Muhammad Saud Ul Hassan

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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. Dynamics (A)

University of Engineering & Technology, Lahore   Lahore, Pakistan
BSc Petroleum & Gas Engineering   *Oct 2013 – Aug 2017*
First Position in Bachelor's Thesis ("Oil Field Optimization through Gas Lift Optimization")

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

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.

Florida State University | *MATLAB, LaTeX*   June 2021 – Nov 2021
Research Intern with 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.

Teaching Experience

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.

Relevant 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 prospective students applying abroad. 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 dynamic running in quadruped robots. Simulation results showed stable running even with up to 10% error in landing state observations.

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

Cruise Control with Evolving Car Dynamics (2020): Designed a cruise control algorithm to regulate the speed of a car with a time-varying kinematic model.

Publications

1. Ahmed, S., Dera, D., *Hassan, S. U.*, Bouaynaya, N., & Rasool, G. (2022). Failure Detection in Deep Neural Networks for Medical Imaging. Frontiers in medical technology, 4, 919046. https://doi.org/10.3389/fmedt.2022.919046

2. "A comprehensive review of characterizing CO_2-brine interfacial tension using machine learning algorithms." Under review at Renewable and Sustainable Energy Reviews.

Presentations

1. *Hassan, S. U.*, & Hubicki C. (2021). Tractability of Stability-Constrained Trajectory Optimization. Dynamic Walking 2021

2. "The Mathematics of Deep Neural Networks for Software Engineers." A tutorial series presented at AMD.

Works in Progress

1. "Modern deep neural networks for estimation of Direct Normal Irradiance in the absence of meteorological data." Finalizing manuscript with Dr. Laura Schaefer. To be submitted for publication in November 2023.

2. "Adarmer: An adaptive transformer for Direct Normal Irradiance forecasting in the absence of meterological data." Finalizing manuscript with Dr. Laura Schaefer. To be submitted in 2023.

3. "Optimization of open-loop stable limit cycles with direct collocation and smooth, symbolic derivatives." Finalizing manuscript with Dr. Christian Hubicki. To be submitted in 2023.

4. "Reformer: A compute-efficient transformer for runtime selection of convolution kernels." Data collection and write up in progress.

Languages

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