

Dhairya Gandhi

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EDUCATION

- **Birla Institute of Technology and Science, Pilani** Hyderabad, India
Bachelor of Engineering (Hons.) in Electrical and Electronics Aug. 2014 – July. 2018

PROFESSIONAL EXPERIENCE

- **JuliaHub Inc.** Bangalore, India
Data Scientist Jun 2018 - Present
 - **JuliaSimSurrogates**: Served as Technical Lead for the JuliaSimSurrogates Team under JuliaSim. Oversaw a team of 5 developers in implementing modular and full-scale workflows to automate surrogatization of continuous-time systems. Developed novel surrogatization pipelines to which scale to dynamical systems requiring complex inputs and from unknown dynamics.
 - **JuliaSim**: Developed and trained high quality ML surrogates for Density Functional Theory (DFT) simulations for accelerating battery modelling and materials science. Further developing surrogates for non-autonomous dynamical system identification.
 - **ARPA-E**: Collaborated with the Viswanathan Group at the Carnegie Mellon University on accelerating discovery of high quality electrochemical materials. Developed novel methods to generate candidate molecules via score-based modelling. Worked on novel methods of determining modeling electrochemical kinetics using automatic differentiation.
 - **FluxML**: Lead Developer of the FluxML machine learning ecosystem and its packages. Flux has grown an active community with over 4k stars on GitHub and over 150 contributors across the board. Instituted FluxML as a NumFocus affiliated project.
 - **Scaling for ML Tasks**: Demonstrated a high throughput training pipeline of large neural networks with big datasets with Flux. Developed a flexible and performant model parallelism framework using a distributed DAG scheduler. Designed and developed a mass experimentation framework used by several teams in the company. It is designed to generate reproducible experiment runs, track artifacts and metrics of training, alongside any code changes necessary automatically.
 - **Client Facing Projects**: Designed high-performance neural surrogates for continuous time dynamical systems. These problems require solving real-world stiff systems with dynamics in different time scales at scale. I conducted original research in fitting implicit neural representations to global system dynamics in limited data domains using neural networks trained using periodic activation functions and incorporating physical constraints implicitly. This was used to model Williams' Formula 1 car's speed-over-ground sensor and helped reduce over 3 kgs of weight from the vehicle.

SELECTED TALKS

- **Traing a Llama(2) in Julia!**: JuliaCon 2024
- **Modern CI/CD Machine Learning workflows using Julia**: JuliaCon 2024
- **Scaling Up Training of Any Flux.jl Model Made Easy**: JuliaCon 2022
- **A Tour of the Differentiable Programming Landscape with Flux.jl**: JuliaCon 2021
- **Machine Learning with Julia**: ODSC 2018, 2019, 2020
- **How to Train and Deploy a Machine Learning Model in Julia**: ODSC Europe 2020
- **On The State of Flux.jl**: JuliaCon 2020
- **Write a WebApp in Julia with Dash.jl**: JuliaCon 2020
- **Machine Learning Developers Summit 2020**:
- **The Future of Machine Learning - Differentiable Programming**: Software Freedom Day 2020
- **Indians in Open Source**: Open Source India 2020
- **Machine Learning for Social Good**: JuliaCon 2019

WORKSHOPS, PUBLICATIONS AND POSTERS

- **Nonequilibrium Electrochemical Phase Maps: Beyond Butler–Volmer Kinetics:** The Journal of Physical Chemistry Letters, American Chemical Society, 2022
Rachel C. Kurchin, **Dhairya Gandhi**, Venkatasubramanian Viswanathan
- **Score-Based Generative Models for Molecule Generation:** ML4Molecules, NeurIPS 2021
Dwaraknath Gnaneshwar, Bharath Ramasundar, **Dhairya Gandhi**, Venkat Vishwanathan
- **Fashionable Modelling with Flux:** Systems for ML, NeurIPS 2018
Michael J Innes, Elliot Saba, Keno Fischer, **Dhairya Gandhi**, Marco Concetto Rudilosso, Neethu Mariya Joy, Tejan Karmali, Avik Pal, Viral B. Shah
- **ACED: Accelerated Computational Electrochemical Systems Discovery:** ML for Climate Change, NeurIPS 2020
Rachel C Kurchin, Eric Muckley, Lance Kavalsky, Vinay Hegde, **Dhairya Gandhi**, Xiaoyu Sun, Matthew Johnson, Alan Edelman, James Saal, Christopher V Rackauckas, Bryce Meredig, Viral Shah, Venkat Viswanathan
- **Julia - A Differentiable Programming Language for Machine Learning:** Heiße 2018
Keno Fischer, **Dhairya Gandhi**, Sebastian Pfitzner (Julia Computing)
- **Modern Machine Learning with Flux:** Computing Brazil, Brazilian Computer Society 2019
Dhairya Gandhi, Keno Fischer, Micheal Innes, Elliot Saba, Viral B. Shah

OPEN SOURCE PACKAGES AND CONTRIBUTIONS

- **DaggerFlux.jl** [link]: Generic Scalability for Training ML models on diverse system architectures with multiple accelerators.
- **Flux.jl** [link]: Lead Developer and Maintainer of the FluxML Differentiable Programming Ecosystem in Julia.
- **Zygote.jl** [link]: Flexible, performant, backend agnostic automatic differentiation in Julia.
- **JuliaCon 2023** [link]: Served as Program Chair for the "Finance And Economics" track.
- **Torch.jl** [link]: Exposing kernels from torch in Julia.
- **Google Summer of Code Mentor 2019, 2020, 2021** [[link], [link], [link]]: Notable projects include a differentiable ray tracer (RayTracer.jl), making Density Functional Theory Toolkit (DFTK.jl) differentiable, and a fast 3D computer vision library - Flux3D.jl.
- **Google Code-In 2019:** Program administrator for the Julia Programming Language.
- **Google Season of Docs 2020:** Project aimed at updating the FluxML website. [link]
- **Julia Summer of Code Mentor 2019, 2020, 2021:** Notable projects include a differentiable computer vision engine in Julia [link] - DiffImages.jl.

OTHER PROJECTS

- **SmartCampus**
 - Created a framework to handle and manage the transactions students make around the campus.
 - Developed and deployed a system to track and predict the real-time position of all the buses plying on campus routes.
- **Hyperloop One Global Challenge**
 - Implemented a genetic algorithm and collected GIS data to map India's terrain.
 - The only student-led Indian team selected as a finalist.
- **Automated Monitoring of Solar Energy Farms using ML**
 - Performed image analysis on images of solar panels in a solar farm to find out when the panels need cleaning, eliminating the need for manual checking.
 - Swarms of drones captured images of solar panels and sent them to a central server which identified the panels that needed cleaning. Cracks and breakages in the panels are also detected.

PROGRAMMING SKILLS

- **Languages:** Julia, Python, Javascript
- **Experience:** Machine Learning, Program Transformation