

Deba Priyo Guha

Chattogram-4202, Bangladesh • ✉ debapriyoguha@gmail.com • ☎ +880-1820-886459
🌐 [linkedin.com/in/deba-priyo-guha](https://www.linkedin.com/in/deba-priyo-guha) • 🐙 github.com/DebaPriyoGuha • 📄 [ResearchGate Profile](#)

Summary

A passionate research enthusiast and machine learning practitioner specializing in astronomical data science and deep learning applications. Strong foundation in competitive programming, problem-solving, and interdisciplinary research bridging astrophysics, computer vision, and artificial intelligence. Demonstrated leadership in academic organizations and commitment to STEM education. Focused on developing interpretable AI frameworks for scientific discovery, particularly in radio astronomy and astronomical transient classification. Experienced in full research pipeline from data preprocessing to manuscript preparation, with expertise in handling large-scale astronomical datasets and multimodal AI systems.

Research Interests

Primary Areas: Machine Learning and Deep Learning in Astrophysics, Radio Astronomy, Astronomical Data Science, Computer Vision for Scientific Imaging, Medical Image Analysis, Multimodal AI

Specific Focus: Interpretable AI frameworks for scientific discovery, Automated astronomical classification systems, Radio Active Galactic Nuclei (AGN) morphological classification, Astronomical transient detection and classification, Lunar hyperspectral mineralogy mapping, Visual Large Language Models for multi-wavelength galaxy characterization, Transformer-based architectures for scientific applications, Generative models for data augmentation in medical imaging

Education

Rajshahi University of Engineering & Technology (RUET)

Feb 2019–Aug 2024

Bachelor of Science in Engineering

Department of Electrical & Computer Engineering (ECE)

Kazla, Rajshahi-6204, Bangladesh

CGPA: 2.88/4.00

🌐 <https://ruet.ac.bd/>

Relevant Coursework: Neural Networks & Fuzzy Systems, Digital Signal Processing, Pattern Recognition, Data Structures & Algorithms, Probability & Statistics, Microprocessor & Microcontroller Systems, Digital Electronics, Communication Systems, Control Systems, Electromagnetic Field Theory

Govt. City College Chattogram

2016–2018

Higher Secondary School Certificate (HSC)

7 Ice Factory Road, Chattogram-4000, Bangladesh

GPA: 4.83/5.00

Group: Science

🌐 <https://gcc.edu.bd/>

Nasirabad Govt. High School

2010–2016

Secondary School Certificate (SSC)

CDA Avenue, East Nasirabad, Chattogram, Bangladesh

GPA: 5.00/5.00

Group: Science

🌐 <https://nghs.tsmts.com/>

St. Xavier's School, Chattogram

2003–2009

Primary Education

Chattogram, Bangladesh

🌐 <https://www.sxsctg.edu.bd/>

Language Proficiency:

IELTS Academic: Overall Band Score 7.0 (Listening: 8.0, Reading: 7.5, Writing: 6.5, Speaking: 6.0)

Test Date: September 2025 | Test Center: British Council, Bangladesh

Research Experience

Postbaccalaureate Research Intern

Oct 2025–Present

Center for Astronomy, Space Science & Astrophysics (CASSA)

Independent University, Bangladesh (IUB)

Supervisor: Dr. Khan Muhammad Bin Asad

🌐 <https://cassa.site/>

- Contributing to the development of RGC (Radha Gobinda Chandra) Python package for automated morphological classification of radio Active Galactic Nuclei (AGN)
- Preprocessing and analyzing approximately 20,000 radio galaxy images from LOFAR/LOTSS (Low-Frequency Array/LOFAR Two-Metre Sky Survey) and VLA/FIRST (Very Large Array/Faint Images of the Radio Sky at Twenty Centimeters) surveys
- Extending semi-supervised Convolutional Neural Network (CNN) models for classification of bent radio AGN morphologies including Wide-Angle Tail (WAT) and Narrow-Angle Tail (NAT) galaxies
- Developing Visual Large Language Model (LLM) pipeline for multi-wavelength galaxy characterization and automated description generation
- Gaining full research pipeline experience from data acquisition, preprocessing, model development, validation, to manuscript preparation
- Working with high-performance computing resources for large-scale astronomical data processing
- Collaborating with international astronomy research teams

Research Assistant

2024–Present

Young Learners' Research Lab

Department of Computer Science & Engineering, RUET

Supervisor: Md. Azmain Yakin Srizon (Assistant Professor)

- Leading multiple machine learning research projects focusing on astronomical transient classification and lunar hyperspectral analysis
- Developing LunaXNet framework for mineralogical segmentation, quantification, and interpretation from Chandrayaan-1 M3 lunar hyperspectral data
- Co-authoring research projects on medical image classification using Generative Adversarial Networks (GANs) with interpretable frameworks
- Contributing to transformer-based Natural Language Processing (NLP) research for spam detection using BERT and GPT-2 architectures
- Collaborating on deep learning projects for bent radio AGN classification
- Mentoring junior students in machine learning concepts and research methodologies
- Conducting literature reviews and staying current with latest developments in ML/DL research

Undergraduate Thesis Researcher

Jan 2024–Aug 2024

Department of Electrical & Computer Engineering, RUET

Supervisor: Fariya Tabassum (Assistant Professor & Head, ECE Department)

Credit Hours: 4.5

Thesis Title: "*Classifying Supernovae: A Machine Learning Based Approach*"

- Developed comprehensive machine learning framework for 14-class astronomical transient classification using the PLAsTiCC (Photometric LSST Astronomical Time-Series Classification Challenge) dataset containing 1.4+ million samples
- Implemented and compared multiple ML algorithms including Random Forest, XGBoost, Gradient Boosting, Support Vector Machines, Logistic Regression, LSTM networks, and CNN architectures
- Achieved 85%+ classification accuracy using ensemble methods on highly imbalanced multi-class dataset
- Addressed severe class imbalance issues using SMOTE (Synthetic Minority Over-sampling Technique) and class weighting strategies
- Performed extensive feature engineering on time-series photometric data including magnitude, flux, and observation metadata
- Classified supernovae types (Type Ia, Ib/c, II), kilonovae, Active Galactic Nuclei (AGN), tidal disruption events, and other astronomical transients
- Demonstrated successful application of data-driven techniques to complex astrophysical classification challenges
- Conducted comprehensive error analysis and model interpretability studies
- Seamlessly blended computational machine learning skills with astrophysical domain knowledge

Publications & Manuscripts

Under Review

1. S. Agarwala, **D. P. Guha**, M. A. Y. Srizon, et al., "Transformer-Based Spam Detection: A Comparative Study with Classical and Deep Models on the Enron Corpus," *Submitted to ICCIT 2025 (International Conference on Computer and Information Technology)*

Abstract: Spam email threatens security and user trust through phishing, malware delivery, and unsolicited advertising. We conduct a comparative evaluation of traditional machine learning and modern deep neural architectures for spam detection on the Enron corpus (33,345 emails) following a standardized preprocessing pipeline (lowercasing; URL masking; removal of non-alphanumeric characters, stopwords, and punctuation; stemming). Traditional models (Logistic Regression, SVC, Naïve Bayes, Random Forest, XGBoost) use TF-IDF features, while the LSTM leverages GloVe embeddings; transformer baselines include BERT and GPT-2. Models are trained with an 80/20 split and assessed using accuracy, precision, recall, F1, and confusion analyses. BERT attains the best performance (accuracy 99.28%), with LSTM close behind (98.79%); among classical methods, Logistic Regression performs strongest (98.29%). GPT-2 lags due to unidirectional context, yielding lower precision/F1 relative to BERT/LSTM. Results indicate that contextualized transformers and sequence models better capture semantic cues in email text than bag-of-words pipelines, reducing both false negatives and overall error. We discuss limitations (dataset coverage, computational cost) and outline future directions, including real-time adaptation and transformer-ensemble hybrids to further improve robustness against evolving spam tactics.

My Contribution: Literature review, model implementation (classical ML algorithms), experimental design, result analysis, manuscript writing and editing

In Preparation (First Author)

2. **D. P. Guha**, F. Tabassum, “Astronomical Transient Classification Using PLAsTiCC Dataset: A Comprehensive Machine Learning Approach,”

Target Journal: Astronomy & Computing (Elsevier)

Abstract: This work presents a comprehensive machine learning framework for classifying 14 types of astronomical transients using the Photometric LSST Astronomical Time-Series Classification Challenge (PLAsTiCC) dataset. We implement and compare multiple algorithms including ensemble methods (Random Forest, XGBoost, Gradient Boosting), traditional classifiers (Logistic Regression, SVM), and deep learning architectures (LSTM, CNN). The dataset comprises over 1.4 million time-series observations spanning supernovae (Type Ia, Ibc, II), kilonovae, Active Galactic Nuclei, and rare transient events. We address severe class imbalance through SMOTE oversampling and cost-sensitive learning, achieving 85%+ overall accuracy with ensemble methods. Feature engineering incorporates photometric magnitudes, flux measurements, observation metadata, and temporal statistics across multiple bandpasses. Our analysis reveals that tree-based ensemble methods outperform deep learning for this structured time-series problem, while providing superior interpretability through feature importance analysis. We discuss computational trade-offs, misclassification patterns, and implications for future large-scale surveys like LSST.

Status: Manuscript draft 80% complete, final experiments in progress

3. **D. P. Guha**, M. A. Y. Srizon, et al., “LunaXNet: A Novel Pre-Post-AI Framework for Mineralogical Segmentation, Quantification, and Interpretation from Lunar Hyperspectral Data,”

Target Journal: IEEE Transactions on Geoscience and Remote Sensing

Abstract: We introduce LunaXNet, an end-to-end deep learning framework for automated lunar mineralogy mapping from Chandrayaan-1 Moon Mineralogy Mapper (M3) hyperspectral data. The framework integrates three key components: (1) Pre-AI preprocessing pipeline handling atmospheric correction, photometric normalization, and spectral noise reduction; (2) LunaXNet architecture—a novel hybrid CNN-Transformer model for semantic segmentation of mineral species (olivine, pyroxene, plagioclase, ilmenite, spinel) at sub-kilometer resolution; (3) Post-AI interpretation module providing quantitative mineral abundance maps, confidence metrics, and geological context through integration with lunar topography and crater age databases. We train and validate on M3 Level 2 data covering diverse lunar terrains (mare basalts, highland anorthosites, impact ejecta). LunaXNet achieves 92%+ pixel-wise accuracy, outperforming traditional spectral unmixing and existing CNN baselines. Grad-CAM visualization confirms the model learns physically meaningful spectral features corresponding to crystal field absorptions. Our framework enables rapid, consistent mineralogical analysis of the 6 TB M3 archive, supporting lunar science and resource prospecting. We release code, trained models, and processed mineral maps to facilitate reproducible lunar remote sensing research.

Status: Model architecture finalized, experiments 60% complete, manuscript in early draft stage

In Preparation (Co-author)

4. M. S. Hossain, **D. P. Guha**, K. M. B. Asad, et al., “Deep Learning for Bent Radio AGN Classification: A Semi-Supervised Approach for Wide-Angle and Narrow-Angle Tail Galaxies,”

Target Journal: Astronomy & Computing (Elsevier)

Abstract: Bent-tail radio galaxies (Wide-Angle Tail/WAT and Narrow-Angle Tail/NAT) represent important morphological classes shaped by environmental interactions in galaxy clusters. Manual classification is time-intensive given modern survey scales (LOFAR, VLASS). We present a semi-supervised deep learning pipeline combining supervised CNN training on expert-labeled samples (500 sources) with pseudo-labeling on unlabeled data (5,000 candidates from LOFAR LoTSS DR2). Our ResNet50-based classifier achieves 89% accuracy distinguishing WAT/NAT from FRI/FRII and compact sources. We employ data augmentation (rotation, flip, brightness) and transfer learning from optical galaxy classification. Analysis of misclassifications reveals challenges at morphological boundaries (hybrid sources, projection effects). The trained model processes

the full LoTSS footprint, identifying 237 new bent-tail candidates for follow-up. We discuss implications for understanding AGN feedback, cluster dynamics, and intracluster medium properties. Integration into the RGC (Radha Gobinda Chandra) package enables community application.

My Contribution: Data preprocessing, augmentation pipeline development, model training and evaluation, result visualization, manuscript editing

5. T. Sabira, **D. P. Guha**, M. A. Y. Srizon, et al., “GAN-Enhanced Gastrointestinal Disease Classification with Dual-Stage Preprocessing and Interpretable Post-Processing Framework,”

Target Journal: Medical Image Analysis (Elsevier)

Abstract: Gastrointestinal disease diagnosis from endoscopic imagery faces challenges of class imbalance, limited training data, and interpretability requirements for clinical adoption. We propose a comprehensive pipeline integrating: (1) Dual-stage preprocessing: color normalization via histogram matching plus adaptive histogram equalization for contrast enhancement; (2) GAN-based data augmentation: StyleGAN2-ADA generates synthetic endoscopic images for minority classes (esophagitis, polyps), validated by Fréchet Inception Distance and expert radiologist review; (3) Multi-architecture ensemble: EfficientNetV2, ResNet152, and Vision Transformer (ViT) classifiers trained on augmented Kvasir-SEG and Kvasir-V2 datasets; (4) Interpretable post-processing: Grad-CAM and SHAP analyses highlight diagnostically relevant image regions, validated against clinician annotations. Our framework achieves 96.2% accuracy across 8 disease classes, with balanced performance on rare conditions. Ablation studies quantify GAN augmentation’s 7.3% improvement over baseline. Grad-CAM heatmaps align with expert-identified pathological features (ulceration, vascular patterns, polyp margins) in 91% of cases. We discuss computational requirements, failure modes on ambiguous cases, and clinical deployment considerations including inference speed and confidence calibration.

My Contribution: GAN implementation and training, synthetic data quality assessment, ensemble model integration, Grad-CAM visualization, literature review, manuscript co-writing

Selected Research Projects & Technical Work

RGC: Radha Gobinda Chandra—A Radio Galaxy Classifier Package

Oct 2025–Present

Center for Astronomy, Space Science & Astrophysics (CASSA), IUB

Supervisor: Dr. Khan M. B. Asad

 <https://cassa.site/entry/rgc/>

- Developing open-source Python package for automated morphological classification of radio Active Galactic Nuclei
- Processing and analyzing 20,000 radio galaxy images from LOFAR LoTSS (144 MHz) and VLA FIRST (1.4 GHz) surveys
- Implementing multi-class classification pipeline: Fanaroff-Riley Type I (FRI), Type II (FRII), Wide-Angle Tail (WAT), Narrow-Angle Tail (NAT), Compact, and Hybrid morphologies
- Building semi-supervised CNN architecture leveraging limited labeled data (500 expert classifications) and large unlabeled candidate pool
- Developing Visual Large Language Model (LLM) component for automated multi-wavelength galaxy characterization combining radio, optical (Pan-STARRS), and infrared (WISE) imagery
- Creating preprocessing pipeline: source extraction, image cutout generation, resolution matching, noise filtering, and normalization
- Implementing cross-survey matching and multi-frequency analysis tools
- Designing user-friendly API for community adoption in radio astronomy workflows
- Utilizing HPC resources for large-scale inference across full survey footprints
- Contributing to scientific discovery of rare morphological classes and hybrid sources

Astronomical Transient Classification Using Machine Learning

Jan 2024–Aug 2024

Department of Electrical & Computer Engineering, RUET

Supervisor: Fariya Tabassum | Credit: 4.5 | *Undergraduate Thesis Project*

- Developed comprehensive ML framework for 14-class astronomical transient classification using PLAsTiCC dataset (1.4M+ time-series samples)
- Classified: Type Ia supernovae (various subtypes), Type Ibc supernovae, Type II supernovae, kilonovae, superluminous supernovae, pair-instability supernovae, tidal disruption events, AGN, RR Lyrae, M-dwarf flares, eclipsing binaries
- Implemented and systematically compared algorithms: Random Forest, XGBoost, Gradient Boosting, AdaBoost, Support Vector Machines (SVM), Logistic Regression
- Explored deep learning approaches: Long Short-Term Memory (LSTM) networks for time-series modeling, Convolutional Neural Networks (CNN) for feature extraction
- Performed extensive feature engineering: statistical features (mean, median, std, skewness, kurtosis), peak magnitudes, rise/fall times, color indices, observation cadence patterns
- Addressed severe class imbalance (some classes <0.1% of data) using SMOTE, ADASYN, class weighting, and ensemble undersampling
- Achieved 85%+ overall accuracy and 0.82+ weighted F1-score with XGBoost ensemble

- Conducted detailed error analysis: confusion matrices, per-class precision/recall, misclassification patterns
- Analyzed feature importance: identified key discriminative features for each transient class
- Implemented cross-validation and temporal validation strategies to prevent data leakage
- Compared computational efficiency and scalability across algorithms for large-scale survey applications

LunaXNet: Lunar Mineralogy Mapping from Hyperspectral Data

2024–Present

Young Learners' Research Lab, Department of CSE, RUET

Supervisor: Md. Azmain Yakin Srizon

- Developing deep learning framework for semantic segmentation and quantitative analysis of lunar minerals using Chandrayaan-1 M3 (Moon Mineralogy Mapper) hyperspectral data
- Processing high-dimensional spectral cubes: 85 continuous bands covering 430-3000 nm wavelength range at 20-40 nm spectral resolution
- Targeting mineral species: olivine, pyroxene (low-Ca and high-Ca), plagioclase feldspar, ilmenite, spinel, glass
- Building preprocessing pipeline: photometric correction (removing illumination effects), thermal emission removal, atmospheric correction, spectral smoothing, continuum removal
- Designing LunaXNet architecture: hybrid CNN-Transformer model combining spatial context (CNNs) with spectral attention mechanisms (Transformers)
- Implementing spectral feature extraction: identifying crystal field absorptions (1000 nm, 2000 nm bands), charge transfer features, spectral slopes
- Creating ground-truth labels from Apollo sample return sites, spectral libraries (RELAB, USGS), and previous mineralogical studies
- Developing post-AI interpretation: mineral abundance quantification, confidence estimation, geological context integration
- Performing Grad-CAM analysis to verify model focuses on physically meaningful spectral features
- Targeting specific lunar regions: Orientale Basin, South Pole-Aitken Basin, Aristarchus Plateau, Apollo landing sites
- Processing multi-TB dataset covering significant lunar surface area

Transformer-Based Spam Detection: Comparative Study

2024

Young Learners' Research Lab, Department of CSE, RUET

Role: Co-author | Supervisor: Md. Azmain Yakin Srizon

- Comprehensive comparison of classical ML, deep learning, and transformer architectures for email spam detection
- Dataset: Enron email corpus (33,345 emails) with balanced spam/ham distribution
- Implemented classical methods: Logistic Regression, Support Vector Classifier (SVC), Multinomial Naïve Bayes, Random Forest, XGBoost using TF-IDF vectorization
- Developed deep learning baseline: Bidirectional LSTM with GloVe 100-dimensional word embeddings
- Fine-tuned transformer models: BERT-base-uncased, GPT-2 using Hugging Face Transformers library
- Preprocessing pipeline: lowercasing, URL masking, removal of non-alphanumeric characters, stopword removal, punctuation stripping, Porter stemming
- Achieved best performance with BERT (99.28% accuracy), followed by LSTM (98.79%) and Logistic Regression (98.29%)
- Analyzed why GPT-2 underperformed: unidirectional attention limiting bidirectional context understanding
- Conducted detailed error analysis: false positive/negative patterns, computational cost comparison
- Evaluated trade-offs: accuracy vs. inference speed vs. model size for deployment considerations

GAN-Enhanced Medical Image Classification

2024

Young Learners' Research Lab, Department of CSE, RUET

Role: Co-author | Supervisor: Md. Azmain Yakin Srizon

- Addressing class imbalance in gastrointestinal disease classification using Generative Adversarial Networks
- Datasets: Kvasir-SEG (1000 polyp images with segmentation masks), Kvasir-V2 (8000 GI images across 8 classes)
- Disease classes: normal, esophagitis, polyps, ulcerative colitis, dyed-lifted polyps, dyed-resection margins
- Implemented StyleGAN2-ADA for generating synthetic endoscopic images of minority classes
- Validated synthetic images: Fréchet Inception Distance (FID) scores, visual inspection by domain experts
- Built dual-stage preprocessing: color normalization via histogram matching, adaptive histogram equalization (CLAHE)
- Trained multi-architecture ensemble: EfficientNetV2-L, ResNet152, Vision Transformer (ViT-B/16)
- Achieved 96.2% classification accuracy with balanced performance across all classes
- Implemented interpretability frameworks: Grad-CAM heatmaps highlighting diagnostically relevant regions
- Validated Grad-CAM outputs against expert annotations of pathological features
- Conducted ablation studies quantifying contribution of GAN augmentation, preprocessing stages, and ensemble components
- Analyzed failure modes: performance on ambiguous cases, inter-observer variability effects

Car Counter: Real-Time Vehicle Monitoring System

2022

ECE IoT Lab, RUET

Supervisor: Tasnim Binte Shawkat | Credit: 1.50

- Designed and implemented IoT system for real-time vehicle detection, counting, and traffic density estimation
- Hardware: Raspberry Pi 4 Model B, Pi Camera Module v2, power supply, mounting hardware
- Software stack: Python 3.7, OpenCV for computer vision, NumPy for numerical operations
- Implemented vehicle detection: background subtraction (MOG2), blob detection, contour analysis

- Built tracking algorithm: centroid tracking for unique vehicle identification across frames
- Developed counting logic: virtual detection lines, direction-based counting (in/out)
- Optimized for real-time performance: frame resizing, multi-threading, GPU acceleration
- Created web dashboard: Flask backend, real-time count display, historical data visualization
- Tested under various conditions: different lighting, weather, traffic densities, vehicle types
- Achieved 90%+ counting accuracy in moderate traffic conditions
- Enhanced skills: embedded systems programming, real-time image processing, hardware-software integration

knackbook: Social Media Platform for Talent Showcasing

2021

Department of ECE, RUET

Supervisor: Rakibul Hassan | Credit: 0.75

- Designed and developed full-stack social networking platform focused on creative talent sharing
- Frontend: HTML5, CSS3, Bootstrap 4 for responsive design, JavaScript/jQuery for interactivity
- Backend: PHP for server-side logic, session management, authentication
- Database: MySQL for relational data storage, normalized schema design
- Core features: user registration/login with validation, profile creation and customization, photo/video uploads with file handling
- Social features: post creation with media attachments, commenting system, real-time messaging between users, like/reaction system
- Implemented security: password hashing (bcrypt), SQL injection prevention (prepared statements), XSS protection, CSRF tokens
- Built newsfeed algorithm: chronological and relevance-based post ordering
- Developed search functionality: user search, hashtag support, content filtering
- Created notification system: activity alerts for likes, comments, messages
- Optimized database queries for performance, implemented pagination for scalability
- Deployed on local server for testing and demonstration
- Demonstrated full-stack web development expertise from database design to UI/UX

Goal Sensing Machine: Automated Football Goal Detection

2020

Department of ECE, RUET

Supervisor: Md. Nahiduzzaman | Credit: 0.75

- Developed Arduino-based automated system to detect when football crosses goal line
- Hardware components: Arduino Uno microcontroller, infrared (IR) sensors, laser diodes, photodetectors, buzzer, LED indicators, goal frame prototype
- Sensor configuration: multiple IR beam-break sensors placed across goal line plane
- Detection logic: sequential triggering algorithm to confirm ball passage vs. false triggers
- Implemented debouncing: software filtering to eliminate noise and vibration-induced false positives
- Built user interface: LCD display showing goal count, team scores, match time
- Added audio-visual feedback: buzzer sound, LED flash pattern upon goal detection
- Programmed in Arduino C: interrupt handling, timer functions, sensor polling
- Calibration system: adjustable sensitivity for different ball speeds and sizes
- Tested accuracy: 95%+ detection rate in controlled environment
- Demonstrated skills: sensor integration, real-time embedded programming, sports automation, hardware prototyping
- Potential applications: amateur football leagues, training facilities, recreational centers

Technical Skills

Programming Languages:

Proficient: Python (5+ years), C (4+ years), C++ (4+ years), MATLAB (3+ years)

Intermediate: SQL, PHP, JavaScript, Bash scripting

Familiar: HTML5, CSS3, Bootstrap, L^AT_EX

Machine Learning & Deep Learning:

Frameworks: TensorFlow, Keras, PyTorch, Scikit-learn, XGBoost, LightGBM

Techniques: Supervised learning (classification, regression), Deep neural networks (CNN, RNN, LSTM, Transformers), Transfer learning, Ensemble methods, Semi-supervised learning, Generative models (GANs, VAEs)

Specialized: Time-series analysis, Image classification and segmentation, Natural Language Processing, Computer vision, Model interpretability (SHAP, Grad-CAM)

Data Science & Analysis:

Pandas, NumPy, SciPy, Matplotlib, Seaborn, Plotly, OpenCV, PIL/Pillow, scikit-image

Feature engineering, Data preprocessing, Dimensionality reduction (PCA, t-SNE, UMAP), Statistical analysis, Data visualization

Astronomy & Astrophysics Tools:

Astropy, APLpy, AstroPy-affiliated packages, FITS file handling, DS9/SAOImage, TOPCAT

Radio astronomy: LOFAR/LoTSS data, VLA/FIRST data, Radio imaging techniques

Optical surveys: Pan-STARRS, SDSS, Legacy Survey

Spectroscopy: Hyperspectral data analysis, Spectral unmixing

Coordinate systems: celestial coordinate transformations, cross-matching catalogs

Development Tools & Environments:

Git/GitHub (version control, collaboration), Linux/Unix systems (Ubuntu, command line), Jupyter Notebook/Lab, Google Colab, VS Code, PyCharm

High-Performance Computing (HPC): SLURM job scheduling, parallel computing, cluster computing

Cloud platforms: basic AWS, Google Cloud exposure

Web Development:

Backend: PHP, Flask (Python), MySQL/PostgreSQL databases

Frontend: HTML5, CSS3, Bootstrap, JavaScript, jQuery

RESTful API design, Database design and normalization

Hardware & Embedded Systems:

Arduino (C/C++ programming), Raspberry Pi (Python), Microcontroller programming, Sensor integration (IR, ultrasonic, temperature, etc.), IoT systems, Circuit design basics

Other Technical Skills:

L^AT_EX (document preparation, academic writing), Microsoft Office Suite (Word, Excel, PowerPoint), Technical documentation, Research methodology, Scientific writing, Data management

Certifications & Training

CASSA Workshop: Unclouding Thousand Eyes of Array Radio Telescope

May 2025

Center for Astronomy, Space Science & Astrophysics (CASSA), IUB

🌐 <https://cassa.site/>

- Intensive week-long workshop on radio interferometry and array telescope data processing
- Topics covered: Radio telescope fundamentals, Interferometry principles, LOFAR telescope architecture, Primary beam modeling, Calibration techniques, Imaging pipelines, Data reduction workflows
- Hands-on training: Python programming for radio astronomy, Working with FITS files and astronomical images, Using Astropy and radio astronomy packages, HPC server usage and job submission
- Group project: Developed LOFAR telescope primary beam modeling code using Python
- Implemented beam pattern calculations, Visualized beam response across frequency and sky position, Validated against theoretical models
- Presented findings to workshop participants and instructors
- Gained practical experience with large-scale astronomical data processing on HPC infrastructure
- Networking with radio astronomy researchers and professionals

Industrial Attachment: Code Studio Software Company

April 2023

Chattogram, Bangladesh

- One-month intensive industrial training program in machine learning and data science
- Topics covered: Machine learning fundamentals (supervised/unsupervised learning), Time series analysis and forecasting, Feature engineering techniques, Model evaluation and validation, Real-world ML project workflows
- Practical training: Implemented ML algorithms from scratch and using Scikit-learn, Built time series forecasting models (ARIMA, Prophet), Worked on real industry datasets, Learned software development best practices
- Projects: Customer churn prediction model, Sales forecasting using time series, Sentiment analysis of product reviews
- Gained industry perspective on ML application challenges: Data quality issues, Scalability considerations, Production deployment requirements, Client communication and requirement gathering
- Exposure to agile development methodology and team collaboration tools


Awards & Honors

2023


- **Silver Medal** – The University Physics Competition

🌐 <https://www.uphysicsc.com/>




International physics competition; solved advanced theoretical physics problem over 48-hour period; demonstrated mathematical modeling and scientific writing skills

- **Online Round Winner (Mathematics)** – National STEAM Olympiad, Bangladesh
 <https://nationalsteamolympiad.com/>
 Secured first place in national-level mathematics competition; competed against thousands of students across Bangladesh
- **Top 10 Winner (Physics-RUET)** – Precise Energy Olympiad
 Placed in top 10 among university-level participants in physics olympiad organized by energy sector



2022

- **Accomplished Winner** – The University Physics Competition
 <https://www.uphysicsc.com/>
 Recognition for outstanding performance in international physics competition; tackled complex multi-disciplinary physics problem
- **Quarter Finalist** – Green Earth Quest
 Advanced to quarter-final round in environmental science and sustainability competition

2021

- **Bronze Honor** – International Youth Math Challenge (IYMC)
 <https://iymc.info/>
 Earned bronze medal in prestigious international mathematics competition for youth; solved challenging mathematical problems requiring creative problem-solving
- **Bronze Honor** – International Astronomy & Astrophysics Competition (IAAC)
 <https://iymc.info/>
 Achieved bronze medal in global astronomy competition; demonstrated knowledge in theoretical and observational astronomy
- **1st Place in Presentation Contest** – Einstein's Birthday and Pi Day Celebration 2021
 Organized by Astronomy & Science Society of RUET
 Won first prize for scientific presentation on astrophysics topic; demonstrated communication and presentation skills
- **Honorable Mention** – ICPC Asia Dhaka Regional Site Online Preliminary Contest
 Team: RUET_Noob_Coders
 [ICPC Profile: L4CHE9B9411F](#)
 Achieved Honorable Mention in prestigious competitive programming contest; solved complex algorithmic problems under time pressure

2020

- **Silver Honor** – International Youth Math Challenge (IYMC)
 <https://iymc.info/>
 Secured silver medal in international mathematics competition; improved from previous bronze performance
- **Silver Medal** – The University Physics Competition
 <https://www.uphysicsc.com/>
 Earned silver medal for solving challenging physics problem involving mathematical modeling and computational analysis
- **Role Model Award 2020-2021** – Student Leadership Development Workshops
 US Embassy, Dhaka, Bangladesh
 Selected as Role Model among participants in leadership development program sponsored by US Embassy; recognized for leadership potential and community engagement

Competitive Programming Achievements

- **Total Problems Solved: 160+** across multiple platforms
- **LeetCode:** [Profile: DebaPriyoGuha](#)
 Solved problems in data structures, algorithms, dynamic programming, graph theory
- **Codeforces:** [Profile: kobeze_CDEF_solvekorum](#)
 Participated in rated contests; solved problems in competitive programming
- **Codechef:** [Profile: ece_1810027](#)
 Regular contest participation; solved algorithmic challenges
- **AtCoder:** [Profile: DebaPriyoGuha](#)
 Participated in Japanese competitive programming platform
- **GitHub:** github.com/DebaPriyoGuha
 Active open-source contributions; project repositories for research and coursework

Leadership & Service

President

June 2023–May 2024

Astronomy & Science Society of RUET (ASSR)

Rajshahi University of Engineering & Technology

🌐 <https://assr-hhgt.vercel.app/>

- Led organization of 50+ active members promoting astronomy, astrophysics, and science education
- Organized flagship event: **"AURORA: National Science Fest"**
 - National-level science festival with 500+ participants from universities across Bangladesh
 - Featured competitions: astrophotography, poster presentation, science quiz, project exhibition
 - Invited speakers: renowned astronomers and scientists from national institutions
 - Managed budget, logistics, sponsorships, and event execution
 - Coordinated content creation, graphic design, and marketing teams
- Conducted regular astronomy observation sessions: telescope nights, meteor shower watching, solar observation
- Organized seminars and workshops: topics in astrophysics, space technology, research methodology
- Led website development project: modern website showcasing society activities, events, resources
- Mentored junior members: guidance in academic pursuits, research interests, career planning
- Established partnerships with other university science clubs and national organizations
- Managed social media presence: content creation, engagement with astronomy community
- Coordinated participation in national-level science fairs and astronomy olympiads
- Developed leadership, team management, event organization, and communication skills

Vice President (Sports)

Aug 2023–Jan 2024

Chittagong Engineering Students' Association (CESA)

RUET Chapter, Rajshahi

- Led sports activities for students from Chattogram studying at RUET
- Organized and managed cricket and football teams: player recruitment, practice schedules, team selection
- Coordinated inter-department and inter-university sports tournaments
- Arranged friendly matches with other student associations
- Managed sports equipment, ground bookings, and logistics
- Fostered teamwork, competitive spirit, and physical fitness among members
- Organized social events and networking opportunities for Chattogram students
- Developed skills in team leadership, strategy planning, and sports management

Academic Team Member

2019–Present

Bangladesh Mathematical Olympiad (BdMO)

Bangladesh Physics Olympiad (BdPhO)

Bangladesh Olympiad on Astronomy & Astrophysics (BDOAA)

- Volunteered as academic team member for national-level olympiad competitions
- **Question Creation:** Designed challenging mathematics, physics, and astronomy problems for regional and national rounds
- **Answer Checking:** Evaluated student solutions ensuring fair and consistent grading
- Contributed to problem vetting process: reviewing difficulty, clarity, originality
- Participated in training camps: mentored students preparing for international olympiads
- Helped identify and nurture mathematical and scientific talent among Bangladeshi students
- Collaborated with university professors and olympiad alumni
- Gained experience in problem-solving pedagogy and educational assessment
- Stayed connected with competitive mathematics and physics community

Founder & Lead Instructor

Dec 2018–Present

STEM by Priyojeet

Private Tutoring Initiative, Chattogram

- Founded and operated private tutoring service specializing in STEM education
- **Students Mentored:** 16+ across various educational levels
- **Subject Areas:** Physics (mechanics, electromagnetism, thermodynamics, modern physics), Mathematics (calculus, algebra, geometry, number theory, problem-solving), Programming (Python, C, algorithms), Other Science subjects (chemistry, biology - occasionally)
- **Teaching Methodology:** Conceptual understanding over rote memorization, Problem-solving strategies and critical thinking, Hands-on demonstrations and real-world applications, Olympiad-style training for advanced students, Personalized curriculum based on individual student needs
- **Student Achievements:**
 - Multiple students gained admission to top colleges in Bangladesh
 - Students secured places in medical colleges (MBBS programs)
 - Students admitted to prestigious engineering universities (BUET, RUET, CUET)
 - Students gained admission to top-tier universities

- One exceptional student: completing university-level coursework while only in Class 9, demonstrating advanced mathematical and programming capabilities
- Developed custom study materials, problem sets, and practice exams
- Provided career counseling and academic guidance beyond classroom instruction
- Built long-term mentoring relationships extending beyond formal tutoring
- Adapted teaching methods during COVID-19: transitioned to online platforms, created digital content
- Maintained high student satisfaction and parent communication
- Demonstrated passion for education and knowledge dissemination
- Honed communication, pedagogy, and mentorship skills

Professional Development & Activities

AI Training Contributor

2024–Present

Outlier AI

Remote/Online Position

- Contributing to training and evaluation of Large Language Models (LLMs) for AI companies
- **Domain Expertise:** Mathematics problem-solving, Programming and algorithms, Code generation and debugging
- Creating high-quality training data: writing mathematical problems and solutions, coding challenges and implementations, detailed explanations and step-by-step reasoning
- Evaluating model outputs: assessing correctness, clarity, completeness of AI-generated responses, identifying errors and suggesting improvements
- Providing human feedback to improve model performance in STEM domains
- Rating model responses across multiple dimensions: accuracy, reasoning quality, code efficiency
- Participating in specialized projects requiring domain expertise
- Collaborating with global team of subject matter experts
- Gaining insight into cutting-edge LLM training methodologies and AI development
- Contributing to advancement of AI capabilities in technical domains
- Earning supplementary income while developing expertise in AI evaluation

Competitive Archer

2025–Present

Chittagong Archery Club

Chattogram, Bangladesh

- Active member and competitive participant in archery club
- **Achievement: 5th Position** – 2nd Chittagong Open Archery Championship
- Regular training sessions: recurve bow technique, target shooting, distance shooting
- Participated in regional and national archery competitions
- Developed mental focus, hand-eye coordination, and discipline
- Balancing athletic pursuit with academic and research commitments
- Demonstrated commitment to physical fitness and competitive sports
- Applying principles of precision and consistency from archery to research work

Languages

Bengali: Native speaker; full professional proficiency in reading, writing, speaking

English: Fluent; advanced academic and professional proficiency

- IELTS Academic: Overall 7.0 (Listening: 8.0, Reading: 7.5, Writing: 6.5, Speaking: 6.0)
- Extensive experience in technical writing, research paper composition, academic presentations
- Regular consumption of English scientific literature, lectures, and media

Hindi: Advanced proficiency in listening and speaking; passive understanding through media consumption

- Can understand Bollywood movies, news, and conversations without subtitles
- Comfortable speaking in informal contexts
- Limited formal writing ability

Personal Interests & Hobbies

Martial Arts:

- Practicing martial arts for physical fitness, discipline, and self-defense
- Interest in various martial arts forms and philosophies
- Applying principles of focus and perseverance to academic work

Whistling Melodies:

- Skilled at whistling complex musical melodies and compositions
- Repertoire includes classical music, film songs, and contemporary pieces
- Creative outlet for stress relief and artistic expression
- Entertaining friends and bringing joy through musical whistling

Late Night Street Exploration:

- Enjoying peaceful late-night walks through city streets
- Observing urban landscapes, architecture, and nocturnal atmosphere
- Time for reflection, thinking, and mental relaxation
- Exploring different neighborhoods and discovering hidden spots
- Finding inspiration and clearing mind for creative problem-solving

Other Interests:

- Reading science fiction and popular science books
- Following developments in space exploration and astronomy news
- Photography, especially astrophotography and night sky imaging
- Participating in online science and astronomy communities
- Watching scientific documentaries and educational content
- Playing strategy-based video games and chess

References

Dr. Khan Muhammad Bin Asad

Founder & Director, Center for Astronomy, Space Science & Astrophysics (CASSA)

Assistant Professor, Department of Physical Sciences

Independent University, Bangladesh (IUB)

✉ kasad@iub.edu.bd

☎ +880-1320-767186

🌐 <https://cassa.site/people/asad/>

Relationship: Current research supervisor at CASSA; Principal Investigator for RGC project

Md. Azmain Yakin Srizon

Assistant Professor

Department of Computer Science & Engineering

Rajshahi University of Engineering & Technology (RUET)

✉ azmainsrizon@cse.ruet.ac.bd

✉ azmainsrizon@gmail.com

☎ +880-1790-187189

🌐 <https://www.ruet.ac.bd/azmainsrizon>

Relationship: Research supervisor at Young Learners' Research Lab; mentor for multiple research projects. Advisor of Astronomy Science Society of RUET.

Fariya Tabassum

Assistant Professor & Head

Department of Electrical & Computer Engineering

Rajshahi University of Engineering & Technology (RUET)

✉ fariya@ece.ruet.ac.bd

☎ +880-1303-086970

🌐 <https://www.ruet.ac.bd/fariya>

Relationship: Undergraduate thesis supervisor; Department Head during final year

Md. Nazmul Sharif

Assistant Professor

Department of Mathematics

Rajshahi University of Engineering & Technology (RUET)

✉ nazmul@math.ruet.ac.bd

✉ nazmul06024160@gmail.com

☎ +880-1717-116999

🌐 <https://www.ruet.ac.bd/nazmul06024160>

Relationship: Academic mentor; collaborated on olympiad activities; knows student through mathematics courses and competitions. Retired Advisor of Astronomy Science Society of RUET.

Updated: January 2025
Full CV available upon request