

# SARANSH CHOPRA

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## About

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Saransh is an engineering junior who, by day, works on his academic and professional commitments, and by night, develops and maintains Open-Source Research Software, which he believes are the key to reproducible and collaborative research.

He is passionate about Research Software Engineering, DevOps, Machine Learning, Scientific Machine Learning, and Open-Source Research Software.

## Education

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### Cluster Innovation Centre, University of Delhi

New Delhi, India

Major: Information Technology and Mathematical Innovations

2020 – 2024

Minor: Computational Biology

CGPA 9.40/10

## Research and Work Experience

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### FluxML, The Julia Programming Language

Remote

Technical Writer and Open-Source Developer [Funded by The Julia Programming Language] May 2022 – November 2022

Mr. Dhairya Gandhi (Julia Computing)

- Worked on FluxML, an ML ecosystem providing lightweight abstractions on top of Julia's native GPU and AD support.
- Fixed bugs and developed the infrastructure of numerous ML packages such as Flux.jl, NNlib.jl and Metalhead.jl.
- Wrote original Machine Learning/Deep Learning tutorials, documentation and API references for FluxML's ecosystem.

### Institute for Research and Innovation in Software for High Energy Physics (IRIS-HEP), Princeton University

Remote

Research and Development Fellow [Funded by IRIS-HEP]

June 2022 – October 2022

Dr. Henry Schreiner (Princeton University / CERN) and Dr. Jim Pivarski (Princeton University)

- Prepared Vector, a Python library for constructing Just-In-Time compilable jagged Lorentz vectors, for v0.9.0, v0.10.0, and v1.0.0 (first major release, in progress).
- Worked closely with CERN researchers to develop new API, fix bugs, and build infrastructures for the HEP ecosystem.
- The releases are currently being used by researchers at CERN, Princeton University, and other research institutes.

### AiView

New Delhi, India

Research and Development Engineer

September 2021 – December 2021

Mr. Geetansh Saxena and Mr. Chappa Sri Vinay

- Developed end-to-end OCR and Object Detection libraries by wrapping existing software 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 (Python Battery Mathematical Modelling), NumFOCUS

Remote

Google Summer of Code Student Developer [Funded by Google]

May 2021 – August 2021

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

- Built an automated Twitter Bot capable of constructing Mathematical Simulations of Batteries, including but not limited to different battery models, parameter sets, chemistries, degradation modes, and experiments.
- Developed a replying functionality to run Mathematical Simulations on command using Twitter API.
- Created a novel CI - CD infrastructure and followed a micro-services-based architecture.

## Open Source Research Software

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### PyBaMM

Steering Committee Member and Core Developer - 450+ stars

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

### Vector

Collaborator and Core Developer - 45+ stars

Vector is a Python 3.7+ library for 2D, 3D, and Lorentz vectors, especially arrays of vectors, to solve common physics problems in a NumPy-like way.

[SSP] **S. Chopra**, H. Schreiner, and J. Pivarski. *Vector: vector classes and utilities*. DOI: 10.5281/zenodo.5942082. URL: <https://github.com/scikit-hep/vector>.

## Flux.jl

Member (FluxML) and Core Contributor - 3,700+ stars

*Flux is an elegant approach to machine learning. It's a 100% pure-Julia stack, and provides lightweight abstractions on top of Julia's native GPU and AD support. Flux makes the easy things easy while remaining fully hackable.*

## BattBot

Maintainer and Core Developer - 10+ stars

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

## liionpack

Member (pybamm-team) and Core Contributor - 30+ stars

*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.*

## Other notable contributions

- **Zarr**: An implementation of chunked, compressed, N-dimensional arrays for Python. - 1,000+ stars  
Migrated Zarr's build and packaging infrastructure to a pyproject.toml based configuration.
- **Scikit-HEP ecosystem**: High Energy Physics in Python  
Fixed minor bugs in awkward and hist, added support for coverage in cookiecutter, and wrote new developer pages.
- **Scikits.odes**: Offers extra ODE/DAE solvers; an extension to ones available in SciPy - 100+ stars  
Debugged and fixed their build (which was failing because of setuptools) and removed support for Python 2.7-3.6.

## Posters and Presentations

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- [SSP22a] **S. Chopra**, H. Schreiner, and J. Pivarski. *Compiling Awkward Lorentz vectors with Numba*. 21st International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT). Poster. Oct. 2022. URL: <https://indi.to/45Kzq>.
- [SSP22b] **S. Chopra**, H. Schreiner, and J. Pivarski. *Constructing HEP vectors and analyzing HEP data using Vector*. 5th International Workshop on Python in High Energy Physics (PyHEP). Presentation. Oct. 2022. DOI: <https://doi.org/10.5281/zenodo.7081003>. URL: <https://indi.to/bPmMc>.
- [S C22a] **S. Chopra**. *Code coverage through unit tests running in sub-processes/threads: Locally and automated on GitHub*. 10th Annual Conference on Python - Asia-Pacific (PyCon APAC). Presentation. Sept. 2022. URL: <https://tw.pycon.org/2022/en-us/conference/talk/243>.
- [S C22b] **S. Chopra**. *Code coverage through unit tests running in sub-processes/threads: Locally and automated on GitHub*. 21st Annual Conference On Python - Europe (EuroPython). Presentation. July 2022. URL: <https://ep2022.europython.eu/session/code-coverage-through-unit-tests-running-in-sub-processes-threads-locally-and-automated-on-github>.

## Grants, Prizes and Achievements

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- **PyCon Asia-Pacific (APAC)**'s grant to lead a talk virtually (NT\$3,600). July 2022
- **Shubhra Kar Linux Foundation Training Scholarship** (500 recipients worldwide) for contributions to Open-Source Research Software (\$695). June 2022
- **EuroPython**'s travel grant to lead a talk in-person (£460). June 2022
- **PyCon Italia**'s travel grant to lead a workshop in-person (£400 + lodging support). April 2022
- **Faraday Institution's Collaboration Award** to the PyBaMM community. November 2021
- Won the **Elastic hackathon** (out of 2500+ registrations) with a Flutter-Node-Google Cloud-ELK (Elasticsearch, Logstash, Kibana) based application. May 2021
- **Discovered an asteroid** having a fixed orbit around Sun by analysing the data from the **Pan-STARRS** observatory. August 2016

## Projects

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- releaseup** [NLP, Text summarisation, spaCy, Scikit-learn, TF-IDF, Python library] September 2022
  - Releaseup uses an extractive approach for generating release notes from comments and docstrings added between two git tags.
  - The Python library has **400+ installs** on PyPI, **5+ stars** on GitHub, and follows best development practices.
- OCRed** [OCR, Computer Vision, Tesseract-OCR, NLTK, Python library] August 2022
  - OCRed provides clever, simple, and intuitive wrapper functionalities for OCRing specific textual materials.
  - The Python library has **2,900+ installs** on PyPI, **10+ stars** on GitHub, and follows best development practices.

- ForMente** [NLP, Flutter, Dart, FastAPI, Python, Firebase, Firestore, Heroku, GitHub Actions] *June 2022*
- Using Natural Language Processing, ForMente lets you diagnose your feelings in the form of a secure personal diary.
  - The NLP model is deployed on Heroku using FastAPI, and the app uses Firebase and Firestore as its backend.
- ChaoticEncryption.jl** [Image processing, Encryption algorithms, ODEs, PRNGs, Julia package] *February 2022*
- Vectorised image encryption and PRNG algorithms that runs **~40X faster** than ordinary nested-for implementations.
  - The Julia package has **10+ installs** on JuliaHub and **28+ stars** on GitHub.
- PopItUp** [Android, Kotlin, Firebase, Firestore, Google Sceneform SDK, Google ARCore SDK] *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 and Firestore.
- 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 this data, providing an auto-complete feature to search any meme.

## Position of Responsibilities, Volunteering, and Mentoring

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- Member of **PyBaMM's steering committee**. *Present*
- Member of **FluxML's** GitHub organisation. *Present*
- **Vector's** collaborator on GitHub. *Present*
- Invited to mentor a hackshop organised at **PyHEP 2022**. *September 2022*
- Mentored students under PyBaMM, NumFOCUS for **Google Summer of Code 2022**. *May 2022*
- Mentored 10+ students under Codepeak 2021 on open-source application development. *December 2021*

## Relevant Skills

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<b>Languages:</b>	Python (proficient)   Julia (proficient)   Dart (proficient)   C/C++   Java   JavaScript
<b>Frameworks/Libraries:</b>	Tensorflow   PyTorch   FluxML-Ecosystem   PyData-Ecosystem   SciML-Ecosystem   Flutter FastAPI   NodeJS   ExpressJS   Android
<b>Platforms and Tools</b>	Linux   Heroku   Google Cloud   Elasticsearch   Kibana   Shell Scripting   Docker   CI/CD   VCS SQL and NoSQL Databases   GitHub Actions   Documentation Tools   $\LaTeX$

## Languages

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Hindi (mother tongue), English (fluent)