

# Mayukh Deb

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## Publications ([Google Scholar](#))

### TopoNets ([ICLR 2025 Spotlight](#) → [toponets.github.io](https://toponets.github.io))

Jan 2025

**Mayukh Deb**, Mainak Deb, N. Apurva Ratan Murty

Inducing topographic structure in Vision and Language models (GPTs). Yielded brain-like functional organization, lower dimensionality, and efficiency through structured pruning. Featured by [College of Sciences News @ Georgia Tech](#)

### AtMan ([NeurIPS 2023](#) + featured in [Scientific American](#))

Jan 2023

**Mayukh Deb\***, Björn Deiseroth\*, Samuel Weinbach\* et al. (\* = equal contribution)  
Causally trace and explain LLM outputs without gradients. Works on anything with attention. Foundation behind [Aleph-Alpha's Explain functionality](#)

### DORA ([ICLR 2023 Trustworthy ML workshop + TMLR](#))

June 2022

Kiril Bykov, **Mayukh Deb**, Klaus Robert Müller et al.

Clustering neurons and detecting spurious outlier features with [feature-vis](#).

### CONFORM: A Project to Create Crowd-Sourced Open Neuroscience fMRI Foundation Models ([NeurIPS 2025 Workshop](#))

Nov 2025

Benjamin Lahner, Andrew Luo, Jacob Prince **Mayukh Deb**, Leila Webhe, Aude Oliva, N. Apurva Ratan Murty, Michael J. Tarr et al.

A proposal for a crowd-sourced fMRI foundation model that integrates large-scale data aggregation, generative denoising, and meta-learning to overcome current limits in human neuroimaging.

### MOSAIC: A Scalable Framework for fMRI dataset aggregation and modeling of human vision ([preprint](#) + [webpage](#) + [python library](#))

Nov 2025

Benjamin Lahner, **Mayukh Deb**, Aude Oliva, N. Apurva Ratan Murty

MOSAIC is composed of eight large-scale vision fMRI datasets totaling 93 subjects, 430,007 fMRI-stimulus pairs, and 162,839 naturalistic and artificial stimuli. It enables large-scale pre-training of Vision models on human fMRI data.

### End-to-end Topographic Auditory models Replicate Signatures of the Human Auditory Cortex ([ArXiv preprint](#), under review)

Sep 2025

Haider Al-Tahan, **Mayukh Deb**, Jenelle Feather, N. Apurva Ratan Murty

The first end-to-end topographic deep neural networks for audition. Showed signatures like tonotopic maps, Music and Speech selectivity, etc while preserving model performance.

## Talks

### Vision Sciences Society, 2025 ([abstract](#), [YouTube video](#))

Jan 2025

## Education

### Georgia Institute of Technology

Aug 2024 – Present

PhD Student - Cognition and Brain Science - [Murtylab](#)

- Mentored by [Dr. N. Apurva Ratan Murty](#)
- Building brain-inspired algorithms to improve Language and Vision models (see recent work: [toponets](#))
- Leading the engineering effort for training and inference of state-of-the-art models of the visual cortex

## Experience

### Research Engineer @ [Aleph-Alpha](#)

Nov 2021 – May 2023

- Led their Trustworthy AI project and built [AtMan](#)
- AtMan was the foundation behind Aleph-Alpha's "explain" API for LLMs
- Also worked on building multimodal search-engines.

## Research Intern @ MIT Brain + Cognitive Sciences

May 2023 - Dec 2023

Worked with Dr. Nancy Kanwisher's lab on 2 projects:

- Inducing brain-like topographic structure in transformers (eventually led to [toponets](#))
- Training data-constrained vision models on fMRI data

## Research Engineer @ Eden.Art

Dec 2023 – Aug 2024

- Implemented tools like Textual Inversion, IP-Adapters and ZipLoRA into production.
- Built flexible pipelines to fine-tune diffusion models (SDXL, SD3) quickly on user data

## Intern @ RunwayML

Jan 2021 – Feb 2021

- Implemented, optimized (1.4x speedup) and dockerized pipelines for optical-flow (RAFT) and video frame interpolation (RIFE) models to be used in Runway's video editing tool.

## Google Summer of Code @ INCF

May 2020 – Aug 2020

- Worked with [OpenWorm](#) to train models to extract metadata from microscopic videos/images embryos
- Also mentored two contributors in GSoC 2023.

## Open Source (over 100k installs on pip)

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### [TopoLoss](#)

- Induce topographic structure in pytorch models during training with this loss function
- Works on both Linear and Conv layers
- Core codebase behind [toponets](#)
- Also released some pre-trained vision and language models
- [4k downloads](#) on PyPI

### [torch-dreams](#)

- A highly flexible framework to do [feature visualization](#) on pytorch models
- [56k downloads](#) on PyPI

### [MOSAIC](#)

- Python package to efficiently load one of the largest fMRI datasets (Lahner et al., in prep)
- The goal was to democratize access to large-scale fMRI data for pre-training
- [over 1k downloads](#) on PyPI

### [Eden](#)

- Single python decorator to convert a python function into a hosted endpoint with queuing (celery)
- Surprisingly scalable across instances with kubernetes
- Foundational pet-project which eventually led to [eden.art](#)
- [9.4k downloads](#) on PyPI

### [DevoLearn](#)

- Trained models to segment embryo data from microscope
- Outcome of [Google Summer of Code, 2020](#) and then taken forward by other students in the next years
- [35k downloads](#) on PyPI

More projects can be found on my github profile: [github.com/mayukhdeb](https://github.com/mayukhdeb)

## Technologies

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**Languages:** Python and a little bit of CUDA – I just learn whatever is required

**Frameworks:** PyTorch, NumPy, einops, Pandas

**Tools:** SLURM