

Muhammad Saud Ul Hassan

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EDUCATION

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

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 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

Nov 2021 – Present

Software Development Engineer II

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

Rice University | Python, PyTorch, Tensorflow, LaTeX

July 2023 – Present

Visiting Researcher with Dr. Laura Schaefer

Houston, TX

- Reviewed literature on the application of machine learning to predict interfacial tension (IFT) in CO₂-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 with 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.

- 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

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.

United Nations Volunteers

2017

- Volunteered to develop Math and Science curriculum for underprivileged Zambian high schools.

SELECTED PROJECTS

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.

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.

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.

Stable Gait Generation in Quadruped Robots (2021): Developed a control algorithm to produce stable running in quadruped robots. Simulation results showed dynamic stability even with up to 10% error in landing state observations.

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.

PUBLICATIONS

1. Sabeen Ahmed, Dimah Dera, *Saud Ul Hassan*, Nidhal Bouaynaya & Ghulam Rasool. (2022). “Failure Detection in Deep Neural Networks for Medical Imaging.” *Frontiers in medical technology*, 4, 919046.
2. *Muhammad Saud Ul Hassan*, Kashif Liaqat & Laura Schaefer. “A comprehensive review of characterizing CO₂-brine interfacial tension using machine learning algorithms.” Submitted to *Renewable and Sustainable Energy Reviews*.
3. *Muhammad Saud Ul Hassan* & Christian Hubicki. (2021). “Tractability of Stability-Constrained Trajectory Optimization.” *Dynamic Walking 2021*

WORKS IN PROGRESS

1. *Muhammad Saud Ul Hassan*, Kashif Liaqat, Laura Schaefer & Alexander J. Zolan. “Modern deep neural networks for estimation of Direct Normal Irradiance in the absence of meteorological data.” Ready for Submission, Manuscript Under Review.
2. *Muhammad Saud Ul Hassan*, Kashif Liaqat & Laura Schaefer. “Adarmer: An adaptive transformer for Direct Normal Irradiance forecasting in the absence of meteorological data.” Ready for Submission, Manuscript Under Review.
3. *Muhammad Saud Ul Hassan* & Christian Hubicki. “Optimization of open-loop stable limit cycles with direct collocation and smooth, symbolic derivatives.” Ready for Submission, Manuscript Under Review.
4. “Reformer: A compute-efficient transformer for runtime selection of convolution kernels.” Data Collection in Progress.

LANGUAGES

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