Mohammed Rakib

Stillwater, OK 74075, USA
+1 405-269-2479 mohammed.rakib@okstate.edu https://mohammedrakib.github.io
LinkedIn Github Google Scholar

Education

Doctor of Philosophy in Computer Science **August 2023 – Present**
Oklahoma State University (OSU) - Stillwater, OK, USA ***GPA: 3.79***

Bachelor of Science in Computer Science and Engineering **September 2017 – September 2021**
North South University (NSU) - Dhaka, Bangladesh ***GPA: 3.96***

Research Interest

• Computer Vision • Multimodal Learning • NLP • Model Compression Techniques

Technical Skills

Programming Languages: Python, Java, C, C++, Shell Scripting, Arduino, HTML, SQL, x86 Assembly
AI & Data Science: PyTorch, TensorFlow, Keras, OpenCV, Scikit-learn, Hugging Face, Pandas, Matplotlib
Web Development: Django, FastAPI, Flask, Nginx, HTML, CSS, JavaScript
Version Control: Git, Bitbucket
Databases: MySQL, MongoDB, NoSQL, Redis
DevOps & Containerization: Docker, Kubernetes
Cloud Computing: Amazon EC2, AWS Services
Big Data Technologies: Hadoop, Apache Spark

Professional Experience

Data Scientist & Machine Learning Engineer **September 2022 – July 2023**
NeovoTech Ltd. *Dhaka, Bangladesh*

- Create crawlers to scrape news articles from various websites and store them in an AWS S3 bucket.
- Create, maintain, and deploy text translation and text summarization pipelines.

Machine Learning Intern **June 2022 – August 2022**
NeovoTech Ltd. *Dhaka, Bangladesh*

- Collaborate with colleagues to prepare a web crawler that crawls Swedish news text.
- Contribute to improving the Neural Machine Translation (NMT) pipeline from Swedish to English text.

Academic Experience

Graduate Research Assistant **August 2023 – Present**
Complex Systems Lab, Oklahoma State University *Stillwater, OK, USA*

- Investigate modality imbalance in multimodal learning across real-world applications and benchmark datasets to ensure equitable representation of all modalities during model training.
- Refine knowledge distillation techniques to enhance cross-modal learning.
- Develop a multimodal framework integrating smartphone/edge-device captured crop/soil patch images with tabular meteorological data for improved soil moisture estimation and precision agriculture.

Graduate Teaching Assistant **August 2023 – Present**
Department of Computer Science, Oklahoma State University *Stillwater, OK, USA*

- Assist in developing and grading course materials and manage the Canvas platform.
- Provide one-on-one mentorship, maintain course websites, and participate in curriculum development meetings.
- Courses include:
  - Design & Implementation of Operating Systems I (Fall 2023)
  - Intro to Object-Oriented Programming (Spring 2024)

Research Assistant **September 2021 – September 2022**
Apurba-NSU R&D Lab *Dhaka, Bangladesh*

- Collaborate with fellow RAs to train, fine-tune, and deploy various deep learning models for image classification, OCR, ASR, sentence similarity, masked language modeling, QA, and NER.
- Conduct research in model compression techniques (pruning, quantization, and knowledge distillation), analyze findings, and present weekly reports.

Projects

MIS-ME: A Multi-modal Framework for Soil Moisture Estimation **August 2023 – January 2024**

Research Member

- Curated a real-world dataset of soil patch images paired with meteorological data, creating a benchmark that captures both visual and environmental factors for soil moisture estimation.
- Developed a multimodal framework that fuses tabular meteorological data with soil patch images, improving soil moisture prediction by reducing MAPE by 3.25% over meteorological models, 2.15% over image-based models, and at least 1.5% over conventional fusion models.

LILA-BOTI: Leveraging Isolated Letter Accumulations by Ordering Teacher Insights for Bangla Handwriting Recognition **June 2021 – March 2022**

Research Member

- Developed a knowledge distillation (KD) method where a student CRNN model trained on an imbalanced handwritten word-level dataset leveraged insights from a teacher model trained on a balanced printed character-level dataset to mitigate class imbalance.
- Demonstrated that LILA-BOTI improved the F1-Macro score for minor classes by up to 3.5% and increased the overall word recognition rate by up to 4% compared to the base CRNN model and conventional KD techniques.

Water Level Forecasting Using Spatiotemporal Attention-Based Long Short-Term Memory Network **June 2021 – September 2021**

Research Member

- Developed a flood forecasting system using a Spatial-Temporal Attention LSTM (STALSTM) that integrated gauge-based water level data from multiple stations, improving prediction accuracy over LSTMs by 3.44% at Dhaka station.

IoT-Based Air Pollution Monitoring & Prediction System **January 2020 – April 2020**

Project Leader

- Led a group of 3 to develop an IoT-based air pollution monitoring system that collects real-time atmospheric data from multiple sensors, transmits it to a cloud storage platform, and continuously tracks air quality parameters.
- Implemented an ARIMA model to predict future pollutant levels with over 90% accuracy, leveraging 144 hourly observations to forecast next-day air quality.

An Open Source Contractual Language Understanding Application Using Machine Learning **January 2021 – August 2021**

Project Co-leader

- Co-led a team of 4 to develop an end-to-end legal contract review system that processes digital and scanned contracts, using transformer-based models to highlight key clauses and provide contextual explanations for non-legal users.
- Fine-tuned and optimized RoBERTa-base, improving AUPR by 4%, and deployed the model in a resource-constrained environment; made it publicly available on **Hugging Face**, where it receives 20k downloads per month.

Cyclic Overlapping Lottery Ticket (COLT) – Undergraduate Thesis **November 2020 – October 2021**

Research Member

- Developed an iterative pruning algorithm that identifies a highly sparse subnetwork by leveraging overlapping weights from class-wise dataset partitions, achieving comparable accuracy to the original unpruned model.
- Demonstrated that COLTs require fewer pruning iterations than Iterative Magnitude Pruning (IMP) and can be transferred across datasets without performance degradation, showcasing their generalization capability.

My Reading Room **May 2020 – August 2020**

Individual Project

- Developed a Django-based learning management system enabling users to create classrooms, upload documents, and track reading time of enrolled users.
- Implemented face detection and recognition using OpenCV to accurately monitor user engagement with documents.

Awards and Honors

Summa Cum Laude Distinction at NSU for achieving a GPA of 3.96.
Academic Excellence Award at NSU, 2017 – 75% scholarship for Bachelor's degree.
Individual Student Fund Travel Award, 2024 - USD 400 by Graduate College at OSU
2nd Runner Up - Bengali ASR Competition, DL Sprint - BUET CSE Fest 2022.
5th Place - Project Showcasing, MIST ICT Innovation Fest 2021.

Voluntary Activities

Conducted a **DataBytes Workshop** on Multimodal Learning at OSU
Instructed workshops on PyTorch and Deep Learning at NSU, promoting skill development in neural networks.
Assisted in fundraising for SCARS, a non-profit, to support the underprivileged, encouraging community support.