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Hamed Mahdavi

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Education

Ph.D. Computer Science and Engineering **Jan 2022 - Now**
Pennsylvania State University
State College, PA

Advisor: Prof. Vasant Honavar
Thesis: To be determined

M.Sc. Artificial Intelligence **Sep 2017 - Dec 2020**
Sharif University of Technology
Tehran, Iran

Advisor: Prof. Hamid Beygi
Thesis: Approximate Inference in Probabilistic Network Models

B.Sc. Computer Engineering **Sep 2012 - Sep 2017**
Sharif University of Technology
Tehran, Iran

Advisor: Prof. Hossein Sameti
Thesis: A Survey On Speech Enhancement Algorithms

Skills

Programming	Python, Java, C, C#, Scala, Git, LaTeX, Matlab,
ML Tools	PyTorch, PyTorch Geometric, HuggingFace, scikit-learn, NumPy, SciPy, Pandas,
Development Tools	Python Django, Play Framework, SQL, Bootstrap
Communication	English (fluent)
Other	Github, Microsoft Office

Professional and Academic Experience

Research Assistant **Jan 2022 - Present**
Pennsylvania State University *State College, PA*

- Collaborating with Prof. Honavar to develop machine learning models that generalize well on molecules that contain rare elements or combinations.
- Developing graph neural network models specific for molecules using PyTorch Geometric library.

Data-scientist Intern **Jun 2023 - Aug 2023**
Arconic Technology Center *New Kensington, PA*

- I worked in the Fabrication Technology group under the supervision of Martin Marinack. I tackled several data-driven optimization problems during my internship to enhance and optimize Arconic's fabrication processes such as welding, rolling, and casting.

Teaching Assistant **Jan 2022 - Present**
Pennsylvania State University *State College, PA*

- Taught the recitation classes for Discrete Math and Introduction to Computation Theory, Data Structures and Algorithms.
- Collaborated in grading assignments and exams for Discrete Math and Introduction to Computation Theory.

Research Assistant **Sep 2017 - Dec 2020**
Sharif University of Technology *Tehran, Iran*

- Collaborated with Prof. Hamid Beygi to develop a novel graph neural network model for meaningful social media network representations, incorporating probabilistic machine learning models and graph neural network-based approaches.
- Collaborated with Naeemeh Omidvar and Prof. Maddahali on a novel distributed optimization approach, merging zeroth and first-order gradients, and implemented it using Ray framework and PyTorch. Evaluated performance in a real distributed environment on remote machines alongside other algorithms.

Research Intern **Aug 2018 - Jan 2019**
Max Planck Institute for Software Systems *Saarbrücken, Germany*

- Worked on fundamental aspects of reinforcement learning. Our main focus was on multi-agent, adversarial and human-centered reinforcement learning.
- Studied the problem of designing an AI agent that can robustly cooperate with agents of unknown type. The project was inspired by real-world applications in which an AI agent, e.g., a virtual assistant, has to cooperate with new types of agents/users after its deployment.

Software Engineer Intern **Jul 2017 - Sep 2017**
Faragostar *Tehran, Iran*

- Developed a compression algorithm that allowed Faragostar to save all of their official documentation while minimizing the storage space needed.
- Configured the infrastructure for a search engine tool known as Elasticsearch, which allowed for more efficient and complex searches to be performed in their app when compared to the simple SQL query search tool that it replaced.

Mathematical Olympiad Teacher **Oct 2012 - Apr 2013**
Allameh Helli Highschool *Tehran, Iran*

- Allameh Helli is a school for the academically gifted and, as a Mathematical Olympiad Teacher, I was responsible for teaching Number Theory.

Publications

- A. Ghosh, S. Tschiatschek, H. Mahdavi, and A. Singla, "Towards Deployment of Robust AI Agents for Human-Machine Partnerships," In *AAMAS*, 2020.
- Naeimeh Omidvar, Mohammad Ali Maddah-Ali, Hamed Mahdavi: "A Hybrid-Order Distributed SGD Method for Non-Convex Optimization to Balance Communication Overhead, Computational Complexity, and Convergence Rate", 2020; arXiv:2003.12423.

Projects

Elemental Features Improve Out-of distribution Potential Energy Prediction **May 2022**
Research Project
Pennsylvania State University

- Studied the generalization properties of elemental embeddings in geometric GNNs for molecules.
- Demonstrated enhanced model performance by incorporating element features in the out-of-distribution scenario.

Studying the Effect of Sample Permutations in In-context Learning **Apr 2022**
Deep Learning for NLP Course Project
Pennsylvania State University

- Demonstrated the impact of example permutation on class decision boundaries in in-context classification tasks using GPT2-XL and GPT3.
- Proposed two solutions for enhancing in-context learning based on empirical findings.

Dirichlet Variational Graph Autoencoder **November 2020**
Research Project
Pennsylvania State University

- Applied Dirichlet distribution to design a graph neural network that learns interpretable embeddings for the nodes in social networks.
- Developed amortized inference algorithm for the model. This was a part of my master thesis.