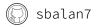
Shanmugha Balan

Research Student in Astrophysical Applications of Machine Learning



sbalan7.github.io









EXPERIENCE

ASTROPHYSICS RESEARCH GROUP, BITS PILANI | RESEARCH STUDENT

Dec 2020 - Current | Pilani, India

- → Working on data about the star clusters in our galaxy from the Gaia Mission by the European Space Agency, queried through VizieR, a database maintained by the University of Strasbourg
- → Studying the structural properties and dynamical stability of clusters using K-means clustering and Gaussian Mixture Models to identify member stars and determined the presence of tidal tails

SPACE TECHNOLOGY CELL, ISRO | RESEARCH INTERN

Oct 2021 - Jan 2022 | Pune, India

- → Theorized a model predictive controller model to determine a safe and optimal landing trajectory for a lunar spacecraft
- → Implemented a simulation of the controller in Python

COMPUTATIONAL SYSTEMS BIOLOGY LAB, IIT MADRAS | RESEARCH STUDENT Apr 2018 - Jun 2018 | Chennai, India

- → Analysed protein networks for the bacterium E. coli using data from the STRING database and made a network graph with NetworkX
- → Used the interactions to identify potential target proteins for novel drugs to act upon using graph centrality measures

PROJECTS

PROPERTIES OF OPEN CLUSTERS USING GAIA DATA | WITH DR. KAUSHAR VAIDYA

- → The cluster membership information on the Gaia DR2 data of open clusters was used to study the effect of dynamical evolution on the observed properties of star clusters with a clear binary track
- → The morphology of star clusters is examined to look for the presence of any tidal tails in the star clusters

SEU DETECTION FOR CASSIOPE

- Trained a random forest model with sklearn for predicting single event upsets for the CASSIOPE satellite as a part of the NASA SpaceApps challenge
- → Achieved an F-score of 0.78 despite having a heavily imbalanced dataset for classification

RESPONSIBILITIES

- → TEACHING ASSISTANT Nonlinear Dynamics and Chaos at BITS Pilani
- → TEAM LEAD Microsoft Learn Student Ambassadors, Pilani Chapter
- → PROJECT LEAD 3D Research Team, Computer Vision Research Society, Pilani
- → CHIEF EDITOR Physics Association, BITS Pilani
- → JOINT COORDINATOR The Radio Astronomy Club, BITS Pilani

SKILLS

PROGRAMMING

Proficient:

Python • C/C++ • MATLAB • LATEX

Experienced:

Julia • Shell • HTML • JS • CSS

LIBRARIES/FRAMEWORKS

Numpy • Scipy • Scikit-Learn Astropy • OpenCV • Matplotlib PyTorch • TensorFlow

EDUCATION

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

M Sc Physics + BE Electrical and **ELECTRONICS ENGINEERING** Jul 2019 - Present | Pilani, India Cum. GPA: 8.15 / 10.0

COURSEWORK

MATHEMATICS

Multivariable Calculus Linear Algebra Complex Analysis Probability and Statistics Differential Equations

PHYSICS

Classical Mechanics • Optics Electromagnetic Theory Quantum Mechanics Statistical Mechanics Nonlinear Dynamics and Chaos Theory of Relativity Computational Physics Nuclear and Particle Physics

ELECTRONICS

Digital Design • Signals and Systems • Control Systems

MOOCS

Deep Learning Spec. Applied Data Science Spec. Data Driven Astronomy