Sina Malakouti

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Legal status in the US: Permanent Resident (Green Card holder)

Education

University of Pittsburgh Aug 2020 - Oct 2025
PhD in Computer Science *Pittsburgh, PA*

· Advisor: Adriana Kovashka

Amirkabir University of Technology Sep 2015 - May 2020
B.Sc. in Software Engineering *Tehran, Iran*

· Advisors: Maryam Amir Haeri and Saeedeh Momtazi

Related Coursework Computer Vision, Natural Language Processing, Machine Learning, Linear Algebra, AI, Statistics, Algorithms & Data Structures, Database Design

Interests

Computer Vision Multimodal Learning Foundational Models (LLM, Vision-Language) Generative AI Robustness

Publications

· *Benchmarking VLMs' Reasoning About Persuasive Atypical Images*, Under Review
· *Incorporating Geo-Diverse Knowledge into Prompting for Increased Geographical Robustness in Object Recognition*, **CVPR'24**
· *Semi-Supervised Domain Generalization for Object Detection via Language-Guided Feature Alignment*, **BMVC'23**
· *A MuST for Consistency Regularization in Semi-Supervised Medical Image Segmentation*
· *DeepTreeNetworks: A New Symbolic Deep Architecture,* DeCoDeML workshop, **ECML PKDD'19**

Presentations & Talks

· *(Invited Talk)* Introduction to Labeled-Efficient Deep Learning Approaches, From Few to None: Exploring Few-Shot, One-Shot, and Zero-Shot Deep Learning in Clinical Settings tutorial, **BHI'23**
· *DeepTreeNetworks: A New Symbolic Deep Architecture. DeCoDeML workshop,* ***ECML PKDD'19***

Technical Skills

Programming Languages	Python, Java , MATLAB, SQL, C/C++, R
ML & Deep Learning	PyTorch, DL4j, Scikit-learn, Weka, Keras, Tensorflow, Numpy, Pandas
Big data	Hadoop, Spark
Web Programming	JavaScript, Vue.js, Node.js, Express.js, jQuery, HTML/CSS, Flask, Jetty
Database	MySQL, MongoDB, SQLite
Misc	Data Engineering and Cleaning, Object Oriented, MVC, Problem-Solving

Experience

Graduate Research Assistant Aug 2020 - Present
University of Pittsburgh *Pittsburgh, PA*

· Researching on making ML methods more **robust** and capable of understanding and **reasoning** about complex visual scenes with a focus on **vision-language** and **large language models**.

Applied Scientist Intern May 2024 - Sep 2024
Prime Video, Amazon *New York, NY*

· Pioneered exploration of multimodal data (text and images) for content understanding and duplicate detection. Developed two methods of CLIP-like model with novel data fusion and InternVL/Claude-3 with chain-of-thought reasoning, achieving sota results and highlighting limitations, future possibilities and improvements.

Applied Research Intern May 2023 - Aug 2023
Search Science, eBay *San Jose, CA*

· Employed **vision-language models (CLIP)** and a novel **transformer-based Mixture-of-Modality-Experts fusion** model, significantly boosting results on search and ranking tasks. *To be submitted*

Machine Learning Image Processing Intern May 2022 - September 2022
Image Signal Processing (ISP), Apple *Cupertino, CA*

· Developed efficient models for computer vision and Image Processing tasks, achieving enhanced performance and efficiency over state-of-the-art methods and baselines. **Python**, **PyTorch**, and **Matlab**.

Machine Learning Research Assistant, Intern July 2018 - Sep 2019
Johannes Gutenberg University *Mainz, Germany*

· Proposed a novel efficient symbolic deep architecture with differentiable decision trees, achieving superior performance on imbalanced data. **Java**, **DL4j**, **Weka**

Machine Learning Engineer, Intern June 2019 - Sep 2019
Shahid Rajaei Hospital & Research Center *Tehran, Iran*

· Developed ML pipeline, predicting pulmonary complication with 20% improvement. **Python**, **scikit-learn**, **Flask**.

Selected Projects

- **Improved abstract reasoning and spatial reasoning for Diffusion Models** Fall 2024- ongoing
PyTorch, Generative AI, Diffusion Models, Reasoning

· We are investigating spatial reasoning and awareness of text-to-image diffusion models to understand abstract concepts and accurately represent objects, their attributes and relations.

- **Multi-Modal Reasoning for Understanding Advertisement Images** Under Review
PyTorch, Large Language Models (LLM), Multimodal Large Language Modeling (MLLM)

· Benchmarked 3 novel tasks and proposed a novel semantically hard negative generation method to assess MLLM (e.g., LLaVA, InternVL, InstructBLIP, GPT4-V) understanding of complex visual reasoning data. Developed an atypicality-aware verbalization strategy that mitigates MLLM's lack of reasoning ability, significantly improving ad image understanding in a zero-shot manner.

- **Domain Robustness with Soft Prompting in Vision-Language Object Recognition** CVPR'24
LLM, Parameter Efficient Finetuning (PEFT), Domain Robustness, Vision-Language Models (VLM)

· Proposed a novel distillation-based approach leveraging LLMs' extensive world knowledge to learn generalized soft prompts in a few-shot manner, enhancing cross-geography generalization.

- **Cross-Domain Descriptive Multi-Scale Learning for Object Detection** BMVC'23
Contrastive Learning, Vision-Language Pre-training (VLP), Domain Robustness, Object Detection

· Developed a novel multi-scale method by proposing a contrastive consistency objective to enforce descriptive consistency in the language feature space, preserving essential semantic information and improving object detection performance by up to 12%.

- **MuST for Semi-Supervised Medical Image segmentation**
Python, PyTorch, Data Augmentation, Consistency Regularization, Semantic Segmentation

· Proposed a novel consistency regularization framework for brain lesion segmentation with feature-space augmentation. Achieved novel performance by only having 3% labeled data.

Professional Services

Conference Reviewer: IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024
European Conference on Computer Vision (ECCV), 2024
Winter Conference on Applications of Computer Vision (WACV), (2022, 2024-2025)
Empirical Methods in Natural Language Processing (EMNLP), 2022
Association for the Advancement of Artificial Intelligence (AAAI), 2024

Honors & Awards

· Department of Computer Science Travel Award, University of Pittsburgh (2023)
· Full SCI Fellowship, University of Pittsburgh (2020)
· Honored as an outstanding student, Amirkabir University of Technology (2015-2020)

Extra Curricular & Leadership

President of Student Scientific Chapter Jan 2017 - March 2018
Computer Engineering, Amirkabir University of Technology *Tehran, Iran*

· Organized 70+ national and international contests, talks, and workshops in collaboration with Technische Universität München, Germany, and KTH Royal Institute of Technology, Sweden.