Hafsah Shahzad

✉ hafsahshahzad@gmail.com 🌐 https://hafsahshahzad.github.io/

OBJECTIVE

Recent PhD graduate specializing in **Deep Learning**, **Performance Engineering** and **Hardware Validation**. Experienced in accelerating **Machine Learning algorithms** for data-centric applications and optimizing design flow for **CPU, FPGA and GPU architectures**. Skilled in **post-silicon system testing and validation**, with expertise in **Reinforcement Learning** and **Bayesian Optimization** to enhance system efficiency.

EDUCATION

BOSTON UNIVERSITY *Boston,USA*
PhD in COMPUTER ENGINEERING *Sept 2021 - May 2025*

TECHNICAL UNIVERSITY MUNICH *Munich, Germany*
MSc in POWER ENGINEERING *Sept 2013 - Oct 2015*

LAHORE UNIVERSITY OF MANAGEMENT SCIENCES (LUMS) *Lahore, Pakistan*
BS in ELECTRICAL ENGINEERING *Sept 2009 - June 2013*

SKILLS

Programming Languages:
Python(Scikit-Learn,Tensorflow,Pytorch,Keras), SQL, C/C++, Matlab/ Simulink, VHDL/Verilog, CUDA, Assembly
Software & Tools:
Vivado, Vitis, gem5, Linux perf, TestStand, LabView, Quartus II, Proteus 7(Ares, ISIS), Altium, Spice Simulators
Hardware Design and Testing:
Digital/Analog Circuit Design, Power Management, Control Loop Design, PCB Design, Soldering, Device Validation, Data Evaluation, Data Acquisition
Deep Learning:
CNN, RNN, LSTM, Large Language Models (LLM), Fine-tuning, RAG, Raylib, Transformers, Attention

RESEARCH AND PROJECTS

***BOSTON UNIVERSITY* | Computer Architecture and Automated Design Lab, ECE Department**

Reinforcement Learning of Compiler Heuristics ***Feb 23 to May 25***
Developed infrastructure to train deep reinforcement learning models that can predict compiler heuristics resulting in up to 80% reduction in binary size. Improved algorithm accuracy by exploring code embeddings, heuristics choices, reward shaping and classifier based predictions.

CodeXplorer - Framework for Feature Extraction from GCC's Gimple ***June 23 to May 25***
Designed an automated framework for extracting over 100 function-level features from GCC's intermediate representation, enhancing feature selection and comparison for optimization tasks.

Neural Network based Cost Model for GCC Binary Size Prediction ***June 24 to May 25***
Designed and implemented a neural net model to predict GCC binary size based on code features and flag transformations, improving compilation efficiency with reasonable accuracy.

Source To Source Compilation For Performance ***Sept 22 to May 25***
Developed framework for automatically annotating high level language programs to improve the quality of code generated by modern compilers, such as GCC, LLVM, Vitis HLS, Intel HLS

Reinforcement Learning Based Compiler Tuning for Custom Hardware Generation ***Jan to Aug 22***
Designed a machine learning based framework to determine the optimal sequence of compiler passes for high level synthesis compilations. Explored new learning strategies for compiler tuning and metrics to evaluate their impact, hence enabling developers to choose best possible reinforcement learning training options based on their target goals.

UNIVERSITY OF COLORADO, BOULDER | CoPEC - Colorado Power Electronics Center

Rectifiers and Inverters for Single Phase UPS Applications ***Jun to Aug 17***
Evaluated trending topologies. Design control loop, simulate the UPS system and determine the loss model.

TECHNICAL UNIVERSITY MUNICH* and *TEXAS INSTRUMENTS, Freising Germany

Master's Thesis | *Maximum Power Point Tracking Solutions for Low Power DC-DC Converters*

Simulated and designed ultra-low power PCB circuits that enable the system to sense and monitor maximum power from solar cells under varying light and temperatures, efficiently powering wireless sensor nodes.

Analyze Electrical Behavior of Lithium Battery Types for Metering Applications ***Sept to Nov 14***

Texas Instruments, Freising Germany

Battery characterization- designed and developed measurement setup, executed and analyzed the results.

Lithium Ion Capacitor for Hybrid and Battery Electric Vehicles ***Sept 14 to Jan 15***

Lehrstuhl für Elektrische Energiespeichertechnik- EES (TUM)

Research into Lithium Ion Capacitor technology, market survey for HEV, field of applications, future prospects

Hardware And Software Design For Resolver Demodulation ***Mar to Jun 14***

Lehrstuhl für Elektrische Antriebssysteme und Leistungselektronik (TUM)

Simulated and designed PCB circuit, Testing and debugging, VHDL coding on Quartus II and ModelSim.

LAHORE UNIVERSITY OF MANAGEMENT SCIENCES-School of Science and Engineering (LUMS-SBASSE)

Bachelor's Thesis | *Maximum Power Point Tracking For Turbine-Generator Systems*

Simulated and designed hardware circuits to extract maximum useful energy from renewable systems such as solar thermal, wind and micro-hydroelectric.

PROFESSIONAL EXPERIENCE

GRADUATE TEACHING ASSISTANT **Boston University,** *Aug 2022 - May 2023*

Graduate Teaching Assistant for EC413: Computer Organization and Assembly Language.

- Lead discussion sections, manage staff of graders and lab assistants, substitute lecturer

VALIDATION ENGINEER **Texas Instruments,** *Jan 2016 - Dec 2016*

Perform validation measurements on the device over different conditions using lab equipment, automation software like Labview and Teststand.

- Improved the post-silicon validation process using methods to enhance data collection efficiency and test time reduction
- Developed new measurement techniques i.e. varied start-up timing tests, frequency measurements, load and line transients, stability analysis of closed loop systems
- Integrated new lab instruments into measurement automation to improve existing procedures

Provide product development support to design, system and other interfaces in the project team. This includes testing special design features of the device and datasheet graphs and supporting critical customer measurements.

WORKING STUDENT | *Texas Instruments*

- Lab measurements and automation on Labview and Teststand. *Oct 2015 - Dec 2015*
- Thermal and electrical measurements on different silicon types, efficiency analysis of converters, providing customers' application support. *Nov 2014 - Dec 2014*

INTERNSHIP| *Texas Instruments* Aug *2014 - Oct 2014*

Analyze electrical behavior of lithium battery types for metering applications- characterize batteries, design and develop measurement setup, execute and analyze the results.

CERTIFICATIONS

DEEP LEARNING SPECIALIZATION| *Coursera* *May 2025 - Present*

IBM DATA SCIENCE PROFESSIONAL CERTIFICATE| *Coursera* *July 2020 - Oct 2020*

DATA SCIENCE CAREER PATH ONLINE CERTIFICATION| *Codecademy* *Feb 2020 - June 2020*

POWER ELECTRONICS SPECIALIZATION CERTIFICATION| *Coursera* *Oct 2017 - Mar 2018*

AWARDS

- **DISTINGUISHED COMPUTER ENGINEERING FELLOWSHIP -** Boston University (2021-2025)
- **BEST PAPER AWARD -** 25th International Symposium on Quality Electronic Design *(ISQED 2024)*
- **GOLD MEDAL -** Technical University Munich (Oct 2015)
- **DEUTSCHLAND STIPENDIUM SCHOLARSHIP** - Siemens and Technical University Munich (2014-15)
- **DEAN'S HONOR LIST** - LUMS School of Science & Engineering (2009-2013)