ABRAR HOSSAIN

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Education

The University of Toledo — Toledo, Ohio
Master's, Computer Science, GPA 3.90/4.00 — August 2023 – May 2025

Chittagong University of Engineering and Technology — Chittagong, Bangladesh
Bachelors, Electrical Engineering, GPA 3.23/4.00 — March 2015 – September 2019

Experience

Visitor — August 2024 – December 2024
NSF National Center for Atmospheric Research — Remote
- Set up CouchDB, Chords, and Streampipes on ACCESS Jetstreams for community weather data storage.
- Built data orchestrator for efficient data routing, achieving 39% transmission efficiency gain
- Reduced deployment costs by 22% for communities implementing the project

Intern — May 2024 – August 2024
NSF National Center for Atmospheric Research — Boulder, CO
- Designed private LoRa network for 6+ data types with Raspberry Pi gateways and central server.
- Improved wind forecasting with edge-ML, achieving 26% accuracy gain on Raspberry Pi
- Image analysis with TensorFlow, 23% accuracy gain, 3x faster training, and 93% precision on 10,000+ images

Graduate Research Assistant — August 2023 – Present
The University of Toledo — Toledo, OH
- Contributed to an NSF-funded project to design HPEE, a new auto-tuning algorithm for optimizing HPC applications on edge devices
- Achieved 2.5X more efficiency with HPEE than benchmark methods
- Improve High-performance computing (HPC) systems through stochastic modeling and optimization.

Projects

Fantasy Premier League points prediction using LSTM — March 2020 – April 2020
- Scraped understat.com for player data to train an LSTM model.
- Developed and deployed XGBoost and Decision Trees for performance comparison.
- Optimized weekly team selections using linear programming, adhering to fantasy game rules and budget limits.
- Frameworks used: Scikit-optimize, LSTM, XGBoost, Random Forest, Pandas, Scipy, Numpy.

Fantasy Premier League Team Optimization Framework — October 2024 – Ongoing
- Developed an optimization framework to maximize FPL points using single and multi-period strategies.
- Implemented modeling techniques for lineup selection, chip optimization, and multi-objective decision making.
- Automated data collection from FPL API and integrated sensitivity analysis for robust performance evaluation.
- Frameworks used: Pandas, PuLP, CBC Solver, Docker, Python.

RAG-Based LLM Chatbot with Multimodal Capabilities — October 2024 – December 2024
- Developed a Generative AI application using Azure OpenAI for question answering and text-to-image generation.
- Designed a custom chatbot API integrated with Azure OpenAI and multimodal capabilities for conversational AI.
- Built an interactive web interface with Next.js and React, including an admin panel for embedding management.
- Frameworks used: Next.js, FastAPI, Azure OpenAI, Pinecone, TailwindCSS, LangChain, TypeScript.

LoRa-enabled Environmental Data Monitoring — May 2024 – August 2024
- Designed IoT weather sensor mesonet to collect temperature, humidity, air quality, and UV data.
- Built a private LoRa network using custom Raspberry Pi gateways for data aggregation and transmission.
- Designed multi-tier architecture for real-time data processing, integrating sensors, gateways, and servers.
- Frameworks used: Raspberry Pi, Adafruit Feather, LoRa, Python, Docker, MQTT.

Spoti-safe: Spotify Playlist Backup Platform — May 2024 – June 2024
- Developed a Flask-based web application to back up Spotify playlists by exporting track information to CSV files.
- Integrated Spotify OAuth for secure access to both public and private playlists using Authlib.
- Implemented RESTful API endpoints to retrieve playlist details and automate data extraction.
- Frameworks used: Flask, Authlib, Spotify Web API, Pandas.

Publications

[Paper] • **Abrar Hossain**, Abdel-Hameed Badawy, Mohammad Atiqul Islam, Tapasya Patki, Kishwar Ahmed. **HPC Application Parameter Autotuning on Edge Devices: A Bandit Learning Approach (HiPC 2024)**

[Paper] • **Abrar Hossain**, Abubeker Abdurahman, Mohammad Atiqul Islam, Kishwar Ahmed. **Power-Aware Scheduling for Multi-Center HPC Electricity Cost Optimization (IPDPSW 2025)**

[Paper] • Abubeker Abdurahman, **Abrar Hossain**, Kevin A Brown, Kazutomo Yoshii, Kishwar Ahmed. **Scalable HPC Job Scheduling and Resource Management in SST (WSC 2024)**

[Paper] • Tasnimul Hasan, **Abrar Hossain**, Mufakir Qamar Ansari, Talha Hussain Syed **Enhanced Intrusion Detection in IIoT Networks: A Lightweight Approach with Autoencoder-Based Feature Learning (IoTBDS 2025)**

[Paper] • Abubeker Abdurahman, Arihant Singh, **Abrar Hossain**, Kishwar Ahmed. **A Hands-On Approach To Teaching Parallel and Heterogeneous Computing (EduHiPC 2024)**

[Poster] • **Abrar Hossain**, Kishwar Ahmed. **Automating HPC Model Selection on Edge Devices (SC 2023)**

[Poster] • **Abrar Hossain**, Keith Maull, Agbeli Ameko. **Environmental Data Sensing and Monitoring System Using Community-based Private LoRa Network (AGU 2024)**

Honors and Awards

- 2024 CRA-WP Grad Cohort for IDEALS Scholarship
- 2024 SIParCS Student Travel Grant
- 2024 AGU Student Travel Grant
- 2024 Friends Education Fund Travel Grant
- 2024 IEEE HiPC TCPP Travel Grant
- 2025 Midwest Research Computing and Data Travel Grant

Professional and Volunteer Activity

- **Reviewer:** PEARC'25 Tutorials and Workshops
- **Student Vounteer:** HiPC'24, AGU'24

Technical Skills

Programming Languages: Python, Bash, PowerShell, C, SQL, R, HTML/CSS
Libraries & Frameworks: NumPy, Pandas, Matplotlib, TensorFlow, PyTorch, BoTorch, Scikit-learn, PuLP, CBC
Optimization & Modeling Tools: Pyomo, GAMS, MATLAB
Developer Tools: Git, Linux, Docker, Kubernetes, Podman
Cloud Platforms: Google Cloud Platform (GCP), Amazon Web Services (AWS), Microsoft Azure

Technical Skills

Operating Systems: Linux (Ubuntu, CentOS, Debian), Windows Server (Active Directory, Group Policy)
Networking: TCP/IP, DNS, DHCP, Firewalls (iptables, ufw), VPN (WireGuard, OpenVPN)
Automation & Scripting: Bash, Python, PowerShell, Ansible, Terraform
Cloud Platforms: Amazon Web Services (AWS), Google Cloud Platform (GCP), Microsoft Azure
Virtualization & Containers: VMware, KVM, Docker, Kubernetes, Proxmox
Monitoring & Logging: Prometheus, Grafana, ELK Stack (Elasticsearch, Logstash, Kibana), Nagios
Backup & Disaster Recovery: Rsync, Bacula, Veeam, RAID
Version Control & CI/CD: Git, GitHub, GitLab, Jenkins, ArgoCD