

# SARANSH CHOPRA

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## EDUCATION

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### 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 | Systems Biology | Cell Biology | Integrative Biology | In silico Biology

## RESEARCH AND WORK EXPERIENCE

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### Cluster Innovation Centre, University of Delhi

New Delhi, India

Undergraduate student researcher

December 2021 – February 2022

Dr. Shobha Bagai (University of Delhi)

- Approximated the solutions of partial differential equations in 1, 2, 3, and 4-dimensions using Physics-Informed Machine Learning.
- Worked 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 end-to-end OCR and Object Detection libraries by wrapping the existing technologies 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.

### PyBaMM, NumFOCUS

Remote

Google Summer of Code student developer

May 2021 – August 2021

Dr. Valentin Sulzer (Carnegie Mellon 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

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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 RESEARCH SOFTWARE

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### 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, 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 Planella (University of Warwick) to build the bot and the infrastructure from scratch.

## liionpack

Core Developer - 200+ installs

*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.

## Other notable contributions

- **Colour:** *Colour Science for Python* - 1,100,000+ installs  
Implemented the conversion between RGB and HCL colourspaces.
- **DeepXDE:** *DeepXDE is a library for scientific machine learning* - 240,000+ installs  
Implemented utility functions and improved the existing examples on solving partial differential equations using Physics-Informed neural networks.

## PROJECTS

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**ChaoticEncryption.jl** [Julia Package, GH Actions, GH 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 package.
- The package has been starred 21 times on GitHub and is available on JuliaHub here (4 downloads).

**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

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<b>Languages:</b>	Julia   Python   C/C++   Javascript   Java   Dart   Kotlin
<b>Frameworks/Libraries:</b>	Flutter   ReactJS   NodeJS   Tensorflow   FastAPI   DeepXDE
<b>Platforms and Tools</b>	Linux   Heroku   Google Cloud   Elasticsearch   Kibana   MongoDB   Firebase   Docker   CI/CD
<b>Research:</b>	Machine Learning   Scientific ML   Research Software Development   Computer Vision

## AWARDS AND ACHIEVEMENTS

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<b>Hackathons:</b>	Winner of the Elastic hackathon (out of 2500+ registrations).
<b>Asteroid Discovery:</b>	Discovered an asteroid having a fixed orbit around Sun by analysing the data of Pan-STARRS.
<b>Awards:</b>	<b>Faraday Institute's Collaboration Award</b> - The Faraday Institute, UK.

## PRESENTATION AND TALKS

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<b>PyCon Italia</b>	<i>Upcoming (June 2022)</i>
◦ Will be leading a workshop on "Code coverage through unit tests running in sub-processes/threads: Locally and automated on GitHub".	
<b>PyBaMM Advanced workshop</b>	<i>October 2021</i>
◦ Presented BattBot in front of researchers and industrialists belonging to various institutions.	
<b>Indian Institute of Technology, Madras</b>	<i>August 2021</i>
◦ Taught 50+ students the basics of Git and GitHub while touching on some advanced topics.	

## LANGUAGES

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

## MENTORSHIP

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<b>Google Summer of Code</b>	<i>Upcoming (May - September 2022)</i>
◦ Will be mentoring students under PyBaMM, NumFOCUS, on projects involving, but not limited to, documentation, devops, parameterisation, and visualization.	
<b>CodePeak</b>	<i>December 2021</i>
◦ Mentored 10+ students in the field of open-source application development.	