Muhammad Saud Ul Hassan

🌐 msaudulhassan.github.io | ⌂ github.com/msaudulhassan

📞 850-300-1309

✉ msaudulh@gmail.com

EDUCATION

Florida State University — Tallahassee, FL
MS Mechanical Engineering (Robotics) — *Aug 2019 – Apr 2021*
Deep & Reinforcement Learning (A), Intro to AI (A), Optimal Control (A), Adv. Control (A)
Robot Kinematics & Dynamics (A), Adv. Dynamics (A)

University of Engineering & Technology, Lahore — Lahore, Pakistan
BSc Petroleum & Gas Engineering — *Oct 2013 – Aug 2017*
Bachelor's Thesis: "Oil Field Optimization through Gas Lift Optimization"

HONORS AND AWARDS

Florida State University Tuition Waiver (45-credits)	2019 – 2021
US Navy's $45,000 award for 2nd position in AI Tracks at Sea Challenge	2021
Adelaide Wilson Fellowship	2020
First Position in Bachelor's Thesis	2017
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

Advanced Micro Devices Inc. | *Python, PyTorch, Tensorflow, C++, Git, MySQL, Linux* — Austin, TX
Senior Software Engineer — *Nov 2023 – Present*
Software Development Engineer II — *Nov 2021 – Nov 2023*

- 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

Rice University | *Python, PyTorch, Tensorflow, LaTeX* — July 2023 – Present
Visiting Researcher at Energy Systems Lab (w/ Dr. Laura Schaefer) — Houston, TX

- Reviewed literature on the application of machine learning to predict interfacial tension (IFT) in CO_2-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* — June 2021 – Nov 2021
Research Intern at Rowan AI Lab (w/ Dr. Ghulam Rasool) — 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.

Florida State University | *MATLAB, LaTeX*   June 2021 – Nov 2021
Research Intern at Optimal Robotics Lab (w/ Dr. Christian Hubicki)   *Tallahassee, FL*

- 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.

Florida State University | *Python, PyTorch, Git, Linux, LaTeX*   Oct 2020 – Jan 2021
Research Affiliate at Resilient and Autonomous Systems Lab (w/ Dr. Olugbenga Anubi)   *Tallahassee, FL*

- Developed an object tracking system for real-time GPS trajectory generation from low framerate video from a fixed monocular camera.
- Trained a 1D-CNN to model process non-linearity in a Kalman filter's output as an additive term. Used this method for inertial dead reckoning.

Florida State University | *Python, PyTorch, Keras, LaTeX*   May 2020 – July 2020
Research Affiliate at Florida State Vision Group (w/ Dr. Xiuwen Liu)   *Tallahassee, FL*

- Reviewed literature on panoptic segmentation and graph neural networks in the context of pedestrian indent prediction.

Teaching Experience

Advanced Micro Devices Inc. | *LaTeX*   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

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." *Robotics and Automation Letters* (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." *Applied Energy* (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 meterological data." *APL Machine Learning* (Under Review)
6. **M. Saud Ul Hassan**, K. Liaqat & L. Schaefer. (2023). "A comprehensive review of characterizing CO_2-brine interfacial tension using machine learning algorithms." *Sustainable Production and Consumption* (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.*

Presentations

1. "Quantization in Neural Networks." Talk delivered at Advanced Micro Devices, Inc. 2022.
2. "Tractability of Stability Constrained Trajectory Optimization." Poster presented at Dynamic Walking 2021.
3. "Uncertainty Quantification Methods." Presentation delivered to Overjet. 2021.
4. "Self-assessment & Detection of Failure in Deep Neural Networks." Presentation delivered to Lockheed Martin. 2021.

Startups and Organizations

Society of Pakistani Americans   2023 – Present
Founder   *Austin, TX*

- A non-profit organization committed to uniting and empowering Pakistani professionals and PhD students across the United States.

Gradily (Discontinued)   2018 – 2019
Founder   *Pakistan*

- 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.

Selected Projects

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.

3D Modelling and Rendering Services (2018–2019): Worked as a freelancer developing 3D product models and renders on Fiverr.

Open-source Software

MIOpen: An open-source library of high performance machine learning kernels for GPU-accelerated computing (tl;dr open-source equivalent to cuDNN).

MITuna: An open-source tool for distributed tuning based on SLURM with user-friendly Jenkins pipelines for launching and monitoring jobs. MITuna provides a scalable job management infrastructure ready to integrate with external libraries.

Educational Initiatives and Volunteer Work

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.

Languages

Urdu (*Native*), Punjabi (*Native*), English (*Fluent*), Hindi (*Oral Proficiency*), Dari/Farsi (*Basic*), Arabic (*Basic*)