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RESEARCH INTERESTS

Reliable machine learning: uncertainty quantification, calibration, and trustworthy AI evaluation.

EDUCATION

Bangladesh University of Engineering and Technology (BUET)

April 2018 – September 2023

B.Sc. in Computer Science and Engineering

Thesis: ShasthoSheba: An mHealth Solution for Providing Healthcare Service to Orphanages

Supervisor: Prof. A. B. M. Alim Al Islam

CGPA 3.62/4.00 · GRE 329 (Quantitative 170, Verbal 159) · IELTS 8.0

PUBLICATIONS & MANUSCRIPTS

SUBMITTED AND UNDER REVIEW

- [1] **T. H. Munim**, B. A. Saiem, A.-A. Sany, and T. Hashem. “A Free Knob: Decoupling Calibration and Predictive Skill in Threshold-Based Evaluation.” *Submitted to ICLR 2027*.
- [2] **T. H. Munim**, M. T. T. Anan, F.-Z.-I. Galib, B. A. Saiem, and A. B. M. A. A. Islam. “ShasthoSheba: Leveraging an mHealth Solution for Providing Healthcare Service to Orphanages.” *Under review at ACM Transactions on Computer-Human Interaction (TOCHI)*.

PEER-REVIEWED PUBLICATION

- [3] I. J. Eliza, M. A. Urmi, M. T. T. Anan, **T. H. Munim**, F.-Z.-I. Galib, and A. B. M. A. A. Islam. “eDakterBari: A Human-Centered Solution Enabling Online Medical Consultation and Information Dissemination for Resource-Constrained Communities in Bangladesh.” *Heliyon*, 10(1), e23100, 2024.

WORK IN PROGRESS

- [4] **T. H. Munim**. “Anchored Risk Profiles: Exact Robustness Certificates for Fixed-Threshold Forecast Rankings under Acceptable Corrections.” *Manuscript in preparation*.

RESEARCH EXPERIENCE

Calibration Confounds in Rare-Event Evaluation

August 2025 – Present

Supervised by Prof. Tanzima Hashem, BUET

- Showed that max-pooled CSI conflates calibration with spatial skill. A no-retraining monotone recalibration shrinks CasCast’s published CSI gain from 0.160 to 0.034; across 450 SEVIR contrasts the frequency-bias gap tracks the shift ($r = 0.80$) and 51 contrasts reverse sign.
- Implemented the audit as the freeknob Python package; the effect reproduces on crowd density and vanishes on well-calibrated segmentation.

Distribution-Free Uncertainty for Crowd Counting

July – August 2026

- Post-hoc, model-agnostic conformal wrapper using a label-free crop-consistency difficulty signal. Improves hardest-region coverage in all 12 model–dataset pairs (4 counters, 3 benchmarks), with intervals 15% narrower than a label-trained normalizer at matched coverage.
- Weighted conformal prediction cuts the cross-dataset mean coverage gap from 0.139 to 0.079.

Certified Robustness of Forecast Rankings

2026 – Present

- Developed an exact rational-arithmetic framework for testing whether a fixed-threshold model ranking survives every acceptable recalibration. On GraphCast/HRES/GFS precipitation forecasts, robust leads fall from 109 to 7 as the correction budget grows from 0.1 to 2 mm.

RESEARCH EXPERIENCE (CONTINUED)

Vocabulary Shift in Conformal Open-Vocabulary Segmentation

August 2026 – Present

Ongoing research

- Studying when conformal risk guarantees break under vocabulary change and how to predict the break from calibration data alone; ongoing pre-registered, hash-verified experiments across ADE20K, Pascal Context, and OpenEarthMap.

PROFESSIONAL EXPERIENCE

AI GeoLAB Ltd

April 2026 – Present

Senior Research Engineer

- Handwritten land-record AI:** QLoRA-fine-tuned Qwen2.5-VL-3B on 163K labeled Bengali records with village-disjoint splits; field F1 **0.965** and owner-name CER **0.041** on a 10,509-image held-out test (zero-shot Gemini 2.5 Flash: 0.34 F1).
- Cadastral map digitization:** ConvNeXt-V2 U-Net, digit-reader ensemble, and roster-constrained assignment recover and correctly number **91.7%** of plots on 22 held-out sheets. Shipped both models in an offline, human-in-the-loop desktop platform (v0.1.0, pilot-ready).

Regional Integrated Multi-Hazard Early Warning System (RIMES)

July 2024 – July 2026

Senior Software Engineer

- Led backend, data-pipeline, and ML architecture for the GCF-funded **Timor-Leste CDIS** national meteorological platform: 1 TB+/day from 5 NWP models and 2 satellites, ~8K Airflow tasks/day at 97.6% task success.
- Designed OASIS CAP v1.2 alerting used in two countries, the data unification behind Bangladesh FFWC's live 15-day flood forecasts, and a Bengali hybrid-retrieval livestock advisor running a 7B model on a 4 GB GPU.

Interactive Cares

Jun 2021 – Aug 2022; Jun 2023 – Aug 2024

Backend Developer; later Tech Lead

- Led an eight-person engineering team as the learning platform grew from 8,000 to 100,000 users.

TALKS, FELLOWSHIPS & SOFTWARE

Invited talks	“Climate–Agriculture Risk Modeling: Sri Lanka,” South Asian Hydromet Forum, Malé, Maldives, 2026.
	“Machine Learning for Extreme-Event Detection in Agrometeorology,” National Center of Meteorology, UAE, 2025.
Fellowship	National Science and Technology Fellowship, Bangladesh (2026).
Recognition	NVIDIA Inception Program, MIRA AI (2025) · Accelerating Asia selection, team member (Top 9 of 500+, 2023) · Champion, Bangladesh Mathematical Olympiad; IMO team shortlist (2016).
Software	<u>wis2downloader</u> (WMO): distributed Celery refactor with spatial filtering before queueing; merged upstream and used in CDIS. · <u>pycap-validator</u> (co-author): private operational CAP v1.2 validation software used by two national meteorological agencies.

TECHNICAL SKILLS

Reliability & evaluation	Conformal prediction (split, Mondrian, weighted, risk control), calibration, bootstrap inference, benchmark auditing, pre-registration, PyMC
ML & vision	PyTorch, Hugging Face, VLM fine-tuning (QLoRA, full), segmentation, OCR, hybrid RAG, llama.cpp, vLLM
Geospatial & climate	Sentinel-1, Earth Engine, ERA5, IMERG, GloFAS, WeatherBench2, SEVIR, xarray, GDAL, PostGIS
Systems	Python, Rust, TypeScript, C++, SQL · Airflow, Celery, Docker, Kubernetes