Ahmad **Mohammadshirazi**

Senior Machine Learning Applied Scientist

Ph.D. Candidate in Computer Science

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"Be the change that you want to see in the world."

Summary

Ahmad Mohammadshirazi is a dedicated Ph.D. candidate in Computer Science and Engineering at The Ohio State University, specializing in **Time Series, Large Language Models (LLMs), Vision Language Models (VLMs), and Multimodal Models** under the guidance of Professor Rajiv Ramnath. His research introduces innovative architectures that bridge the gap between vision and language understanding, particularly focused on **document processing, time series prediction, and smart mobility** applications. Through advanced attention mechanisms and feature fusion strategies, his work demonstrates a consistent ability to create computationally efficient solutions that achieve state-of-the-art performance. With **11 papers** accepted or under review at prestigious conferences such as **ICML and SIGKDD**, he is also a reviewer for conferences like **SIGKDD (2024–2025), ICLM 2024, and CVPR 2025**, reflecting his commitment to advancing the field of computer vision and machine learning.

Education

PhD. Candidate in Computer Science and Engineering

Columbus, Ohio

The Ohio State University — *August 2020 - Present*

- **Supervisor:** Prof. Rajiv Ramnath
- **Large Language and Vision Models:** Designing state-of-the-art multimodal architectures leveraging LLMs and VLMs for document understanding and visual question answering. Research includes transformer-based architectures like DLaVA that combine visual features and text embeddings through advanced attention mechanisms.
- **Multimodal Vision-Language Systems:** Creating advanced neural architectures that combine multiple modalities through innovative pre-training and fusion techniques. Work includes integrating visual embeddings, sequential data, and textual information using cross-modal attention mechanisms and feature fusion strategies for enhanced document understanding and real-world applications.
- **Time Series Prediction and Sequential Modeling:** Developing novel architectures integrating physics-based state-space models with deep learning. Research includes Decomposition State-Space RNN (DSSRNN) and Fourier-enhanced models that outperform traditional transformer-based approaches in temporal prediction tasks.
- **Smart Mobility Research:** Developing transformer-based architectures for intelligent transportation applications using heterogeneous data sources. Research includes advanced deep learning models like CrashFormer that combine historical patterns, geographical information, and demographic data for improved traffic safety and mobility planning.

Papers (Selected)

Advancing Multimodal Large Language Models for Seamless and Diverse Video Generation

Under Submition

Ahmad Mohammadshirazi, Pinaki Prasad Guha Neogi, Ser-Nam Lim, Rajiv Ramnath — *2025*

DLaVA: Document Language and Vision Assistant for Answer Localization with Enhanced Interpretability and Trustworthiness

Under Review - CVPR

Ahmad Mohammadshirazi, Pinaki Prasad Guha Neogi, Ser-Nam Lim, Rajiv Ramnath — *2025*

DSSRNN: Decomposition-Enhanced State-Space Recurrent Neural Network for Time-Series Analysis

Under Review - ICML

Ahmad Mohammadshirazi, Ali Nosratifiroozsalari, Rajiv Ramnath — *2025*

A Comprehensive Multi-Modal Framework for Traffic Event Prediction

Under Review - ICML

Pinaki Prasad Guha Neogi, **Ahmad Mohammadshirazi**, Rajiv Ramnath — *2025*

DocParseNet: Advanced Semantic Segmentation and OCR Embeddings for Efficient Scanned Document Annotation.

ICML

Ahmad Mohammadshirazi, Ali Nosratifiroozsalari, Mengxi Zhou, Dheeraj Kulshrestha, Rajiv Ramnath — *2024*

- ES-FoMo II 24:Efficient Systems for Foundation Models
- Vienna, Austria

Novel Physics-Based Machine-Learning Models for Indoor Air Quality Approximations *29TH ACM SIGKDD - KDD*

Ahmad Mohammadshirazi, Aida Nadafian, Amin Karimi Monsefi, Mohammad H Rafiei, Rajiv Ramnath *2023*

- MILETS 23: Mining and Learning from Time Series
- Long Beach, California, USA

CrashFormer: A Multimodal Architecture to Predict the Risk of Crash *31st ACM SIGSPATIAL*

Amin Karimi Monsefi, Pouya Shiri, **Ahmad Mohammadshirazi**, Nastaran Karimi Monsefi, Ron Davies, Sobhan Moosavi, Rajiv Ramnath *2023*

- UrbanAI 23: Proceedings of the 1st ACM SIGSPATIAL
- Hamburg, Germany

Predicting airborne pollutant concentrations and events in a commercial building using low-cost pollutant sensors and machine learning: A case study *Elsevier - Journal - Impact Factor 7.1*

Ahmad Mohammadshirazi, Vahid Ahmadi Kalkhorani, Joseph Humes, Benjamin Speno, Juliette Rike, Rajiv Ramnath, Jordan D Clark *2022*

- Journal: Building and Environment

Professional Experience

FlairSoft *Columbus, OH*

Senior Machine Learning Applied Scientist *2022 – Present*

- **Risk Analysis Project:** Designed and implemented an LLM-based model to predict the probability of land condemnation by integrating text and numerical data for comprehensive risk analysis.
- **Speech-to-Text System Development:** Denoised recorded audio using advanced multi-speaker separation and diarization techniques, fine-tuning state-of-the-art models for ATC audio data. Additionally, fine-tuned the Whisper model for speech-to-text conversion on separated audio streams and applied LLMs to incorporate vernacular data into transcripts.
- **Knowledge-Based Chatbot Development:** Created a Retrieval-Augmented Generation (RAG)-powered chatbot to provide precise answers based on user-defined files, ensuring efficient knowledge retrieval.
- **Document Annotation System:** Developed a state-of-the-art visual-language model (VLM) solution to annotate scanned documents based on user-defined keys, streamlining document processing workflows.
- **Multilingual Translation System:** Engineered a robust translation system supporting over 80 languages to facilitate global communication and accessibility.

Roysa LLC *Columbus, OH*

Chief Technology Officer *2017 – 2020*

- Led development of statistical and ML models for experimental data analysis
- Optimized emergency room spending models for health insurance providers
- Orchestrated comprehensive data pipeline including mining, enrichment, and feature extraction
- Spearheaded research initiatives in food production optimization

Sabz Gostar Darma Inc. *Tehran, Iran*

Chief Executive Officer *2012 – 2017*

- Executed strategic initiatives driving organizational growth and operational excellence
- Optimized assembly line processes to enhance production efficiency
- Led multidisciplinary team of 15 professionals across engineering and operations
- Oversaw core business operations including sales, marketing, and customer service
- Directed research laboratory activities to drive innovation

Honors & Awards

Fellowship

NSF Research Traineeship Program *Columbus, OH*

EMPOWERMENT Program – Data-Driven Sustainable Energy Systems *Jan 2021 – Dec 2022*

- Awarded a **4-semester NSF-funded fellowship** as part of the EMPOWERMENT Program, focusing on machine learning applications in sustainable energy systems.
- Conducted interdisciplinary research applying machine learning to energy systems and indoor air quality challenges.
- Published works in *Building and Environment* (Elsevier, IF: 7.1) and the *29th ACM SIGKDD Conference*.
- Developed models for renewable energy forecasting, and anomaly detection.
- Collaborated across disciplines to implement data-driven solutions for sustainability.

Patents

Earthworms Powder Machine to Feed Fish (Iran Patent #13955) — *Tehran, Iran*
Filed: Jan 2017, Issued: May 2017 — *May 2017*

Kombucha Brewing System by Application of Acidity Control (Iran Patent #85554) — *Tehran, Iran*
Filed: Nov 2014, Issued: Apr 2015 — *Apr 2015*

Teaching Experiences

Teaching Assistant

1 term	**Foundations of Programming Languages (CSE 6341)**, Instructor: Dr. Atanas (Nasko) Rountev	*Ohio State Uni./ 2025*
4 terms	**Foundations of Speech and Language Processing (CSE 5525)**, Instructor: Dr. Chris Brew	*Ohio State Uni./ 2023-24*

Instructor

4 terms	**Introduction to Probability and Statistics**,	*Azad Uni., Tehran, Iran/ 2012-14*
4 terms	**Advanced Database Systems**,	*Azad Uni., Tehran, Iran/ 2012-14*

Skills (Selected)

Machine Learning Expertise
- Python, CUDA
- Deep Learning Frameworks such as TensorFlow, Keras, Pytorch, Scikit-Learn, Transformers, Deepspeed
- Fine-Tuning and prompt tuning LLMs/VLMs (e.g., Pixtral, LLaMA, InternVL, Owen-VL) for advanced NLP tasks

Databases
- SQL (MS SQL, Oracle SQL)

Extracurricular Projects and Interests

Engaging in advanced analytical and predictive modeling for stock markets using diverse data sources, including **textual data** (e.g., Twitter API), **historical trends** of financial tickers across various time frames, and **macro- and microeconomic indicators**.