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 9.27*
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*

RESEARCH AND WORK EXPERIENCE

Cluster Innovation Centre, University of Delhi   New Delhi, India

Student researcher   *December 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 library 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*. Journal of Open Source Software.

OPEN SOURCE SCIENTIFIC SOFTWARE

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 Mr. Gavin Wiggins (Oak Ridge National Laboratory) on the CI/CD pipeline, documentation, and infrastructure of liionpack.

Colour *Contributor - 700,000+ 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

ChaoticEncryption.jl [Julia, GitHub Actions, GitHub Pages, ODEs, Pseudo-Random Number Generators]   *February 2022*
- ○ Developed a Julia package for encrypting and decrypting images using custom Pseudo-Random Number Generators.
- ○ Built the complete infrastructure, documentation, and CI/CD pipeline for the first of its kind package.
- ○ The package gained traction on Twitter (150+ likes+retweets) and GitHub (18 stars) and is available on JuliaHub here.

SceneNet [Transfer Learning, VGG19, CNNs, Python, Flutter, Dart, FastAPI, Heroku]   *December 2021*
- ○ Trained a CNN on 10,000+ images belonging to 67 categories and achieved an accuracy of 96% on the test set and 64% on the cross-validation set.
- ○ Developed a standalone public API for the model, and a Flutter application for the users.

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.
- ○ Developed a live leaderboard using the FirestoreRecyclerView.

MemeTastic [Flutter, Dart, NodeJS, Elasticsearch, Kibana, CI/CD, Google Cloud, Reddit API, Ngram Analyser] *May 2021*
- ○ Developed and deployed a backend service to ingest the latest meme data into Google Cloud hosted Elasticsearch.
- ○ Created a frontend with a clean UI to fetch the data, providing an auto-complete feature to search any meme.

Relevant Skills

Languages:	Julia | Python | C/C++| Javascript | Java | Dart | Kotlin | R | MATLAB
Frameworks/Libraries:	Flutter | ReactJS | NodeJS | 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.

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.