# ABRAR HOSSAIN

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## Education

**The University of Toledo** — Toledo, Ohio
PhD, Computer Science, GPA –/4.00 — August 2025 – Dec 2027

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

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

## Experience

**Graduate Research Assistant** — August 2023 – Present
The University of Toledo — Toledo, OH

- Developed TARDIS, a power-aware HPC scheduler using GNNs, cost reduction: 18% (temporal), 10-20% (spatial)
- Developed LASP, a MAB-based HPC tuner on edge devices, achieving 2.5% average performance gain over default
- Developed a SST-based scalable job scheduler, ensuring high accuracy in wait times, node usage, parallelization

**Intern** — June 2025 – August 2025
National Center for Supercomputing Applications — Urbana, IL

- Built parser for eBPF maps for 80+ VLANs and ports with configurable polling intervals via REST API
- Integrated with InfluxDB for efficient storage and Grafana for real-time visualization
- Added configurable logging, reducing manual reconfiguration time by 40%

**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

## Publications

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

[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] • 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. **CROSS- HPC System Bayesian Optimization with Adaptive Transfer (SC 2025)**

[Poster] • **Abrar Hossain**, and Kishwar Ahmed. **Bandwidth Allocation for Heterogeneous HPC Data Ingestion using Dynamic Auctions(eScience 2025)**

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

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

[Book Chapter (Under Review)] • Abubeker Abdurahman, **Abrar Hossain**, and Kishwar Ahmed. **An Interactive Learning Module for Introducing Parallel Computing (Topics in Parallel and Distributed Computing)**

[Journal Paper (Under Review)] • **Abrar Hossain**, Xingfu Wu, Kishwar Ahmed. **Autotuning Across the High-Performance Computing Stack: Hardware, Software, and Application Optimization Techniques (The International Journal of High Performance Computing Applications (ACM TOPC)**

## 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.

**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.

**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.

## Honors and Awards

- 2025 SGX3 Rising Star of the Year award
- 2025 SIParCS Student Travel Grant
- 2025 USRSE25 Building Engagement (BE) Travel Grant
- 2025 eScience 2025 NSF Travel Grant
- 2025 Cluster 2025 NSF Travel Grant
- 2025 UToledo Graduate Research Assistant Recognition Award
- 2025 Midwest RCD Symposium Scholarship
- 2024 CRA-WP Grad Cohort for IDEALS Scholarship
- 2024 SIParCS Student Travel Grant
- 2024 AGU Student Travel Grant
- 2024 Friends Education Fund Scholarship
- 2024 IEEE HiPC TCPP Travel Grant
- 2024 Bangaldesh Sweden Trust Fund Scholarship

## Professional and Volunteer Activities

**Professional Engagements:**

- Reviewer for *HPEC'25 – Extended Abstracts*
- Reviewer for *PEARC'25 – Tutorials and Workshops*
- Reviewer for *PEARC'25 – Posters and Visualization*

**Conference Volunteer Roles:**

- Student Volunteer at *PEARC'25 – Practice and Experience in Advanced Research Computing*
- Student Volunteer at *HiPC'24 – International Conference on High Performance Computing, Data, and Analytics*
- Student Volunteer at *AGU'24 – American Geophysical Union Fall Meeting*

## 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