SHREYAS SAMAGA

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EDUCATION

Purdue University, USA – Aug 2021 - Present

PhD in Computer Science. Advisor - Prof. Tamal Dey

Past projects:

- Contributed to a foundational paper on Topological Deep Learning and TopoModelX, a library for topological deep learning.
- Worked on GRIL (Generalized Rank Invariant Landscape), a 2-parameter persistence-based vectorization which got accepted as a spotlight work at the TAG-ML Workshop at ICML 2023.

Projects in progress:

- Vectorizing 2-parameter persistence in a differentiable manner for an end-to-end 2-parameter persistence homology learning pipeline.
- Using topological deep learning methods, which includes higher order networks as generalizations of graph neural networks, for learning on meshes.
- Devising an algorithm and implementing it to compute persistent sheaf cohomology.

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

BS-MS Dual Degree Program majoring in Mathematics.

- Cumulative GPA – 9.33/10 | **Department Gold Medalist** | **Director's Gold Medalist**

EXPERIENCE

Lawrence Berkeley National Laboratory, USA – June 2023 – Aug 2023

- Used gradient based tree learning to reduce the dimension of the Persistence Image vector in the topological analysis of a Zeolites dataset.

INRIA Saclay, FRANCE – May 2023 – June 2023

- Proved that GRIL (Generalised Rank Invariant Landscape), 2-parameter persistence-based vectorization, is stratifiably smooth and computed the gradient w.r.t. input bi-filtration functions. Currently working on this approach to make an end-to-end learning pipeline for 2-parameter persistence.

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. Also explored the idea of topological distillation for self-attention maps in a teacher-student learning framework.

Ethereum Foundation, Remote Work – May 2021 – Aug 2021

- Modelled the Eth2.0 Network as a metric space and used Vietoris-Rips like constructions to understand node interactions in the blockchain network and how the message about a new block that is produced is transmitted through the network.

IIT Delhi, INDIA – May 2020 – Oct 2020

- Evaluated the effect of hypertension and diabetes on COVID-19 severity and mortality in India. We found that people with diabetes are 2.46 times more likely to be severely infected and 2.11 times more likely to have a fatal outcome. This work got accepted as a journal article.
- Predicted the severity and mortality of COVID-19 using machine learning models with an AUC-ROC of 0.91 and 0.92 respectively based on non-invasive blood parameter data collected from patients and published the results.

AWARDS AND SCHOLARSHIPS

- INSPIRE (Awarded by Govt. Of India for academic excellence in Grade XII)
- CNR Rao Education Foundation Prize (Awarded to the student with the highest GPA in the first year)
- Charpak Scholarship (Awarded by the French Embassy to enable a student do summer internship in France)
- DAAD-WISE Scholarship (Awarded by the German Embassy to enable a summer internship in Germany)
- NSF Travel Grant to present our work at Symposium on Computational Geometry 2023 in Dallas, TX.