



# Mayukh Deb

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## Publications

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- 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, 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

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- Vision Sciences Society, 2025 ([abstract](#), [video](#))** Jan 2025

## Education

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- 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

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- 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)

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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