Sudmun Hakim Soudho

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PROFILE STATEMENT | Computer Science graduate interested in large language models, natural language processing and computer vision, with a focus on carefully testing whether methods really work. Most recent work shows that for small models solving math problems in Bengali, model size matters far more than extra Bengali training. Also experienced with time-series forecasting (LSTM/BiLSTM), vision transformers and generative image models. Looking for PhD positions and open to remote research opportunities.

Skills

Programming Languages	Python, C, C++, Java
Machine Learning	PyTorch, TensorFlow, Keras, Scikit-learn
Problem Solving	Solved 450+ problems on online judges, including Codeforces and AtCoder
Tools	Wireshark, Flex (Yacc/Bison), OpenGL, Packet Tracer
Databases	MySQL
Web Development	HTML, CSS, Flask
Operating Systems	Windows, macOS, Ubuntu

Experience

BRAC University **November 2024 – May 2025**
Undergraduate Teaching Assistant

- Provided academic consultation and mentoring to undergraduate students, reinforcing their understanding of core course concepts.
- Graded assignments and delivered individualized feedback to strengthen students' logical reasoning and analytical skills.
- Assisted faculty members with course administration, including logistics and responses to student inquiries.

Education

Bachelor of Science in Computer Science *October 2025*
CGPA: **3.901** | CSE courses: **3.96** | Final four semesters: **3.98**

Cantonment Public School and College, Rangpur **2019**
Higher Secondary Certificate (HSC) *GPA: 5.00/5.00*

Cantonment Public School and College, Rangpur **2017**
Secondary School Certificate (SSC) *GPA: 5.00/5.00*

Research Projects

Disentangling Scale from Targeted Pretraining Depth: Testing the Less-Is-More Hypothesis for Bengali Mathematical Reasoning **Paper** | **Code**

- Tested two claims about small language models in Bengali: that extra training on Bengali text can make up for a smaller model, and that a small set of good worked examples is enough to teach a model to reason.
- Compared seven open models (0.6 to 4 billion parameters) on 250 Bengali math problems, from easy to olympiad level. Then fine-tuned each one with LoRA on the same 873 carefully selected Bengali step-by-step solutions and tested it again on the same problems, all on a single 16 GB GPU.
- Found that model size mattered far more than Bengali training: the largest general model solved 44.8% of the problems, while every Bengali-specialised model solved under 5%. Fine-tuning did not significantly improve any model; it changed how the models wrote their answers, not how often they were right.

Resolution Meets Importance Sampling: An Empirical Study of Sample Count and Gradient Estimation in Variational Image Models **Paper** | **Code**

- Studied how to train an image-generating model (a variational autoencoder) better: whether drawing more samples per image helps, which of two training methods (IWAE or DReG) works better, and whether the answers change as images get more detailed (2, 16 or 256 shades of grey).
- Built the training code, the experiment runner and a pilot test that fixed the whole plan before the main runs, then trained 162 models on handwritten digits (MNIST) and letters (EMNIST), repeating every setting three times. Every result is fingerprinted, so it can be traced to the exact code and data that produced it.

– Found that DReG was better in 23 of 24 head-to-head comparisons, but it took longer to reach its best result and was less consistent on the most detailed images. More samples helped with shrinking returns, and helped about six times more on detailed images than on black-and-white ones. Across the two datasets, 52 of 54 results pointed the same way.

Stock Price Prediction Using Deep Learning **Code**

– Aimed to predict Apple's (AAPL) daily closing price, and whether the price would go up or down, from past market data.
– Collected over twenty years of daily AAPL data from Yahoo Finance, cleaned and scaled it, and trained three models: an LSTM, a two-way LSTM (BiLSTM), and AdaBoost for the up-or-down question.
– The BiLSTM gave the best price predictions, with errors about 60% smaller than the plain LSTM's, and its predictions closely followed the real prices ($R^2 = 0.90$). Predicting up or down was much harder: AdaBoost was right only 52% of the time, barely better than a coin flip.

Night Vision: Footage Enhancement and Colorization Using a Hierarchical Transformer Architecture **Code**

– Aimed to turn dark, grainy, black-and-white night-vision footage into clear, natural-looking color images.
– Built a model that uses a Vision Transformer (ViT) to understand what is in a scene and a decoder that paints the colors back in. Trained it on 40,000 ImageNet photos made to look like night-vision footage by turning them grey, darkening them and adding noise.
– In tests against published colorization models such as DDColor and ColorFormer, it scored best for realism (FID) on all four test datasets and reached a colorfulness score of 39.33 on ImageNet. It was also tested on real night-vision footage.

Achievements & Certifications

– **BRAC University** — Ranked **19th** in the written Student Tutor screening for the Summer 2025 semester, among **300 candidates** shortlisted from over **700 applicants** on the basis of CGPA and credentials. 2025
– **BRAC University** — Graduated with Highest Distinction. 2025
– **BRAC University** — Merit Scholarship awarded on the basis of academic results. 2024, 2025
– **BRAC University** — Vice Chancellor's Honour List **(3 times)**; Dean's Honour List **(2 times)**.
– **DataCamp** — Completed multiple courses in data science and image processing. 2024
– **BRAC University** — Participated in the BRACU Intra-University Programming Contest. 2022

Extracurricular Activities

General Member, Event Management Team **BRAC University Computer Club**

– Coordinated logistics and on-site execution of seminars and workshops organized by the club.
– Collaborated with club officers on the planning of marketing and outreach activities.

Competitive Programming **School, College & University**

– Participated in numerous programming contests at school, college, and university level.
– Placed **3rd** in the divisional programming contest during school years.

Interhouse Cricket Team **School & College**

– Represented both the school and college interhouse cricket teams, serving as Vice-Captain at college and leading the school team to the championship title.

Science Fair Participant **Primary School**

– Presented a project on basic physics demonstrations at the annual school science fair.

References

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