Puja **Trivedi**

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Research Interests

My research broadly focuses on **graph representation learning** and **graph neural networks (GNNs)**. I am particularly interested in improving performance of GNNs beyond "in-distribution generalization," and have tackled this challenge through the complementary lens of improving the representation expressivity, uncertainty quantification and world-knowledge awareness of GNNs. Additionally, I have experience with **vision models**, gain through my internships at Lawrence Livermore National Laboratory, and experience with **large language models (LLMs)**, gained through my internship at Amazon; where, respectively, I focused on developing finetuning protocols for large, pretrained vision models and joint GNN/LLM solutions for clustering.

Education

University of Michigan — *Ann Arbor, MI*

Ph.D. in Computer Science and Engineering — *Aug. 2019 - Dec. 2024*
- Advisor: Prof. Danai Koutra

M.S. in Computer Science — *May 2021*
- Cumulative GPA: 4.0/4.0

University of Maryland, Baltimore County — *Baltimore, MD*

B.S. in Computer Science, B.S. in Mathematics — *May 2019*
- Summa Cum Laude

Experience

Amazon — *Palo Alto, CA*

Applied Scientist Intern, Search Science and AI — *Oct. 2023 - Mar. 2024*
- *Mentors and Managers: Nurendra Choudary, Vassilis N. Ioannidis, Edward Huang*
- Developed an active learning framework for improving graph neural network (GNN) based clustering on text-attributed graphs using large language model (LLM) feedback. This framework is designed to effectively use a limited API budget and scale to large graphs. These improvements are achieved by accounting for noisy feedback through robust finetuning and prompt engineering. (Under Submission)

Adobe — *San Jose, CA*

Data Science Research Intern, Adobe Research — *May 2023 - Aug. 2023*
- *Mentor: Ryan A. Rossi*
- Developed a novel framework to refine partially observable networks using subgraph-based graph diffusion models (SGDMs). This framework samples subgraphs to learn an expressive prior over a single, large network, which then be used to selectively refine (remove extra edges or add missing edges) portions of the network by conditioning on an existing subgraph and using a "repaint" style algorithm. (ICML 2024, US Patent Pending)

Lawrence Livermore National Laboratories — *Livermore, CA*

Research Intern, Machine Intelligence Group — *Jan 2022 - May 2023*
- *Mentors: Jay J. Thiagarajan, Rushil Anirudh*
- Proposed a novel training protocol, G-ΔUQ, for improving the uncertainty quantification of GNN-based classifiers. Achieved state-of-the-art performance for calibration, out-of-distribution detection, and generalization gap prediction, under covariate and concept shifts. (ICLR 2024, ICASSP 2024)
- Performed in-depth benchmarking of finetuning protocols for pretrained vision models (ResNets/VITs trained with SimCLR, DINO, etc) to understand the role of simplicity bias for safe and generalizable model adaptation. Proposed modified protocols for improved robustness and generalizability. (ICLR 2023, spotlight)

Research Intern, Machine Intelligence Group — *May 2021 - Dec 2021*
- *Mentors: Jay J. Thiagarajan, Mark Heimann*
- Performed the first generalization analysis of self-supervised learning (SSL) for graph representation learning to formalize limitations of popular, generic graph augmentations through the lens of invariance, recoverability and separability. Proposed a synthetic benchmark to gain insights into automated augmentation methods. (NeurIPS 2022)
- Studied the behavior of scoring functions in generalization error predictors under distribution shift and data corruptions. Demonstrated that popular functions are often not viable without calibration datasets or additional trained models. Found that propensity to simplicity bias also harms error prediction performance. (ICASSP 2023)

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Selected Publications

CONFERENCES

[12] Fairness-Aware Graph Neural Networks: A Survey. Chen, A., Rossi, R.A., Park, N., **Trivedi, P.**, Wang, Y., Yu, T., Kim, S., Dernoncourt, F., and Ahmed, N.K. *ACM Trans. Knowl. Discov. Data*, 2024

[11] Forward Learning of Graph Neural Networks. Park, N., Wang, X., Simoulin, A., Yang, S., Yang, G., Rossi, R., **Trivedi, P.**, and Ahmed, N. *Proc. Int. Conf. on Learning Representations (ICLR)*, 2024

[10] PAGER: A Framework for Failure Analysis of Deep Regression Models. Thiagarajan, J.J., Narayanaswamy, V., **Trivedi, P.**, and Anirudh, R. *Proc. Int. Conf. on Machine Learning (ICML)*, 2024

[9] Accurate and Scalable Estimation of Epistemic Uncertainty for Graph Neural Networks. **Trivedi, P.**, Heimann, M., Anirudh, R., Koutra, D., and Thiagarajan, J.J. *Proc. Int. Conf. on Learning Representations (ICLR)*, 2024

[8] On Estimating Link Prediction Uncertainty using Stochastic Centering. **Trivedi, P.**, Koutra, D., and Thiagarajan, J.J. *Proc. Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP)*, 2024

[7] Editing Partially Observable Networks via Graph Diffusion Models. **Trivedi, P.**, Rossi, R.A., Arbour, D., Yu, T., Dernoncourt, F., Kim, S., Lipka, N., Park, N., Ahmed, N.K., and Koutra, D. *Proc. Int. Conf. on Machine Learning (ICML)*, 2024

[6] A Closer Look At Scoring Functions And Generalization Prediction. **Trivedi, P.**, Koutra, D., and Thiagarajan, J.J. *Proc. Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP)*, 2023

[5] A Closer Look at Model Adaptation using Feature Distortion and Simplicity Bias. **Trivedi, P.**, Koutra, D., and Thiagarajan, J.J. *Proc. Int. Conf. on Learning Representations (ICLR)*, 2023. spotlight, top 25%

[4] How do Quadratic Regularizers Prevent Catastrophic Forgetting: The Role of Interpolation. Lubana, E.S., **Trivedi, P.**, Koutra, D., and Dick, R.P. *Proc. Conf. on Lifelong Learning Agents, (CoLLAs)*, 2022

[3] Analyzing Data-Centric Properties for Graph Contrastive Learning. **Trivedi, P.**, Lubana, E.S., Heimann, M., Koutra, D., and Thiagarajan, J.J. *Proc. Adv. in Neural Information Processing Systems (NeurIPS)*, 2022

[2] Augmentations in Graph Contrastive Learning: Current Methodological Flaws & Towards Better Practices. **Trivedi, P.**, Lubana, E.S., Yan, Y., Yang, Y., and Koutra, D. *Proc. The WebConf (Formerly WWW)*, 2022

[1] Leveraging the Graph Structure of Neural Network Training Dynamics. Vahedian, F., Li, R., **Trivedi, P.**, Jin, D., and Koutra, D. *Proc. of ACM Int. Conf. on Information & Knowledge Management (CIKM)*, 2022

PREPRINTS

[2] Large Language Model Guided Graph Clustering. **Trivedi, P.**, Choudhary, N., Huang, E.W., Ioannidis, V.N., Subbian, K., and Koutra, D. *Preprint*, 2024

[1] Large Generative Graph Models. Wang, Y., Rossi, R.A., Park, N., Chen, H., Ahmed, N.K., **Trivedi, P.**, Dernoncourt, F., Koutra, D., and Derr, T. *Preprint*, 2024

Skills

Programming	Python (most frequent), C++, Bash
DL Frameworks	PyTorch (most frequent), Tensorflow, Pytorch-Geometric, DGL

Academic Service

Reviewing	ACML, NeurIPS, ICLR, TKDD, Neurocomputing, ICASSP, WebConf, KDD
PC Member	Posters and Demos Session @ CIKM, GLB @ WebConf, MLG @ KDD, DMLR @ ICML

Honors & Awards

2019	Dwight F. Benton Doctoral Fellowship
2019	Phi Beta Kappa
2019	Outstanding Graduating Senior in Computer Science and Mathematics
2015-19	Meyerhoff Scholar
2015-19	National Security Agency Scholar