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, Australia *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, Australia *March 2021 – April 2023*

Research and development scientist focused on solving problems in various domains including space, horticulture, and predictive maintenance using real data

- 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 anomaly detection models for fault prediction in Cogenerators

Teaching Assistant | Department of Physics, Bits, Pilani – Goa Campus *August 2018 – December 2018*

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

Skills

Foundations	Physics, Astrodynamics, Numerical optimization, Optical and Radio astronomy
AI / ML	Deep learning, Computer vision, Anomaly detection
Programming	Python, C, C++, Julia, MATLAB, Mathematica, JavaScript, HTML, CSS
Frameworks	TensorFlow, PyTorch, FastAPI, Flask, ReactJS, CesiumJS

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)

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)

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

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