

# Komal Gupta

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## Education

### BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, INDIA

August 2015 – August 2020

Master of Science (Hons.) in Physics

Bachelor of Engineering (Hons.) in Electrical and Electronics Engineering

Graduated with Distinction (Cumulative GPA: 9.08/10.00)

### THE UNIVERSITY OF NEW SOUTH WALES, CANBERRA, AUSTRALIA

September 2019 – May 2020

Research Practicum culminating in Masters' Thesis

**Thesis title:** Generating orbital transfers with Differentiable Programming

**Advisor:** Prof. Russell Boyce, UNSW Canberra Space

**Synopsis:** Using differentiable programming to generate heteroclinic connections between  $L_1$  and  $L_2$  Lyapunov orbits in the Earth-Moon Circular Restricted Three-body Problem ([thesis](#))

## Publications

Abay R. and Gupta K. (2021, April 20-23). *GEO-FPN: A convolutional neural network for detecting GEO and near-GEO space objects from optical images*. 8th European Conference on Space Debris, ESA/ESOC, Darmstadt, Germany. ([paper](#))

## Work Experience

### SOFTWARE SYSTEMS ENGINEER | TRILLIUM TECHNOLOGIES

May 2023 – May 2023

Worked towards enhancing the existing flood mapping capabilities of ML4Floods software system using Synthetic Aperture Radar data

- Performed [comparative analysis of SAR and optical/infrared data](#) for several regions and flood events
- Analyzed and compared [thresholding algorithms for flood segmentation](#) using SAR data
- Built FCN model that achieved IoU of 0.95 and 0.52 for land and water classes respectively over holdout set showing good generalization capacity

### DATA SCIENTIST | FUTURIFAI

March 2021 – April 2023

Research and development scientist focused on solving problems in various domains including space, horticulture, and predictive maintenance using real data. I was involved in the following:

- Full-stack development of *RapidAI*, a [no-code platform for AI training and inference](#) for Computer Vision
- Development of *DTSpace*, a cloud-based framework for simulating [digital-twins of rocket launches and satellite trajectories](#)
- Development of [object detection models and tracking algorithms for automatic crop registration](#) and yield prediction application *Fruit Yield Index*
- 4<sup>th</sup> place finish in ESA's machine learning challenge "the OPS-SAT case" with team Alcheringa-Dreamtime
- Development of timeseries anomaly detection models for fault prediction in Cogenerators

### TEACHING ASSISTANT | DEPARTMENT OF PHYSICS, BITS, PILANI

August 2018 – December 2018

Course: Computational Physics - assisted students in solving problems during tutorial & lab hours

## Skills

Foundations	AI / ML	Programming languages / Frameworks		
Physics	Deep learning	Python	C/C++	HTML/CSS
Astrodynamics	Computer vision	Julia	JavaScript	FastAPI
Numerical optimisation	Anomaly detection	MATLAB	ReactJs	Flask
Optical/radio astronomy	TensorFlow/PyTorch	Mathematica	CesiumJs	AWS/Azure/GCP

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## Research Experience

### THE UNIVERSITY OF NEW SOUTH WALES, CANBERRA, AUSTRALIA

June 2019 – August 2019

**Project title:** Study of the Restricted Three-body Problem

**Guide:** Prof. Russell Boyce, UNSW Canberra Space, Canberra

Numerical computation of Lyapunov orbits and orbital transfers in the Earth-Moon Circular Restricted Three-body Problem

### NATIONAL CENTRE FOR RADIO ASTROPHYSICS, PUNE, INDIA

May 2018 – July 2018

**Project title:** Study of pulsar emission mechanism using the Giant Metrewave Radio Telescope

**Guide:** Prof. Yashwant Gupta, NCRA-TIFR, Pune

Development of a C program to analyse individual pulses of bright pulsars to study pulse nulling, subpulse drifting and micro-structures, and deduce the physical processes responsible for the same ([report](#) & [poster](#))

### INDIAN INSTITUTE OF SCIENCE, BENGALURU, INDIA

May 2017 – July 2017

**Project Title:** Classification of sounds using Artificial Neural Networks

**Guide:** Prof. Manoj Varma, Indian Institute of Science, Bangalore

Building a neural network classifier to distinguish between human speech and non-human sounds ([report](#))

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## Academic Projects

### Search for two tone suppression using a minimal model for auditory transduction

August 2018 – December 2018

Modelled the functioning of the inner ear by dividing it into a non-linear oscillator, a RC circuit, & an inhomogeneous Poisson process in order to study the phenomenon of two-tone suppression ([report](#))

### Morphological classification of galaxies using convolutional neural networks

January 2018 to April 2018

Used the Keras library and the Galaxy Zoo dataset to build a convolutional neural network to classify galaxies according to their morphology

### Optimization of orbital parameters for elisa spacecraft configuration

August 2017 to December 2017

Optimized initial phases of the three eLISA spacecrafts under the gravitational influence of Sun, Earth, Moon, and Jupiter in order to have minimum variations in arm lengths over a course of three years ([report](#))

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## Awards

### Partial Travel Support Award for Thesis Abroad

January 2020

awarded by BITS Pilani – Goa Campus: International Programmes and Collaboration division

### Science Academies' Summer Research Fellowship for students

April 2018

awarded by Indian Academy of Sciences

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## Additional Information

- GRE General Test: 329/340 - Quantitative: 168/170, Verbal: 161/170 (Test date: 18 Oct 2022)
- Vice President, SEDS Celestia - Astronomy Club, BITS, Pilani – Goa Campus (2017-18)
- Languages - Fluent English, Native Hindi
- Nationality - Indian