Vikash Chaurasia

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Experience

MRI Reconstruction Algorithm Engineer — Oct 2025 – present
Philips — *Best, Netherlands*

Postdoctoral Researcher — Sep 2024 – Aug 2025
Technische Universiteit Delft (TU Delft) — *Delft, Netherlands*

Postdoctoral Researcher — Aug 2018 – Aug 2024
Okinawa Institute of Science and Technology (OIST) — *Okinawa, Japan*

Education

Ph.D. in Mechanical Engineering — 2013 – 2018
University of Houston — *Houston, TX, USA*

- Dissertation: Variational Formulation of Charged Curves Confined to a Sphere
- Focus: Mathematical modeling, inverse problems, optimization algorithms

M.Tech. in Mechanical Engineering — 2011 – 2012
Indian Institute of Technology (IIT), Kanpur — *India*

B.Tech. in Mechanical Engineering — 2007 – 2011
Indian Institute of Technology (IIT), Kanpur — *India*

Technical Skills

- **Programming Languages**: Python, MATLAB, JavaScript, FastAPI for developing end-to-end applications.
- **Data Analysis and Machine Learning**: PyTorch, TensorFlow, NumPy/SciPy, Scikit-learn for statistical modeling and neural network development.
- **Medical Imaging**: ITK/VTK, OpenCV for processing point clouds and handling imaging artifacts.
- **Geospatial Analysis**: Google Earth Engine, statistical methods for satellite data processing and spatial mapping.
- **Data Visualization**: Streamlit, Matplotlib, Plotly for creating interactive dashboards and visual representations.
- **Numerical Methods**: Variational calculus, finite element analysis, optimization for solving complex physical systems.
- **Software Development**: Git, Docker for version control and reproducible research workflows.
- **Computational Geometry**: Algorithms for modeling and visualizing deformable surfaces and topological structures.

Selected Publications

V. Chaurasia, E. Fried. Isometric and isoenergetic everting motions of orientable and nonorientable bands, *Journal of Nonlinear Science*, 2025.

V. Chaurasia, E. Fried. Möbius bands obtained by isometrically deforming circular helicoids, *Journal of Elasticity*, 2024.

V. Chaurasia, Y.C. Chen, E. Fried. Interacting charged elastic loops on a sphere, *Journal of the Mechanics and Physics of Solids*, 2020.

Key Projects

3D MRI Registration Pipeline (FastReg) | *Python, OpenCV, ITK* GitHub

- Developed automated Python system for registering 3D MRI scans with body point clouds
- Implemented robust algorithms for medical imaging challenges including noise reduction and anatomical variation handling

Marine Ecosystem ML Surrogate Models | *Python, PyTorch, Scikit-learn* GitHub

- Developed ML surrogate models (Random Forest & Neural Networks) to efficiently approximate complex NPZD ecosystem dynamics
- Achieved strong predictive performance with R^2 up to 0.906 for marine variable prediction using North Atlantic training data

TROPOMI Methane Emissions Monitoring | *Python, Google Earth Engine, Streamlit* GitHub

- Built end-to-end pipeline for automated methane hotspot detection using satellite data with statistical clustering methods
- Engineered interactive dashboard for real-time monitoring, visualization, and time-series analysis of atmospheric emissions

Super-Emitter Tracking System | *Python, Statistical Analysis, TROPOMI Data* GitHub

- Developed comprehensive framework for detecting and tracking methane super-emitters with multi-algorithm ensemble methods
- Implemented temporal trend analysis, change point detection, and automated alerting for emission lifecycle monitoring

High-Frequency Soil CO_2 Simulation | *Python, Physics-based Modeling* GitHub

- Built physics-based simulation framework modeling automated soil chambers and environmental drivers
- Developed pattern detection algorithms identifying Birch pulse events, demonstrating 67-76% information loss with sparse sampling

Peatland Carbon Dynamics Framework | *Python, Biogeochemical Modeling, Streamlit* GitHub

- Developed comprehensive modeling framework simulating peatland carbon dynamics under climate change scenarios
- Implemented Q10 kinetics-based decomposition models with interactive dashboard for scenario analysis and visualization

OpenSim RAG Chat Assistant | *Python, FastAPI, Hugging Face, Vector Databases* GitHub

- Built Retrieval Augmented Generation system using open-source Mistral model for biomechanics software documentation
- Implemented semantic search pipeline with custom web scraping, vector embeddings, and interactive chat interface

Visual Assistant for Accessibility | *Python, Computer Vision, OCR, FastAPI* GitHub

- Created locally-hosted application with image description, OCR, and question-answering capabilities
- Integrated text-to-speech functionality and accessible web interface for visual content understanding

Interactive Mathematical Visualization | *JavaScript, Web Technologies, Computational Geometry* Live Demo

- Developed web-based tools for visualizing complex mathematical surfaces including Möbius bands and orientable surfaces
- Implemented real-time algorithms for shape-preserving everting motions and topological transformations