# Shanmugha Balan

*M.Sc. Physics and B.E. Electrical and Electronics Engineering*
*Birla Institute of Science and Technology, Pilani - 8.1/10.0*

Passionate about Astronomy and Machine Learning. Avid blogger, loves to teach and share knowledge!

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## EXPERIENCE

### Undergraduate Research Scholar
🏢 Astrophysics and Cosmology Research Group, Dept of Physics    📅 Dec 2020 – present    📍 BITS Pilani, Rajasthan
- Working on star cluster data from the Gaia Mission by the European Space Agency
- Studied structural properties and stability of clusters using unsupervised learning algorithms

### Machine Learning Intern
🏢 Army Base Workshop    📅 May – Jul 2021    📍 Pitharogarh, Uttarakhand
- Built a machine learning model to determine servicing status of army equipment and added location visualization
- Integrated the above with a Flutter interface to make a highly user friendly UI

### Junior Research Scholar
🏢 Raman Lab, Computational Systems Biology Lab    📅 Apr – Jun 2018    📍 IIT Madras, Chennai
- Analysed protein networks for *E. coli* using data from the STRING database
- Made a protein network graph with NetworkX to identify potential drug targets

## PERSONAL PROJECTS

### SEU Detection for CASSIOPE
Trained a random forest model to protect the CASSIOPE satellite from solar disruptions with a highly unbalanced dataset and got 87.6% accuracy

### Traffic Sign Classifier
Trained a custom CNN on the German Traffic Sign Benchmark dataset of around 50000 images with 92% accuracy and made a GUI to deploy the model

## SKILLS

| **Machine Learning** | **Data Science** | **Scientific Computing** |
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| TensorFlow, PyTorch, Scikit-Learn | Numpy, Pandas, Matplotlib | C/C++, MATLAB, Python (Anaconda) |

## COURSES

### University Courses (Math)
Math 1 (Calculus) | Math 2 (Linear Algebra+Complex Analysis) | Math 3 (Differential Equations) | Probability and Statistics

### University Courses (Physics)
Classical Mechanics | Electromagnetic Theory | Optics | Quantum Mechanics | Nonlinear Dynamics and Chaos

### MOOCs (Certified)
Deep Learning Specialization (5 courses, deeplearning.ai) | Applied Data Science Specialization (5 courses, U Mich) | TensorFlow in Practice (4 courses, deeplearning.ai)

### MOOCs (Audited)
Intro to DL (MIT OCW) | CNNs for Visual Recognition and NLP for DL (Stanford Online) | Deep Reinforcement Learning (UC Berkeley)

## EXTRA CURRICULAR ACTIVITIES

### Microsoft Learn Student Ambassador
Conducted games for APOGEE and paper discussions with the ML student interest group

### The Radio Astronomy Club
Manage the blog and perform data analysis of gravitational wave signals

### FreeLunch
Senior Editor of the Science and Technology section of a research oriented blog

### Physics Association
Made educational posts and conducted talk series to promote physics