

Nafis Sadik Nihal

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EDUCATION

Islamic University of Technology, Gazipur, Bangladesh

2018 – 2022

Bachelor of Science in Electrical and Electronic Engineering

GPA: 3.29/4.00

Last ~70 credits GPA: 3.66/4.00

Relevant Coursework

- *Physics:* Engineering Physics I & II; Basic Mechanical Engineering (Thermodynamics); Electromagnetic Fields and Waves; Engineering Materials
- *Machine Learning & Computation:* Numerical Methods; Artificial Neural Networks and Fuzzy Logic; Signals and Systems; Digital Signal Processing

RESEARCH EXPERIENCE

Postbac Research Assistant: Center for Astronomy, Space Science and Astrophysics July 2025 – Present

Supervisors: Dr. Anowar J. Shajib (Kavli Institute for Cosmological Physics; Einstein Fellow, The University of Chicago); Dr. Simon Birrer (Assistant Professor, Department of Physics and Astronomy, Stony Brook University)

- **Data and Preprocessing:** Reduced HST F814W observations to final drizzled products, and generated science cutouts, generalized PSF, and error maps.
- **Methodology:** Modeled strong gravitational lensing systems using **DOLPHIN**, achieving a success rate of **approximately 78%**, and visually validated reconstructed lens models.
- **Results:** Extracted **lens mass**, **lens light**, and **source light** model parameters for **doubly and quadruply imaged systems**.
- **Analysis:** Analyzed **flux ratio anomalies and uncertainties**; constructed mock lens catalogues for doubly and quadruply imaged systems; and compared probability distributions of **Einstein radius**, **mass ellipticity**, **light ellipticity**, **external shear**, and **position-angle differences** for mock versus real lenses.

Research Intern: Center for Astronomy, Space Science and Astrophysics June 2024 – June 2025

Supervisor: Dr. Anowar J. Shajib, KICP and Einstein Fellow at The University of Chicago

- **Dataset Creation:** Simulated strong gravitational lensing images and labels using **lenstronomy**.
- **Segmentation Design:** Created semantic segmentation classes for the lensing systems, with five classes for galaxy–quasar systems (background, quasar, lens light, satellite galaxy, source light) and four classes for galaxy–galaxy systems (background, lens light, satellite galaxy, source light).
- **Model Architecture:** Created a custom **U-Net** architecture with attention blocks, using focal and Dice loss for semantic segmentation.
- **Model Validation:** Validated the trained model using real telescope observations to assess robustness and real-world applicability. The model performs strongly in segmenting the lens components, with **F1 score for each class above 86%**.

PUBLICATIONS

1. A. J. Shajib, **N. S. Nihal**, et al., *DOLPHIN: A Fully Automated Forward-modeling Pipeline Powered by Artificial Intelligence for Galaxy-scale Strong Lenses*, [ApJ](#), 2025.

EXTRACURRICULAR ACTIVITIES & OUTREACH

Presenter — Journal Talk

July 2025

Topic: DOLPHIN — A fully automated forward-modeling pipeline powered by artificial intelligence for galaxy-scale strong gravitational lenses

Contributor — Team Draco: International Astronomical Search Collaboration

May 2024

Participated in a NASA-supported Pan-STARRS citizen science project

Speaker — Coding & Typesetting: An Introduction to MATLAB and L^AT_EX

October 2023

Presented a talk on the basics of performing calculus and modeling problems using MATLAB

Event organized by the Symmetry: Club of Physical Sciences, Independent University, Bangladesh

STANDARDIZED TEST SCORES

TOEFL iBT

Test Date: November 13, 2024

Total Score: 103/120

Reading	Listening	Speaking	Writing
28	26	25	24

SKILLS

- **Astronomical Data Processing:** NumPy, Pandas, Astroquery, Astropy, Photutils, h5py, glob, os, shutil, pickle, Matplotlib, lenstronomy, SciPy
- **Machine Learning:** TensorFlow, Keras
- **Software:** MATLAB, Photoshop, Visual Studio Code
- **Others:** L^AT_EX, Microsoft Office Suite

PROFESSIONAL EXPERIENCE

MARC Architects and Engineers Limited, Dhaka, Bangladesh November 2022 – September 2024

Electrical Engineer

- Proficiently employed AutoCAD for electrical design work, producing accurate and intricate drawings, schematics, and layouts.