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

## 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.

## 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 a 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*
  - 4th place finish in ESA's machine learning challenge "the OPS-SAT case" with team Alcheringa-Dreamtime
  - Development of timeseries 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

- Extensive academic and research background in Physics, Mathematics, Astrodynamics and Astronomy
- Proficient at using Data Science and ML algorithms with structured and unstructured data
- Experienced in using TensorFlow and PyTorch to build pipelines for ML model training and deployment
- Proficient at Python, Julia, MATLAB, Mathematica, C, C++, HTML and JavaScript
- Experienced in building applications using FastAPI, Flask, ReactJS, CesiumJS and deployment to AWS/Azure

## 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
- **Synopsis**: Numerical computation of Lyapunov orbits and orbital transfers in the Earth-Moon CircularRestricted 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
- **Synopsis:** Development of a C program to analyse individual pulses of bright pulsars to study pulse nulling,subpulse drifting etc. and deduce the physical processes responsible for emission in pulsars

**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
- **Synopsis:** Building a neural network classifier to distinguish between human speech and non-human sounds

## Academic Projects

**SEARCH FOR TWO TONE SUPPRESSION USING A MINIMAL MODEL FOR AUDITORY TRANSDUCTION** *August 2018 – December 2018*

- **Guide**: Dr. Toby Joseph, Department of Physics, BITS, Pilani - Goa Campus
- **Synopsis**: 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

**MORPHOLOGICAL CLASSIFICATION OF GALAXIES USING CONVOLUTIONAL NEURAL NETWORKS** *January 2018 to April 2018*

- **Guide**: Dr. Kinjal Banerjee, Department of Physics, BITS, Pilani - Goa Campus
- **Synopsis**: 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*

- **Guide**: Dr. Kinjal Banerjee, Department of Physics, BITS, Pilani - Goa Campus
- **Synopsis**: 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

## Awards

- Indian Academy of Sciences: Summer Research Fellowship for students (2018)

## Additional Information

- GRE General Test: 329/340 - Quantitative: 168/170, Verbal: 161/170 (Test date: 18 Oct 2022)
- Vice President, Astronomy and Astrophysics Club, BITS, Pilani – Goa Campus (2017-18)
- Core Member, Aerodynamics Club, BITS, Pilani – Goa Campus (2015-17)
- Member, Physics Society, BITS, Pilani – Goa Campus (2015-20)

**Languages** Fluent English, Native Hindi

**Nationality** Indian