

Muhammad Abdullah Soomro

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EDUCATION

University of Massachusetts, Amherst

Doctor of Philosophy in Electrical and Computer Engineering

Amherst, MA

Sep. 2024 – Present

Advisors: [Dr. Fatima M. Anwar](#) and [Dr. Taqi Raza](#)

Relevant Coursework: Foundations of Generative Models, Advanced Operating Systems, Computer Architecture, Computer Algorithms

Lahore University of Management Sciences

Bachelors of Science in Computer Science

Lahore, Pakistan

Aug. 2020 – May 2024

Relevant Coursework: Software Engineering, Databases, Internet of Things, Advanced Programming, Distributed Systems, Theory of Computation

PUBLICATIONS

SynchroNB: Toward Robust Timing for 5G NB-IoT Networks

ACM SenSys 2026

MA Soomro, MS Nazeer, C DelSignore, Y Chandio, T Raza, FM Anwar

CheckMate: LLM-Powered Approximate Intermittent Computing [\[Paper\]](#) [\[Code\]](#)

ACM SenSys 2025

ARI Sayyid-Ali, A Rafay, MA Soomro, MH Alizai, NA Bhatti

SETI: Secure Time for Virtualized Systems

ACSAC 2025

A Nasrullah, MA Soomro, FM Anwar

Breaking Precision Time: OS Vulnerability Exploits Against IEEE 1588 [\[Paper\]](#)

IEEE ISPCS 2025

MA Soomro, FM Anwar

Poster Abstract: Time Attacks using Kernel Vulnerabilities [\[Paper\]](#)

ACM SenSys 2025

MA Soomro, A Nasrullah, FM Anwar

Approxify: Automating Energy-Accuracy Trade-offs in Batteryless IoT Devices [\[Paper\]](#)

IEEE WCNC 2025

MA Soomro, NA Bhatti, MH Alizai

EXPERIENCE

Graduate Research Assistant

Sep. 2024 – Present

University of Massachusetts, Amherst

Amherst, MA

- Designed **SynchroNB**, an on-device 5G NB-IoT timing framework using **LSTM-based drift prediction** and **temporal link modeling**, achieving **sub-10 ms synchronization accuracy**.
- Co-developed SETI**, a trusted-time architecture combining **RDMA introspection** and **SMM-level verification** to detect hypervisor-level time tampering with **<1% overhead**.
- Led a kernel-level security analysis of IEEE 1588 (PTP)**, revealing syscall-based desynchronization attacks that induce **multi-microsecond offsets** and complete **PTP servo destabilization**.

Research Assistant

Jan. 2023 – Aug. 2024

Lahore University of Management Sciences (SysNet Lab)

Lahore, Pakistan

- Developed CheckMate**, an **LLM-powered framework** for approximate intermittent computing that uses **context-aware reasoning** and **Bayesian optimization** to balance accuracy and energy, reducing power cycles by **up to 60%** with only **8% loss in accuracy**.
- Designed Approxify**, a **compiler-assisted framework** for batteryless IoT systems that applies **static analysis** and **energy-aware approximation** to minimize checkpoint overhead in intermittent programs.

Full-Stack Development Intern

May 2022 – Apr. 2023

CodeSlash

Remote

- Implemented a web-based deep-learning dashboard** for facial recognition and attendance tracking using **YOLOv4**, **React**, **FastAPI**, and **MongoDB**.
- Deployed containerized pipelines with Docker** to enable **real-time inference** across edge devices.

PROJECTS

La-Dou | *ReactJS, FastAPI, MongoDB, DigitalOcean*

- Developed a fully supported cross-platform mobile application mimicking the functionality of food delivery services.
- Implemented a responsive frontend using **ReactJS**, ensuring seamless user experience across multiple devices.
- Designed and implemented the backend using **FastAPI** and **MongoDB**, enabling users to request riders and track their orders.
- Deployed and managed the application services on **DigitalOcean** droplets for scalable access.

Fūdoburogu (Food Blog) | *ReactJS, FastAPI, PostgreSQL, Docker, DigitalOcean*

- Developed a fully responsive full-stack recipe portal with interactive user classes and dynamic updates.
- Implemented trending recipe recommendations based on user interactions and engagement analytics.
- Built the backend with **FastAPI**, frontend with **ReactJS**, and integrated a **PostgreSQL** database.
- Dockerized and deployed the web application on **DigitalOcean** for public access.

Systems Programming | *C, C++, POSIX, Linux*

- **Shell:** Implemented a custom Unix-like shell supporting core functionalities such as process creation, I/O redirection, and pipelining.
- **Buddy Allocator & Free-list Allocator:** Designed two complete and efficient memory allocator implementations managing variable-sized blocks with low fragmentation.
- **Thread Library:** Built a lightweight multithreading library inspired by **pthreads**, enabling cooperative scheduling and synchronization in constrained environments.
- **File System:** Developed an **ext4**-like file system supporting essential file operations and direct process-level access through file descriptors.

Machine Learning | *Python, PyTorch, TensorFlow, NumPy, Scikit-learn*

- **RNN for Text Generation:** Implemented a recurrent neural network for **natural language processing (NLP)** tasks, generating coherent text sequences and demonstrating deep learning in language modeling.
- **LLM Fine-tuning for Toxicity Classification:** Fine-tuned a pre-trained large language model to detect and classify toxic or harmful textual content with improved contextual awareness.
- **Audio Classification with Neural Networks:** Designed and trained a convolutional neural network for classifying audio signals based on spectrogram representations.
- **k-NN Classifier for Handwritten Digits:** Built a **k-nearest neighbors** model for digit recognition using the MNIST dataset

TECHNICAL SKILLS

Languages: C/C++, Python, JavaScript, Haskell, SQL , MATLAB, HTML/CSS, R

Tools & Technologies: React.js, Node.js, Express.js, FastAPI, React Native, MongoDB, MySQL, REDIS, Docker, Kubernetes, Git, Github Actions, CI/CD, AWS, ZephyrRTOS