

Mayukh Deb

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Publications

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

Jan 2025

Mayukh Deb, Mainak Deb, N. Apurva Ratan Murty

Inducing topographic structure in Vision and Language models (GPTs). Yielded brain-like functional organization, parameter efficiency and lower dimensionality.

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](#).

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

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](#), [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.

- 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)

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

Technologies

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

Frameworks: PyTorch, NumPy, einops, Pandas