SHREYAS SAMAGA

ssamaga@purdue.edu | Google Scholar | linkedin.com/in/shreyas-samaga | samagashreyas.github.io

EDUCATION

Purdue University, USA **2021 – Present**

PhD in Computer Science. Advisor Prof. Tamal Dey

Projects:

- Contributed to a foundational paper on Topological Deep Learning and its published library TopoModelX
- Proposed GRIL (Generalized Rank Invariant Landscape), a 2-parameter persistence-based vectorization which got accepted as a spotlight work at the Topology, Algebra, Geometry in ML Workshop at ICML 2023
- Proved GRIL is differentiable to build one of the first bifiltration learning pipelines resulting in D-GRIL, and showed that it can be applied to graph learning in various domains, including drug discovery
- Devised and implemented algorithms for complexes of persistence modules which can be used to compute persistent sheaf cohomology among other things (Paper)
- Proposed quasi zigzag persistence as a framework to extract topological information from spatiotemporal data and showed applications in sleep stage detection, among other domains
- Currently working on characterizing hallucination in LLMs using topological information

Indian Institute of Science Education and Research Bhopal, India **2015 – 2020**

BS-MS Dual Degree Program majoring in Mathematics. Department Gold Medalist

EXPERIENCE

Lawrence Berkeley National Laboratory, USA **Jun 2023 – Aug 2023**

- Worked on topological analysis of Zeolites (microporous crystals) using multiparameter persistent homology to capture their structure
- Used gradient based tree learning for dimensionality reduction of the Persistence Images of Zeolites to reduce the redundancy in the captured topological information

INRIA Saclay, France **May 2023 – Jun 2023**

- Proved that GRIL (Generalised Rank Invariant Landscape) is stratifiably smooth and computed the gradient

Adobe Inc., India **May 2022 – Aug 2022**

- Used the topological information present in the self-attention maps of language models like BERT, when modelled as weighted graphs, to improve the performance on GLUE Benchmark tasks by about 3%
- Explored the idea of topological distillation for self-attention maps in a teacher-student learning framework

Ethereum Foundation, Remote Work **May 2021 – Aug 2021**

- Identified critical network links that an adversarial attack could exploit to disrupt the network's functionality
- Applied TDA techniques to Eth 2.0 network to strengthen the structural and health analysis of the network

IIT Delhi, India **May 2020 – Oct 2020**

- Evaluated the effect of hypertension and diabetes on COVID-19 mortality in India using machine learning models. People with diabetes are 2.11 times more likely to have a fatal outcome
- Predicted the mortality of COVID-19 using machine learning models with an AUC-ROC of 0.92 based on non-invasive blood parameter data and published the results

AWARDS AND SCHOLARSHIPS

- NSF Travel Grant to present our work at Symposium on Computational Geometry 2023 in Dallas 2023
- Director's Gold Medal (Awarded to the student with best all-round performance through undergrad) 2020
- CNR Rao Education Foundation Prize (Awarded to the student with the highest GPA in freshman year) 2016
- INSPIRE (Awarded by Govt. Of India to students in the top one percentile in Grade XII) 2015

TECHINICAL SKILLS

Python, C++, C, R, NumPy, Pandas, Scikit-learn, PyTorch, PyTorch Geometric, Huggingface, Slurm, Linux, Git