

# Muhammad Saud Ul Hassan

🌐 [msaudulhassan.github.io](https://msaudulhassan.github.io) | 🌐 [github.com/msaudulhassan](https://github.com/msaudulhassan)

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## EDUCATION

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### Florida State University

*MS Mechanical Engineering (Robotics)*

Deep & Reinforcement Learning (A), Intro to AI (A), Optimal Control (A), Adv. Dynamics (A)

Tallahassee, FL

Aug 2019 – Apr 2021

### University of Engineering & Technology, Lahore

*BSc Petroleum & Gas Engineering*

First Position in Bachelor's Thesis ("Oil Field Optimization through Gas Lift Optimization")

Lahore, Pakistan

Oct 2013 – Aug 2017

## ACADEMIC AWARDS AND FELLOWSHIPS

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Adelaide Wilson Fellowship	2020
US Navy's \$45,000 award for 2nd position in AI Tracks at Sea Challenge	2020
Chief Minister Laptop Award	2015
Punjab Educational Endowment Fund Scholarship (Nominee)	2013
Punjab Group of Colleges Merit Scholarship	2011 – 2013
Punjab Education Commission Merit Scholarship	2006 – 2009

## RELEVANT PROFESSIONAL EXPERIENCE

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**Advanced Micro Devices Inc.** | *Python, PyTorch, Tensorflow, C++, Git, MySQL, Linux*  
*Software Development Engineer II*

Nov 2021 – Present  
Austin, TX

- Developed and trained a transformer-inspired sequence classification network for convolution kernel selection in MIOpen.
  - Achieved up to 3x speed-up in evaluating convolutions in PyTorch and Tensorflow with MIOpen-backend on AMD Instinct MI100.
- Designed a system to collect and analyze benchmarking data for convolution kernels and present it in a Groovy dashboard
  - Allowed for early detection of redundancies and regressions in MIOpen's convolution kernels.
- Developed a seq2seq model for kernel tuning. Treated parameters describing convolution problems as constituting the source "language", and the parameters defining optimal kernels as constituting the target "language".
- Develop and maintain MITuna – an open-source distributed tuning and data collection infrastructure centered around MIOpen.
- Prepare documentation and assist with code reviews.

## RESEARCH EXPERIENCE

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**Rice University** | *Python, PyTorch, Tensorflow, LaTeX*  
*Visiting Researcher at Energy Systems Lab (w/ Dr. Laura Schaefer)*

July 2023 – Present  
Houston, TX

- Reviewed literature on the application of machine learning to predict interfacial tension (IFT) in CO<sub>2</sub>-brine systems. Identified how modern deep sequence processing methods can be used for IFT estimation.
- Formulated direct normal irradiance forecasting for concentrated solar power applications as a multiclass classification problem. Developed and investigated various deep neural network models for the task.

**Rowan University** | *Python, PyTorch, Linux, LaTeX*  
*Research Intern at Rowan AI Lab (w/ Dr. Ghulam Rasool)*

June 2021 – Nov 2021  
Glassboro, NJ

- Established that variance estimates from Bayesian deep neural networks (BDNNs) provide a well-calibrated measurement of predictive confidence.
- Used predictive confidence estimates to propose manual and learnable approaches for detecting performance degradation and failure in neural networks.
- Demonstrated the proposed approaches and accuracy improvement on medical imaging tasks subject to various adversarial attacks.

- Mathematically posed open-loop stability of legged robots as a trajectory optimization problem.
- Implemented support for complex variables and their arithmetic & calculus in COALESCE – a MATLAB library for direct collocation. Used COALESCE to transcribe open-loop stability optimization into a nonlinear program and solved it with IPOPT.
- Demonstrated the proposed approach on various robotic systems through MATLAB simulations.

## TEACHING EXPERIENCE

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### Advanced Micro Devices Inc.

July 2022 – Oct 2022

Tutorial Instructor

Austin, TX

- Presented a tutorial on “The Mathematics of Deep Neural Networks for Software Engineers.”

### Florida State University | C, Arduino

Aug 2019 – Apr 2021

Teaching Assistant for Mechatronics I

Tallahassee, FL

- Conducted labs on C and Arduino programming for the Mechatronics I course.
- Held office hours, & helped with designing and grading assignments and exams.
- Guided & mentored students in open design projects.

## PUBLICATIONS

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1. **M. Saud Ul Hassan** et. al. (2024). “Reformer: A compute-efficient transformer for runtime selection of convolution kernels.” (*In Prep.*)
2. B. Olabiran, A. Vadivel, Y. Zheng, **M. Saud Ul Hassan**, O. Anubi. (2024). “General Purpose Camera-based Multi-modal Motion Tracking System without Camera Calibration.” (*In Prep.*)
3. **M. Saud Ul Hassan** & C. Hubicki. (2023). “Optimization of open-loop stable limit cycles with direct collocation and smooth, symbolic derivatives.” (*Under Review*)
4. **M. Saud Ul Hassan**, K. Liaqat, L. Schaefer & A. Zolan. (2023). “Modern deep neural networks for estimation of Direct Normal Irradiance in the absence of meteorological data.” (*Under Review*)
5. **M. Saud Ul Hassan**, K. Liaqat & L. Schaefer. (2023) “Adarmer: An adaptive transformer for Direct Normal Irradiance forecasting in the absence of meteorological data.” (*Under Review*)
6. **M. Saud Ul Hassan**, K. Liaqat & L. Schaefer. (2023). “A comprehensive review of characterizing CO<sub>2</sub>-brine interfacial tension using machine learning algorithms.” (*Under Review*)
7. **M. Saud Ul Hassan**, D. Vasquez, H. Asif, C. Hubicki. (2023). “Stable and Robust Running in Quadruped Robots with an Energy Conservation-Based Feedback Cancellation Controller.” (*In Prep.*)
8. S. Ahmed, D. Dera, **M. Saud Ul Hassan**, N. Bouaynaya & G. Rasool. (2022). “Failure Detection in Deep Neural Networks for Medical Imaging.” *Frontiers in medical technology*, 4, 919046.
9. **M. Saud Ul Hassan** & C. Hubicki. (2021). “Tractability of Stability-Constrained Trajectory Optimization.” *Dynamic Walking* 2021.

## SELECTED PROJECTS

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**Georeferenced Tracking with Uncalibrated Camera** (2020): Implemented a novel object tracking system for GPS trajectory generation from webcam video in real-time. Featured in Florida State University’s news.

**Pedestrian Intent Prediction** (2020): Reviewed literature on panoptic segmentation and graph neural networks for pedestrian intent prediction.

**AI-Assisted Inertial Dead Reckoning** (2020): Designed a Kalman filter augmented with a 1D-CNN to model process non-linearity as an additive term in the filter’s output. Applied this approach for dead reckoning in autonomous cars.

**Multi-Agent Path Planning** (2020): Conducted a comparative analysis of Prioritized Planning and Conflict-based Search algorithms for path planning in fully observable multi-agent environments.

**Haptic Solar Panel Polishing Robot** (2020): Developed a virtual haptic panel polishing robot to train new polishers in a virtual environment. The trainer responded to user as if the polishing head were constrained to the panel’s surface.

## EDUCATIONAL INITIATIVES AND VOLUNTEER WORK

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**Gradily** (2019): Created a social media platform to connect aspiring graduate students from disadvantaged backgrounds. Shortlisted among 130 top startups by Plan9 – Pakistan’s largest & most prestigious tech incubator.

**United Nations Volunteers** (2017): Math & Science curriculum development for Zambian high schools.

**Career Counselling** (2018-2019): Conducted free career counselling in local schools, and on Quora.

**Jehaad for Zero Thalassemia** (2017-2019): Designed media material on Thalassemia awareness.