAM, Dimensionality Reduction, Multimodal Alignment, Neuromorphic Computing, Computer Vision, Object Detection, Segmentation, Sensor fusion, Perception.

**Software tools and Framework**
Lab Streaming Layer (LSL), BrainFlow, MEEGkit, SciPy, TensorFlow, PyTorch, Jupyter, matplotlib, MultiSim, Simulink, SolidWorks, AutoCAD, Microsoft Office, CAD/CAM, ROS, CUDA, Gazebo, pose tracking, Numpy, Pandas.

**Hands-on Skills**
Piezoresistive tactile sensor, OyMotion gForcePro+ EMG Armband, EEG BrainVision system, embedded systems, Jetson, Raspberry Pi, Arduino, OpenCR, LiDAR sensor, Ultrasonic Sensor, Gyroscope, Intel RealSense camera, FPGA boards, PCBs, BLE, Zigbee, tactile feedback.

## SELECT PUBLICATIONS

**Z. Al-Mashhadani, M. Rakhshan, and D. Wu, "uSense: Stochastic Edge Neuromorphic Sensing"** 2026
*Nature Machine Intelligence*
*(submitted)*

**Z. Al-Mashhadani, T. Overton, D. Wu and M. Rakhshan, "Toward Plug and Play Myoelectric Control via One-Shot Latent Representation Alignment," in IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 33, pp. 4409-4421, 2025.** 2025
*IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*

**T. Overton, Z. Almashhadani, M. Rakhshan. "Limb Position Effect in Myoelectric Control: Strategies for Optimisation and Standardisation"** 2025
*Journal of Neural Engineering (JNE)*
*(accepted)*

**Z. Al-Mashhadani, N. Bayat, I.F. Kadhim, R. Choudhury, and J.H. Park,"The efficacy and utility of lower-dimensional Riemannian geometry for EEG-based emotion classification." Applied Sciences 13.14 (2023): 8274.** 2023

**Multi-Robot Systems - New Advances** 2023
*IntechOpen*
J. Fu, Z. Al-Mashhadani, K. Currier, AM. Al-Ani, JH. Park, "Challenges and Trends of Machine Learning in the Myoelectric Control System for Upper Limb Exoskeletons and Exosuits"*Multi-Robot Systems-New Advances* (2023).

**Z. Al-Mashhadani, and B. Chandrasekaran, "Autonomous Agricultural Monitoring Robot for Efficient Smart Farming," 2023 23rd International Conference on Control, Automation and Systems (ICCAS), Yeosu, Republic of Korea, 2023.** 2023
*ICCAS*

**Bayat, N., Kim, J.H., Choudhury, R., Kadhim, I.F., Al-Mashhadani, Z., Aldritz Dela Virgen, M., Latorre, R., De La Paz, R. and Park, J.H., 2023. Vision transformer customized for environment detection and collision prediction to assist the visually impaired. Journal of Imaging, 9(8), p.161.** 2023

**Z. Al-Mashhadani, M. Mainampati, and B. Chandrasekaran, "Autonomous Exploring Map and Navigation for an Agricultural Robot," 2020 3rd International Conference on Control and Robots (ICCR), Tokyo, Japan, 2020** 2020

**Z. Al-Mashhadani et al. "Autonomous Ripeness Detection Using Image Processing for an Agricultural Robotic System," 2020 11th IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, USA, 2020.** 2020

## WORK EXPERIENCE

**Academic Review Service** 2022 – 2024
*IEEE RA-L (5 reviews)*

**Graduate Research Assistant** 05/2024 – present
*University of Central Florida* Orlando, United States
- Robust Position-Agnostic Control for Hand Prosthetics
- Force and Tactile Sensory Feedback using Unary Computing

**Graduate Teaching Assistant** 01/2023 – 05/2024
*University of Central Florida* Orlando, United States
- Linear circuits I & II, Digital Systems, Electronics I

**Graduate Assistant** 08/2019 – 05/2021
*Florida Polytechnic University* Lakeland, United States
- Graduate Teaching Assistant : Circuits I & II
- Research Assistant : Optimizing Navigation and Vision Systems for Ground Robots

## PROJECTS

**Generalizable myoelectric control via Multi-modal data alignment** 2026 – Present
*University of Central Florida, neuro-enginner*
*(in-progress, initial stage)*
- Designing a robust gesture decoder by fusing ultrasound, sEMG, and IMU.
- Investigating cross-modal correlations to relate peripheral muscle activity to cortical signals.

**Robust Prosthetic Control Based on Ultrasound Signals** 03/2026 – present
*University of Central Florida, neuro-engineer*
Project is at initial stage.

**Robust Hand Gesture Decoding Based on Latent Space Modeling of Surface EMG** 01/2024 – 05/2025
- Designed and deployed an experimental setup to acquire a multimodal hand-gesture dataset via LSL synchronization.
- Analyzed different variations' influence on muscle activity.
- Developed a robust myoelectric decoder agnostic to variations in position, day, and user.

**Sensory Feedback Restoration using Unary Computing and Tactile Sensing in Prosthetics** 05/2024 – 02/2026
- Designed a tactile sensing pipeline for robotic fingertips enabling real-time texture recognition.
- Achieved low-latency perception suitable for closed-loop manipulation.
- Reduced compute and energy footprint for edge deployment.
- Demonstrated robust performance across 21 surface conditions.

**EEG Emotion Recognition Using Riemannian Geometry** 08/2021 – 08/2022
*University of Central Florida, Programmer*
- Increased emotion recognition accuracy by 9% using Riemannian geometry.
- Improved the feature selection algorithm achieving higher accuracy by 5%.

**Autonomous Patient Transfer Robot** 01/2023 – 12/2023
*University of Central Florida, Robotics Engineer*
- Implemented visual SLAM using Intel RealSense
- Integrated perception with navigation for human-centered tasks
- Led system-level development across sensing, perception, and evaluation

## AWARDS AND MEMBERSHIPS

**Future Faculty Laurette Scholarship** 2024
*University of Central Florida - Electrical Engineering Department*

**Faculty Cluster Initiative Fellowship** 2024
*University of Central Florida - Disability, Aging, and Technology Cluster*

**Biomedical Engineering Society (BMES) - Graduate Student Relations Director** 2024

**ORCG Doctoral Fellowship** 2021

**IEEE Robotics and Automation Society** 2021

**IEEE Etta Kappa Nu Mu Omega (HKN) - Founder Member** 2020

**Fulbright Foreign Student Program (alumni)** 2019

**Chevening Scholarship (Offered, 2 times)** 2019

## REFERENCES

**Mohsen Rakhshan**, *Assistant Professor,* University of Central Florida
mohsen.rakhshan@ucf.edu, (407) 823-2044

**Di Wu**, *Assistant Professor,* University of Central Florida
di.wu@ucf.edu, (407) 823-1341