Mohit Kulkarni

✉ mkulkarni@ethz.ch | ⌗ m2kulkarni | in m2kulkarni | ⌂ m2kulkarni.github.io

EDUCATION

ETH Zurich and University of Zurich	*2023-2025* (expected)
M.Sc, Neural Systems and Computation	*5.3/6*
Indian Institute of Technology, Kanpur	*2019-2023*
B.S, Mathematics and Scientific Computing. Minor in Machine Learning	*8.2/10*

TECHNICAL SKILLS

Programming: Python, C++, R   **Libraries:** Pytorch, Tensorflow, OpenCV, ROS   **Tools:** LaTeX, Git, i3wm

RELEVANT COURSES

Math	Brownian Motion and Stochastic Calculus*	Introduction to Lie Groups*	Topological Data Analysis*
	Nonlinear Dynamics and Chaos II*	Mathematics of Data Science*	Neural Network Theory*
	Linear and Abstract Algebra	Analysis: Real/Complex	ODE and PDE
CS	Data Structures and Algorithms	Statistical NLP	ML for Signal Processing

(*): Graduate Courses

EXPERIENCE

Research Assistant, Allen Institute for Neural Dynamics	*Jan 2022 – May 2023*
Research Assistant, Svoboda Lab	*Sep 2020 – Dec 2021*

Dr. Karel Svoboda

- **Project 1**: Experimented with various optimization rules to understand learning in biological and artificial networks
- **Project 2:** Built a data analysis pipeline using GCP and DataJoint to facilitate easy and scalable data manipulation
- **Project 3:** Developed recurrent neural network (RNN) models to test the hypothesis that learning involves out of manifold network reorganization of neural activity, comparing the activity reorganization to experimental data

Visiting Researcher, Imperial College London	*Jun 2021 – Nov 2021*
Prof. Dan Goodman and Dr. Friedemann Zenke (FMI, Basel)	*SNUFA* ↗

- Developed and curated two novel datasets for comprehensive evaluation of Spiking Neural Networks (SNNs). Optimized dataset structures and wrote a user-friendly library to allow researchers to employ their own algorithms.
- Converted audio data from the Librispeech ASR corpus into spike trains through the strategic utilization of HPC clusters and multiprocessing techniques, ensuring swift and efficient processing of the large-scale dataset.

SELECTED PROJECTS

Sign language Segmentation | *Course Project, Natural Language Processing*   *Paper* ↗

Prof. Ashutosh Modi, *Dept. of Computer Science and Engineering, IIT Kanpur*

- Used a semi-supervised transfer learning technique to assign pseudo-labels to unlabelled ISL data based on baseline model trained on BSL data. Analyzed videos to detect abrupt changes in movement and used them to train our model
- Our model generated features from videos using 3D Convnet (I3D). The features were combined with subtitle features and passed through a Temporal Convnet (MS-TCN) to generate changepoint modulated pseudolabels (CMPL).

Neural Turing Machines | *Course Project, Computational Cognitive Science*   *Documentation* ↗

Prof. Nisheeth Srivastava, *Dept. of Computer Science and Engineering, IIT Kanpur*

- Conducted literature review on the development of memory augmented machines and their differentiable variants
- Built upon an existing implementation of NTM to include priority & lexicographic sort and added GPU support

EXTRA-CURRICULAR ACTIVITIES

Group Leader | *Brain and Cognitive Society, IIT Kanpur*   *May 2021 – Apr 2022*

- Conducted an "Introduction and Topics in Brain Sciences" workshop, with lectures on ML/DL, RNNs, SNNs, and RL
- Led a two-tier team of 20 to conduct and organize projects in brain sciences with participation from over a 100 people

Project Mentor | *IIT Kanpur*

- **Dynamics of Life**: Mentored a group of 30 in a reading project on nonlinear dynamics and chaos in nature
- **Models of Memory**: Experimented with classical memory retrieval models like the Hopfield model and implemented neural network models of memory retrieval like NTM and MANN