Saransh Chopra

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Education

Cluster Innovation Centre, University of Delhi — New Delhi, India

Major: Information Technology and Mathematical Innovations — *2020 – 2024*

Minor: Computational Biology — *CGPA 9.15*

Relevant courses:

Computer System Architecture | Object-Oriented Programming | Data Structures | Algorithms | Database Management Systems | Operating Systems | Networking | PDEs | ODEs | Mathematical Visualizations | Discrete Mathematics | Linear Algebra | Statistics and Probability | Systems Biology | Cell Biology | Integrative Biology | In silico Biology

Research and Work Experience

Cluster Innovation Centre, University of Delhi — New Delhi, India

Student researcher — *November 2021 – present*

Dr. Shobha Bagai (University of Delhi)

- Approximating the solutions of partial differential equations in 1, 2, 3, and 4-dimensions using Physics-Informed Machine Learning.
- Working with Neural tangent Kernels, Multi-scale Fourier feature networks, and Spatio-temporal Multi-scale Fourier feature networks to predict high-frequency details.

AiView — New Delhi, India

Research and Development intern — *September 2021 – November 2021*

Mr. Geetansh Saxena (Project lead at Deference Research and Development Organisation, India)

- Developed an end-to-end OCR pipeline to pre-process, read, and post-process different texts (signboards, books, invoices, etc.) for visually impaired people.
- Built a CI/CD pipeline and a REST API for ease of integration with any existing software using FastAPI and Heroku.
- Collected a dataset of human images and their distance from a point by building a stereovision camera.

Google Summer of Code — Remote

Open-Source Developer at PyBaMM, NumFOCUS — *May 2021 – August 2021*

Dr. Valentin Sulzer (Carnegie Melon University), Dr. Robert Timms (University of Oxford), Dr. Ferran Brosa Planella (University of Warwick)

- Worked closely with post-doctoral research fellows and PyBaMM core developers from around the world.
- Built an automated Twitter Bot capable of tweeting random Battery Simulations, including but not limited to different battery models, parameter sets, chemistries, degradation modes, and experiments.
- Developed a replying functionality through which users can direct the bot to run a specific Battery Simulation.
- Created a CI/CD pipeline using GitHub Actions and Heroku, and followed a micro-services-based architecture.

Publications

T. G. Tranter, R. Timms, V. Sulzer, F. Brosa Planella, G. M. Wiggins, P. Agarwal, **S. Chopra**, S. Allu, P. Shearing, D. J. L. Brett. *liionpack: A Python package for simulating packs of batteries with PyBaMM*. Draft - Drive, GitHub.

Open Source Scientific Softwares

PyBaMM — *Maintainer and Core Developer - 100,000+ installs*

PyBaMM (Python Battery Mathematical Modelling) solves physics-based electrochemical DAE models by using state-of-the-art automatic differentiation and numerical solvers.

- Collaborated with researchers from around the world and implemented various new features, fixed bugs, improved the documentation, CI/CD pipeline, and the infrastructure, and wrote advanced tutorials.

BattBot — *Maintainer and Core Developer - 100+ followers*

An automated Twitter Bot that Tweets random Battery Mathematical Modeling Simulations and replies to the requested Battery Simulations.

- Worked under Dr. Valentin Sulzer (Carnegie Mellon University), Dr. Robert Timms (University of Oxford), and Dr. Ferran Brosa Plannela (University of Warwick) to build the bot and the infrastructure from scratch.

liionpack   *Core Developer - Beta testing*

liionpack takes a 1D PyBaMM model and makes it into a pack. You can either specify the configuration e.g. 16 cells in parallel and 2 in series (16p2s) or load a netlist.
- Worked extensively with Dr. Thomas Tranter (University College of London) and Gavin Wiggins (Oak Ridge National Laboratory) on the CI/CD pipeline, documentation, and infrastructure of liionpack.

Colour   *Contributor - 500,000+ installs*

Colour is an open-source Python package providing a comprehensive number of algorithms and datasets for colour science.
- Implemented the conversion between RGB and HCL colourspaces.

DeepXDE   *Contributor - 220,000+ installs*

DeepXDE is a library for scientific machine learning.
- Implemented utility functions and improved the existing examples on solving partial differential equations using Physics-Informed neural networks.

Projects

SceneNet [Transfer Learning, VGG19, CNNs, Python, Flutter, Dart, FastAPI, Heroku]   *December 2021*
- Trained a CNN on 10,000+ images using transfer learning (VGG19) to classify sceneries into 67 categories.
- Developed a standalone API for the model, and a Flutter application for the users.
- Achieved a maximum accuracy of 96% on the test set and 64% on the cross-validation set.

PopItUp [Android, Kotlin, Firebase, Firestore, Google Sceneform SDK, Google ARCore SDK]   *May – August 2021*
- An Augmented Reality shooting game developed in native android by manually adding and editing the Sceneform SDK.
- Used the FirestoreRecyclerView to load live data into the leaderboard.

MemeTastic [Flutter, Dart, NodeJS, Elasticsearch, Kibana, CI/CD, Google Cloud, Reddit API]   *May 2021*
- The backend, deployed on GitHub Actions, ingests the latest meme data into Google Cloud hosted Elasticsearch.
- The frontend, with a clean UI, pulls the data and provides a feature to search any meme using the ngram analyser.

ChaoticEncryption [Python, ODEs, Encryption-Decryption, Pseudo-Random Number Generator, Matplotlib]   *March 2021*
- An Encryption-Decryption script that uses Logistic map and Lorenz System of Differential Equations as PRNGs.
- Along with encrypting images, it also aims to connect chaos, encryption and fractals together.

Relevant Skills

Languages:	Python	C/C++	Javascript	Java	Dart	Kotlin
Frameworks/Libraries:	Flutter	ReactJS	ExpressJS	NodeJS	React-Native	Tensorflow	FastAPI
Platforms and Tools	Linux	Heroku	Google Cloud	Elasticsearch	Kibana	MongoDB	Firebase	Docker	CI/CD
Research:	Machine Learning	Scientific Machine Learning	Computer Vision	NTK and kernels

Awards and Achievements

Hackathons:	Winner of the Elastic hackathon (out of 2500+ registrations).
Asteroid Discovery:	Discovered an asteroid having a fixed orbit around Sun by analysing the data of Pan-STARRS.
Awards:	**Faraday Institute's Collaboration Award** - The Faraday Institute, UK.
	Physics Quiz winner - National Science Centre, India.

Presentation and Talks

PyBaMM Advanced workshop   *October 2021*
- Held in collaboration with the Multi-Scale Modeling project of the Faraday Institute.
- Presented BattBot in front of researchers and industrialists belonging to various institutions.

Git and GitHub   *August 2021*
- Organised and delivered a workshop on Git and GitHub at the Indian Insitute of Technology, Madras.
- Taught 50+ IIT students the basics of Git and GitHub while touching on some advanced topics.

Python in Research   *July 2021*
- Invited to give a talk on Python in Research at the Indian Institute of Technology, Madras.
- Presented the applications of Python in different research fields along with some tutorials.

Languages

Hindi (mother tongue), English (fluent), German (basic), Punjabi (conversational)

Voluntary Services

Mentored 10+ college students through open-source programs - CodePeak and Script Winter of Code.