

RUSKIN PATEL

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EDUCATION

PhD: Physics

Aug 2016 – Dec 2022

University of Texas at Dallas – Dallas, Texas

GPA: 3.36

Dissertation: *Constraining Tidal Quality Factor in Low-Mass Eclipsing Binaries using Tidal Synchronization*

MS: Astronomy and Astrophysics

Aug 2014 – May 2016

Indian Institute of Space Science and Technology – Thiruvananthapuram, Kerala

GPA: 3.52

Thesis: *Equilibrium Photon Density in Pair Creation-Annihilation Plasma in Black Hole Binaries Accretion Disk*

B.Tech: Electronics and Communication

Aug 2010 – May 2014

National Institute of Technology – Kurukshetra, Haryana

GPA: 3.12

EXPERIENCE

Research Assistant

Aug 2018 – Dec 2022

University of Texas at Dallas, Richardson, TX

- Published data catalogs in academic journals created from scientific literature using database queries on astrophysical databases such as CDS and VizieR using numpy and pandas dataframe
- Built custom statistical models for data sampling and hypothesis testing using python’s scientific and numerical libraries such as scipy,.
- Designed Markov Chain Monte Carlo (MCMC) algorithms in python to obtain probability distributions of free parameters in non-linear model implemented in C++. The MCMC library was customized to support multiprocessing and multithreading on High-Power Computing Clusters and store results in pickled and HDF5 format. The output from simulations are published in academic journals and presented in annual meetings of American Astronomical Society and Graduate New Research Accomplishments.
- Designed and developed data visualization techniques in python using python libraries such as corner plot, matplotlib and seaborn to analyze the output of MCMC simulations and interpret relationships between different parameters.

Projects

- Designed multi-dimensional root finding algorithm using numpy’s bisection method that performs better than the standard python library by decreasing computational time and increasing solution accuracy up to 0.001%
- Designed neural network model using TensorFlow to create a regression model that predicts the roots of a non-linear model using the data from multi-dimensional root finding algorithm.
- Designed Machine Learning model to optimize non-linear tidal evolution model through feature engineering and feature scaling, implementing preprocessing pipeline and model selection from Linear Regression, Random Forest Regressor and Support Vector Machines. The preprocessing pipeline was deployed on Google Cloud Vertex AI and optimized using sklearn’s cross validation library. The model with optimal results was implemented in the MCMC library to reduce computational time by 50-70%.

Publications

- Ruskin Patel, Kaloyan Penev, *Constraining tidal quality factor using spin period in eclipsing binaries*, Monthly Notices of the Royal Astronomical Society, Volume 512, Issue 3, May 2022, Pages 3651–3661

SKILLS

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|-----------|-------------------------------|------------------------|--------------|--------------|
| ➤ Python3 | ➤ Object-Oriented Programming | ➤ Statistical Analysis | ➤ JavaScript | ➤ TensorFlow |
| ➤ MySQL | ➤ Linux | ➤ sklearn | ➤ C++ | ➤ PyTorch |

TECHNICAL KNOWLEDGE

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|----------------------------------|------------------------|-------------------------------|------------------|-------------------------|
| ➤ Machine Learning | ➤ Neural Networks | ➤ Data Structures | ➤ Algorithms | ➤ Mathematical Modeling |
| ➤ Google Cloud Core Architecture | ➤ Scientific Computing | ➤ Graduate courses in Physics | ➤ Linear Algebra | ➤ Numerical Methods |