

# MOHAMMED RAKIB

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[github.com/MohammedRakib](https://github.com/MohammedRakib) | [Portfolio](#)

## Summary

PhD candidate in Computer Science with experience as a Data Scientist & Machine Learning Engineer. Led development of the G2D multimodal learning framework, earning a first-author ICCV publication and improving modality balance, and built a distributed web-crawling and neural machine translation pipeline for a fintech client. Proven ability to deliver scalable AI solutions across NLP and computer vision. Seeking to apply research & industry expertise to accelerate machine-learning performance in a cutting-edge team.

## Education

### Oklahoma State University (OSU)

*Doctor of Philosophy, Computer Science*

• **GPA:** 3.84

• **Coursework:** Big Data Analytics, Cloud Computing & Distributed Systems, Data Structure & Algorithms II, Database Systems

**Aug 2023 - Dec 2027**

*Stillwater, OK, USA*

### North South University (NSU)

*Bachelor of Science, Computer Science and Engineering*

• **GPA:** 3.96

**Sep 2017 - Sep 2021**

*Dhaka, Bangladesh*

## Technical Skills

- **AI & Data Science:** PyTorch, TensorFlow, Keras, Scikit-learn, Hugging Face, OpenCV, Pandas, Matplotlib, SQL, Natural Language Processing, Computer Vision, Seaborn
- **Big Data Technologies:** Apache Spark, Hadoop
- **DevOps & Containerization:** Docker, Kubernetes, Rest APIs
- **Cloud Computing:** AWS (EC2, S3)
- **Programming Languages:** Python, Java, C++, C, SQL, Shell Scripting
- **Databases:** MySQL, MongoDB, Redis, PostgreSQL, NoSQL
- **Web Development:** Django, FastAPI, Flask, Nginx, JavaScript, HTML, CSS

## Work Experience

### Neovo Tech Ltd.

*Data Scientist & Machine Learning Engineer*

- Developed a distributed web crawling system for fintech client Eucaps using Python, Celery, and RabbitMQ to scrape and ingest financial news, containerized with Docker and orchestrated on Kubernetes, which increased daily news coverage by delivering timely data to downstream analytics
- Engineered a neural machine translation pipeline that processed scraped news with a fine-tuned Hugging Face model, deployed in Docker containers and stored translations in AWS S3, enabling multilingual access to financial updates for the client
- Co-developed the backend of the Padel Mates booking platform using Python, FastAPI, and Docker, creating over 30 RESTful API endpoints for authentication, scheduling, and Stripe payments, which streamlined the booking process and supported reliable user transactions

**Jun 2022 - Jul 2023**

*Dhaka, Bangladesh*

### Complex Systems Lab, Oklahoma State University

*Graduate Research Assistant*

- Spearheaded novel research in multimodal learning, developing the G2D framework to mitigate modality imbalance, which led to a first-author publication at ICCV 2025.
- Engineered a multimodal fusion model (MIS-ME) for soil moisture estimation, reducing prediction error (MAPE) by over 3% and resulting in a first-author publication at DSAA 2024.

**Aug 2023 - Present**

*Stillwater, OK, USA*

### Department of Computer Science, Oklahoma State University

*Graduate Teaching Assistant*

Served as a TA for courses including: Design & Implementation of Operating Systems I, Intro to Object-Oriented Programming, and Discrete Mathematics.

**Aug 2023 - Present**

*Stillwater, OK, USA*

### Apurba-NSU R&D Lab

*Research Assistant*

- Developed and deployed deep learning models for NLP (QA, NER) and Computer Vision (ASR, OCR) tasks, resulting in publications at ICPR 2022 and ICLR 2023 (Tiny Papers).
- Researched model-compression methods and created an iterative pruning algorithm (COLT) with PyTorch, maintaining accuracy comparable to unpruned models, which led to a publication in IEEE Transactions on AI

**Sep 2021 - Sep 2022**

*Dhaka, Bangladesh*

## Selected Projects

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### Gradient-Guided Distillation for Multimodal Learning (G<sup>2</sup>D)

Aug 2024 - Mar 2025

<https://arxiv.org/abs/2506.21514v3>

- Authored and open-sourced G<sup>2</sup>D, a novel knowledge distillation framework that mitigates modality imbalance by introducing a custom loss function and a Sequential Modality Prioritization (SMP) technique.
- Outperformed 10+ state-of-the-art methods on 6 benchmark datasets, notably improving classification accuracy by over 18% on the CREMA-D dataset with only a 0.5% memory overhead compared to standard baselines.

### PileUp Mitigation at HL-LHC Using Attention for Event-Wide Context

Jul 2024 - Mar 2025

<https://arxiv.org/abs/2503.02860>

- Proposed PUMiNet, an attention-based neural network that leverages self- and cross-attention mechanisms to model correlations between jets and tracks across an entire event for effective pileup mitigation.
- Demonstrated that PUMiNet surpasses traditional jet-level pileup mitigation, achieving  $R^2=0.912$  for energy fraction and  $R^2=0.720$  for mass fraction estimation, enabling improved Higgs boson mass reconstruction.

### Distributed k-NN Classifier with Hadoop MapReduce

Jan 2024 - Mar 2024

- Engineered a distributed k-NN classifier from scratch in Python for the Hadoop MapReduce framework, designing a memory-efficient Reducer using a priority queue to find top-k neighbors.
- Deployed and benchmarked the system across single-node and multi-node Hadoop clusters, analyzing the trade-offs between runtime performance and classification accuracy for various 'k' values.

### MIS-ME: A Multi-modal Framework for Soil Moisture Estimation

Aug 2023 - Jan 2024

<https://arxiv.org/abs/2408.00963>

- 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.

### Bangla-Wave: Improving Bangla Automatic Speech Recognition Utilizing N-gram Language Models

Dec 2022 - Jul 2023

<https://arxiv.org/abs/2209.12650>

- Finetuned a pretrained wav2vec2 model on the Bengali Common Voice dataset (399 hours) to develop a state-of-the-art Bangla ASR model, achieving a WER of 4.66% and a CER of 1.54%.
- Enhanced transcription accuracy by integrating an n-gram language model as a post-processor, optimizing hyperparameters, and implementing preprocessing techniques for improved generalization.

### An Open Source Contractual Language Understanding Application Using Machine Learning

Aug 2022 - Dec 2022

<https://aclanthology.org/2022.lateraisse-1.6/>

- 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.

## Publications

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- M. Rakib, et al..G<sup>2</sup>D: Boosting Multimodal Learning with Gradient-Guided Distillation..*ICCV 2025*.
- M.I. Hossain, M. Rakib, et al..COLT: Cyclic Overlapping Lottery Tickets for Faster Pruning of Convolutional Neural Networks..*IEEE Transactions on AI (TAI)*, 2025.
- L. Vaughan, M. Rakib, et al..PileUp Mitigation at the High-Luminosity Large Hadron Collider Using Attention for Event-Wide Context..*PAKDD 2025*.
- M. Rakib, et al..MIS-ME: A Multi-modal Framework for Soil Moisture Estimation..*DSAA 2024*.
- S. Mollah, M. Rakib, et al..Automated Mapping of Healthcare Concepts to a Standardized Healthcare Taxonomy..*ICLR 2023 (Tiny Papers)*.
- M.I. Hossain, M. Rakib, et al..LILA-BOTI: Leveraging Isolated Letter Accumulations by Ordering Teacher Insights.....*ICPR 2022*.
- F. Noor, S. Haq, M. Rakib, et al..Water Level Forecasting using Spatio-Temporal Attention-based Long Short-Term Memory Network..*Water Journal*, 2022.

## Awards and Honors

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- **Summa Cum Laude:** Summa Cum Laude Distinction at NSU for achieving a GPA of 3.96.
- **2nd Runner Up - Bengali ASR Competition:** 2nd Runner Up - Bengali ASR Competition, DL Sprint - BUET CSE Fest 2022.
- **Academic Excellence Award:** Academic Excellence Award at NSU, 2017 – 75% scholarship for Bachelor's degree.