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Harit Vishwakarma

Research Interests

Vision Building safe and reliable ML/AI systems for diverse tasks with minimal supervision.

Topics Fundamentals of machine learning and AI, model-assisted data-labeling, large language models, self-training, active learning, weak supervision, uncertainty quantification, conformal prediction, selective classification, out-of-distribution detection, safe and human-in-the-loop systems.

Education

2019 – 2025 **Ph.D. in Computer Science**, University of Wisconsin-Madison, WI, GPA: 3.9/4.0
Advisors: *Prof. Frederic Sala* & *Prof. Ramya Korlakai Vinayak*.

2014 – 2016 **M.E. in Computer Science**, Indian Institute of Science, Bangalore, GPA: 7.1/8.0
Advisor: *Prof. Chiranjib Bhattacharyya* Class Rank: 3/50
Thesis: Discovering Groups of Correlated Event Streams from Multi-Dimensional Point Process Data.

2008 – 2012 **B.E. in Computer Science**, G.S. Institute of Technology & Science, Indore , GPA: 76%

Research Papers

In Submission **Monty Hall and Optimized Conformal Prediction to Improve Decision-Making with Large Language Models**
H. Vishwakarma, A. Mishler, T. Cook, N. Dalmasso, N. Raman, S. Ganesh
NeurIPS Workshop on Statistical Frontiers in LLMs and Foundation Models, 2024
NeurIPS Workshop on Open-World Agents, 2024
Under Review, 2024.

In Submission **PabLO: Improving Semi-Supervised Learning with Pseudolabeling Optimization**
Harit Vishwakarma, Yi Chen*, Srinath Namburi*, Sui Jiet Tay, Ramya K. Vinayak, Fred Sala
NeurIPS Workshop on Self-Supervised Learning - Theory and Practice, 2024
Under Review, 2024

In Submission **Improving FPR Control in OOD Detection with Learnable Score Functions and Human-in-the-Loop**
Daisuke Yamada, Harit Vishwakarma, Ramya K. Vinayak
Under Review, 2024.

NeurIPS '24 **Pearls from Pebbles: Improved Confidence Functions for Auto-labeling**
Harit Vishwakarma, Yi Chen, Sui Jiet Tay, Srinath Namburi, Fred Sala, Ramya K. Vinayak
Neural Information Processing Systems (NeurIPS), 2024.

NeurIPS '24 **OTTER: Improving Zero-Shot Classification via Optimal Transport**
Changho Shin, Jitian Zhao, Sonia Cromp, Harit Vishwakarma, Fred Sala
Neural Information Processing Systems (NeurIPS), 2024.

AISTATS '24 **Taming False Positives in Out-of-Distribution Detection with Human Feedback**
Harit Vishwakarma, Heguang Lin, Ramya Korlakai Vinayak
International Conference on Artificial Intelligence and Statistics (AISTATS), 2024.

NeurIPS '23 **Promises and Pitfalls of Threshold-based Auto-labeling**
Harit Vishwakarma, Heguang Lin, Fred Sala, Ramya Korlakai Vinayak
Neural Information Processing Systems (NeurIPS), 2023 ***(Spotlight)***.

NeurIPS '23 **Train 'n Trade: Foundations of Parameter Markets**
Tzu-Heng Huang, Harit Vishwakarma, Fred Sala
Neural Information Processing Systems (NeurIPS), 2023.

ICLR WS '23 **ScriptoriumWS: A Code Generation Assistant for Weak Supervision**
T. Huang, C. Cao, S. Schoenberg, H. Vishwakarma, N. Roberts, F. Sala
Workshop on Deep Learning for Code (DL4C), ICLR, '23.

NeurIPS '22 **Lifting Weak Supervision to Structured Prediction**
Harit Vishwakarma, Nick Roberts, Fred Sala
Neural Information Processing Systems (NeurIPS), 2022.

ICLR '22 **Universalizing Weak Supervision**
Changho Shin, Winfred Li, Harit Vishwakarma, Nick Roberts, Fred Sala
International Conference on Learning Representations (ICLR), 2022.

NeurIPS '20 **Optimal Lottery Tickets via Subset-Sum: Logarithmic Over-param. is Sufficient**
Ankit Pensia, Shashank Rajput, Alliot Nagle, Harit Vishwakarma, Dimitris Papailiopoulos
Neural Information Processing Systems (NeurIPS), 2020 ***(Spotlight)****.*

NeurIPS '20 **Attack of the Tails: Yes, you Really Can Backdoor Federated Learning**
H. Wang, K. Sreenivasan, S. Rajput, H. Vishwakarma, S. Agarwal, J. Sohn, K. Lee, D. Papailiopoulos
Neural Information Processing Systems (NeurIPS), 2020.

NeurIPS '19 **Quantum Embedding of Knowledge for Reasoning**
D. Garg, S. Ikbal, S. K Srivastava, H. Vishwakarma, H. Karnam, L. V. Subramaniam
Neural Information Processing Systems (NeurIPS), 2019.

ACM-HT '18 **Know Thy Neighbors, and More! Studying the Role of Context in Entity Recommendation**, Sumit Bhatia, Harit Vishwakarma
ACM Conference on HyperText and Social Media (HT), 2018 ***(Best Paper Nominee)****.*

D4GX '17 **An End-To-End Machine Learning Pipeline That Ensures Fairness Policies**
S. Shaikh, H. Vishwakarma, S. Mehta, K. R. Varshney, K. N. Ramamurthy, D. Wei
Bloomberg Data for Goods Exchange (D4GX), 2017.

Blog Posts

Blog 2023 **Aggregating Foundation Model Objects**
Harit Vishwakarma, Fred Sala
https://harit7.github.io/posts/2023/06/lifting-ws/

Theses

IISc, 2016 **Discovering Groups of Correlated Event Streams from Multi-Dimensional Point Process Data** M.E. Thesis, Advisor: *Prof. Chiranjib Bhattacharyya.*

Work Experience

Summer 2024 **Research Intern**, *JPMorgan AI Research*, New York, U.S.
Worked on uncertainty quantification for LLMs.

Summer 2021 **Applied Scientist Intern**, *Amazon Alexa*, Seattle, U.S.
Developed new method for learning entity embeddings based on multi-view representation learning. The new embeddings improved performance on entity matching task on a collection of songs. Also showed some of the pitfalls of embeddings obtained from BERT language model and showed that the new method overcomes these issues.

2016 – 2019 **Research Engineer**, *IBM Research, Bangalore*, India.

Contributed to novel research directions on contextual entity retrieval, neuro-symbolic reasoning with structured and unstructured data. In the former, we showed that combining graph and text information improves retrieval performance and in the latter we proposed quantum embeddings and showed their effectiveness in reasoning tasks. These works led to successful publications and integration with the org's reasoning product.

Summer 2015 **Research Intern**, *Flipkart, Bangalore*, India.

Identified key features that influence users' purchase decisions with-in a session and across sessions. These features helped in understanding sessions and developing a highly accurate purchase prediction model based on them. Later, modeled the transaction data using Hawkes Process to identify the interaction among product categories and based on this built a bundle recommendation system.

2012–2014 **Software Engineer**, *Ittiam Systems, Bangalore*, India.

Developed various back-end modules (in Java) and the work-flow management for cloud based Video Transcoding and Live Streaming Service (FarmOTT). Led the development of an efficient media transcoding engine (in C) and integrated several proprietary and open-source AV codecs.

Awards/Achievements

2022 Top reviewer for NeurIPS.

2023 NeurIPS Scholar Award for years 2019, 2022 and 2023.

2018 **Best paper nominee** in ACM HyperText.

2018 ACM HyperText Ted Nelson Newcomer Award. Awarded to the best paper by new authors.

2014 Scholarship from the Ministry of Human Resources & Development, India for graduate studies.

2014 All India Rank 155 (top 0.1%) in GATE – national level exam for grad schools in India.[$]

2011 Won several prizes in national level software development events organized by IITs.

2008 Merit-cum-Means scholarship from the Central Govt. of India for undergraduate studies

2008 State Rank 113 (top 0.1%) in state engineering entrance test (MP-PET)[$].

$ Fully self-taught with no professional coaching or teachers and minimal resources.

Talks

Mar, 2024 *Improved Confidence Functions for Auto-labeling*, IFDS Seminar, UW-Madison.

Nov, 2023 *Promises and Pitfalls of Threshold-based Auto-labeling*, MLOPT Seminar, UW-Madison.

Feb, 2023 *Promises and Pitfalls of Threshold-based Auto-labeling*, IFDS Seminar, UW-Madison.

Oct, 2023 *Human-in-the-Loop Out-of-Distribution Detection with False Positive Rate Control*, IFDS Seminar, UW-Madison.

Programming Skills

Proficient Python, Java, C/C++, PyTorch, Tensorflow, Apache Spark.

Familiar Javascript, SQL.

Service and Organization

2021 – Now Served as reviewer for NeurIPS, ICML, ICLR, AISTATS, AAAI, TMLR, DMLR.

2023 Organized a reading group on ML theory.

2016 Organized machine learning competition during CSA Open days at IISc.

2012 Organized coding competitions in undergraduate techfest.