Rahul Ethirajulu

Ph.D Physics and Astronomy Candidate
Texas Tech University, Lubbock, Texas
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EDUCATION

Texas Tech University, Lubbock — *September 2024 - Present*
Ph.D. Physics and Astronomy — CGPA: 3.812/4.00

Texas Tech University, Lubbock — *September 2024 - December 2025*
M.Sc. Physics and Astronomy (en route to Ph.D.) — CGPA: 3.812/4.00

National Institute of Technology, Calicut — *August 2022 - May 2024*
M.Sc. Physics — CGPA: 8.79/10.0 - First Class with Distinction

Rajalakshmi Engineering College — *August 2017 - April 2021*
B.E. Electronics and Communication — CGPA: 9.1/10.0 - First Class with Distinction

SOFTWARE AND TECHNICAL SKILLS

Python (Scipy, Astropy, Pandas), DS9, VizieR, HPCC, Bash scripting, Qiskit, Linux OS, LaTex, Algorithms and Data structures.

RESEARCH PROJECTS

Cataloging and Time-Series Analysis of Dwarf Novae and Cataclysmic Variables - PhD Research
Texas Tech University, Lubbock
PhD Advisor - Dr. Michael Fausnaugh — *Aug 2024 - Present*

- Identifying and cataloging Dwarf Novae (DN) and Cataclysmic Variables (CVs) from TESS full-frame image light curves.
- Performing detailed time-series analysis using Lomb–Scargle periodograms to extract orbital periods and investigate short-period CVs.
- Modeling DN outbursts using piecewise Fast-Rise Exponential-Decay (FRED) functions to quantify rise time, decay time, peak flux, and quiescent levels.

Quantum Machine Learning with RAG-Driven Dynamic Deep Learning - Independent Research Project
Texas Tech University, Lubbock
Team Members - Gaurav Karwa, Muhammad Haseeb, Dr. Paul Bjerk — *Jun 2025 - Sep 2025*

- Developing a hybrid QML framework using IBM Qiskit to train variational quantum neural networks for binary classification.
- Encoding classical features as qubits using RY/RZ rotations and CZ entanglement gates.
- Applying the framework to ICU patient monitoring (MIMIC-III) by matching real-time patient states with research literature and clinical standards to generate adaptive treatment guidance.

Semi-Model Dependent GW signal Reconstruction - M.Sc Thesis
National Institute of Technology, Calicut
Under the supervision of Dr. M K Haris — *Oct 2023 - May 2024*

- Utilizing non-orthogonal wavelet-based signal reconstruction method to detect and analyze microlensed GWs to identify parameter deviation and signal anomalies.
- Employing Dr. Soumen Roy's QMWaves Python script to reconstruct GW signals and identifying the peak and ring-down frequencies of BBH mergers.
- Making use of Python libraries such as scipy, lalsimulation, pesummary, astropy, gwpy for efficient analysis of GW signal.

Undergraduate & Master's Research Projects

- Conducted research across computational astrophysics, machine learning, and astronomical data analysis, including N-body simulations, gamma-ray burst signal processing, galaxy classification, and exomoon detection.
- Applied machine learning techniques (Random Forests, Neural Networks, CNNs) to interpolate simulation data, classify IFU survey galaxies (MaNGA DR17), and improve signal-to-noise in transient light curves.
- Analyzed time-series and transit data to study GRBs and exomoon candidates using SNR, phase-difference, and statistical criteria.

POSTERS AND CONFERENCES

- Semi-Model Dependent GW Signal Reconstruction
  - presented at **ΣΠΣ** Departmental Poster Presentation Competition, Oct 2025, Department of Physics and Astronomy, Texas Tech University.
- Quantum Machine Learning with RAG-Driven Dynamic Deep Learning
  - presented at the First Texas Quantum Summit 2025 held at Texas A&M University on September 19–20.

OUTREACH

- **Family STEM Night, Texas Tech University, 2024:** Collaborated with peers to present interactive demonstrations, simplifying complex scientific concepts for K-12 students and their families to foster curiosity and engagement in STEM.

CERTIFICATES

- Mathematical Foundations of Machine Learning - Udemy
- Machine Learning A-Z™: Hands-On Python In Data Science - Udemy.
- Introduction to Machine Learning – Covers the basic concepts behind Machine Learning. Organized by NPTEL and conducted by IIT Kharagpur.
- From Big Bang to Dark Energy offered by The University of Tokyo – Coursera.
- Data-driven Astronomy offered by The University of Sydney – Coursera

WORKSHOP AND SCHOOLS

- Short course on Particle Physics, conducted by Ibrahim Mirza, PhD Physics Candidate, University of Tennessee, focusing on Quantum Electrodynamics Lagrangian, Higgs Mechanism, Neutrino Oscillation and Neutrinoless Double-Beta Decay - Jan to Mar 2024
- Astronomy and Astrophysics Summer School conducted by IIA (Indian Institute of Astrophysics) - June 2023
- Data Driven Astronomy Workshop - Nov 2022– Data analysis on FITS, IFU files were taught and learned basics of CNN to classify galaxies.
- Astronomy Winter School, B.M Birla Science Center - Feb 2020 - Concentrating on the basics of Computational Astrophysics using (Jupyter), Radio Astronomy and fundamentals of General Theory of Relativity and problems associated with it.

ACHIEVEMENTS

- All India Asteroid Search Campaign (AIASC) Appreciation Certificate addressed to principal of my college for 21 preliminary discoveries of Asteroid.
- Appreciation Letter for building a MARS ROVER by SEDS - SEDS REC – JULY 2018 - Built a ROVER tested under harsh conditions similar to that of Mars environment.
- Invited for presenting talk on "Radio Frequency Controlled 4-Wheeler" as a part of Design and Development Using Arduino and Raspberry Pi workshop conducted by JNTUH-CEH.
- Received an esteemed commendation from the Education Minister of India in recognition of achieving a perfect 10 CGPA in 10^{th} grade.