Siddharth Chaini

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Research Interests

- **Astroinformatics**
- **Data Science in Astronomy**
- **Time-Domain Astrophysics**
- **Supernova Cosmology**

Education

Indian Institute of Science Education Research Bhopal — Bhopal, India
Integrated BS-MS in Physics, CPI: 8.87*/10 — 2017–2022 (expected)

HSC Maharashtra Board - 12th Grade — Thane, India
Overall: 86.0%, Computer Science: 99% — 2017

ICSE Board - 10th Grade — Thane, India
Overall: 95.83%, Computer Applications: 100% — 2015

Projects

Star - Galaxy - QSO Image Classification — IUCAA, Pune
Advisors: Prof. Ajit Kembhavi, Dr. Kaushal Sharma and Dr. Vivek M — Aug. 2020 –Present

- Exploring the use of deep convnets for photometric classification of of compact images from the Sloan Digital Sky Survey as galaxies, stars or quasars on the basis of their images in five observational bands.
- Predicted photometric redshifts to use as a parameter for classification, through regression using a dense neural net
- Developed a program for automated FITS retrieval, stacking, centering and cropping of SDSS objects across 5 passbands

Photometric Classification of Simulated LSST Light Curves — IISER Bhopal
Course Project for DSE 301: Artificial Intelligence and its Scientific Applications — Feb. 2020 –June 2020

- Worked on a solution for the PLAsTiCC Challenge by implementing an ensemble of deep learning models to classify the time series data of the astronomical object
- Stacked ensemble of GRU and Dense networks was trained on 7878 samples, and achieved an accuracy of 76.2% on a test set consisting of over 2.5 million samples
- Report: arxiv.org/abs/2006.12333
  Code Repository: github.com/siddharthchaini/Astronomical-Classification-PLASTICC

Thermodynamic Properties of Ice - A Monte Carlo Study — IISER Bhopal
Course Project for PHY 312: Numerical Methods and Programming — May 2020 –June 2020

- Implemented a Monte Carlo algorithm to calculate the residual entropy of a two-dimensional lattice model of ice at various temperatures, and identify a phase transition
- Report: Click here
  Code Repository: github.com/siddharthchaini/ColdAsIce

Authorship Identification — IISER Bhopal
Course Project for HSS 322: Computational Linguistics — Nov. 2019

- Implemented an algorithm to identify the author of an unknown text by analyzing the characteristic n-gram frequencies of the author, similar to K-Nearest Neighbours
- Report: Click here
  Code Repository: github.com/siddharthchaini/AuthID

Coupled Harmonic Oscillators and Neutrino Oscillations IISER Bhopal
Course Project for PHY 206: Physics through Computational Thinking April 2019

- Solved and simulated a coupled harmonic oscillator on Mathematica, and modelled neutrino oscillations by treating them as a coupled oscillator
- Mathematica nb file: Click here

Call Data Record Analysis M.P Police
Advisor: Dr. Kushal Kumar Shah May 2018 –Jan. 2019

- Worked on a project under Dr. Kushal Kumar Shah in collaboration with Madhya Pradesh Police on a computer program to extract patterns from large datasets of phone call records.

Positions

- **Head of the Student Research Group** at IISER Bhopal Astronomy Club Aug. 2020 – Present
  In charge of data analysis - photometry and denoising
- **Teaching assistant, Lab assistant and Grader** at IISER Bhopal Jan. 2019 – May 2019
  ECS 102 – Introduction to Programming

Courses Undertaken

Physics and Astronomy
Cosmology*, General Relativity*, Astronomy & Astrophysics, Quantum Information & Computing, Quantum Mechanics, Classical Mechanics, Statistical Mechanics, Computational Physics, Numerical Methods, Electrodynamics and Special Relativity, etc.

Mathematics
Probability and Statistics, Linear Algebra, Calculus, etc.

Other
Data Science and Machine Learning*, Artificial Intelligence, Introduction to Programming, Computational Linguistics, Atmospheric Science, Evolution of the Earth, etc.

Online Courses
Data Driven Astronomy, TensorFlow Specialisation, Applied Machine Learning, Algorithms by Stanford

Summer/Winter School
Astronomy Summer School (IUCAA, 2020), Observational Astronomy Winter School (MPCST - IIT I - IIA, 2021)

Note: Courses marked with * will be completed by May 2021. A full list of courses can be found here.

Technical Skills

Languages: Python, C, C++, Java, Wolfram Language, HTML, SQL, LaTeX, Assembly Language, Bash
Software: Mathematica, SAOImage DS9
Developer Tools: Git, VS Code
Libraries: Astropy, NumPy, Keras, TensorFlow, pandas, scikit-learn, Selenium, matplotlib, qiskit

Achievements and Awards

Academic:
- DST Inspire Fellow
- Governor's Gold Medal awardee, Hiranandani Foundation School, Thane
- Topped in Computer Applications, ICSE Board, 2015

Sports:
- Runner-up in football at Sangharsh 2019, IISER Bhopal's Annual Sports Fest
- Runner-up in football at Hiranandani Estate's Rotary Tournament in 2012 and 2013

Other:
- Winner of Codeplay 2019, IISER Bhopal's annual hackathon
- Winner of Model Solvay Conference 2018 at IISER Bhopal - Physics