

Hossein ZareMehrjerdi

PhD Candidate in Computer Engineering | AI/ML, LLMs, Computer Vision | Agentic AI

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PROFESSIONAL SUMMARY

PhD Candidate in Computer Engineering specializing in Machine Learning, Large Language Models (LLMs), Computer Vision, and AI Systems Engineering. Experienced in designing and deploying production-grade AI systems, including Text-to-SQL platforms and multi-agent architectures. Strong background in Python, PyTorch, SQL, cloud platforms (AWS, Azure, GCP), and MLOps. Proven ability to deliver scalable AI solutions that improve workflow efficiency and enable non-technical users to interact with complex data systems.

WORK EXPERIENCE

Bayer — *Data Science & Visualization Intern*

May 2025 – Aug 2025

Chesterfield, MO

- Built AI-driven image analysis pipelines for Cell Painting to accelerate pesticide discovery and compound screening.
- **Workflow Democratization:** Reduced workflow time from **1 week to 30 minutes** by designing cloud infrastructure (AWS, Docker) with automated provisioning, democratizing access across non-technical scientists.
- **Foundation Models:** Deployed foundation-model-based pipelines (DINO, OpenFold) to extract molecular-level features, accelerating hypothesis generation for downstream biological experiments.

Corteva Agriscience — *Data Scientist Intern*

May 2024 – Aug 2024

Des Moines, IA

- **Launch LLM (Text-to-SQL):** Engineered a production Text-to-SQL system on Azure, translating natural language to SQL queries with advanced prompt engineering and RAG; achieved **~70% query accuracy** on internal benchmarks, enabling self-serve data access for non-technical stakeholders.
- Built and maintained secure data pipelines, ensuring controlled access to enterprise data without direct database exposure.
- **Corteva Chat:** Deployed an internal LLM-based enterprise chat solution on Azure to **1,000+ users** via CI/CD pipelines, ensuring scalable and secure rollout across business units.

Iowa State University — *Graduate Research Assistant*

Jan 2023 – Present

AI Institute for Resilient Agriculture (AIIRA), Ames, IA

- **Ag-LLM:** Engineered a RAG pipeline over large-scale domain corpora powering a live AI pest identification system (pest-id.las.iastate.edu), answering farmer queries across hundreds of pest species.
- **Remote Sensing & Phenotyping:** Built computer vision pipelines on UAV-based RGB imagery and canopy height data to automate trait extraction at field scale, significantly reducing expert annotation effort.
- **Research & Publications:** Co-authored 6+ publications in AI/ML, collaborating with plant scientists, biologists, and domain experts across multiple institutions.

RESEARCH PROJECTS

Bio-Shield — *Agentic AI Biosecurity System*

2025 – Present

Ames, IA

- Designing a multi-agent system for real-time identification and risk assessment of invasive insects and pests deemed dangerous to U.S. crops.
- **Agentic Architecture:** Orchestrating agentic workflows using LangGraph and LangChain, connecting specialized sub-agents via tool-calling and MCP servers.

AgReason — *LLM Reasoning Benchmark & Fine-Tuning for Agriculture*

2025

Ames, IA

- Co-developed the **first benchmark** for evaluating reasoning models on agriculture-specific tasks.
- **Dataset Curation:** Built a custom omics-grounded reasoning dataset, integrating structured biological data with scientific literature to support multi-step inference.

- **Model Fine-Tuning:** Fine-tuned reasoning models using **LoRA** (parameter-efficient fine-tuning) to adapt them to domain-specific tasks at low cost ([project page](#)).

City of Des Moines (Capital of Iowa) — *Automated Property Assessment with VLMs Sep 2025 – Present*
Des Moines, IA

- Designed an automated property assessment pipeline using Vision-Language Models for large-scale municipal infrastructure condition evaluation across the city.
- **Multi-Model Consensus:** Achieved **93% accuracy** by aggregating predictions across multiple VLMs; reduced turnaround from months to days and cut evaluation cost to **one-tenth** of the manual process.
- **Executive Presentation:** Presented findings directly to the City Manager of Des Moines, translating complex AI methodology into actionable insights for municipal leadership.

MaizeEar-SAM — *Computer Vision · Zero-Shot Phenotyping* 2023 – 2025
Ames, IA

- Developed a zero-shot maize ear phenotyping pipeline using Segment Anything Model (SAM), eliminating costly manual annotation at scale.
- Implemented graph-based algorithms for kernel counting; open-sourced at github.com/mhzarem/MaizeEar-SAM.

Large-Scale Multi-Modal Molecular Representation Learning — *Research Project* 2024 – 2025
Ames, IA

- **HPC Pipeline:** Built an HPC pipeline generating 3D molecular geometries for **2.8 billion molecules**, enabling large-scale pre-training of molecular foundation models.
- **Multi-Modal Foundation Model:** Developed a multi-modal embedding model fusing 1D SMILES, 2D graphs, and 3D conformers, improving downstream molecular property prediction.

EDUCATION

Iowa State University, Ames, IA 2023 – Expected 2026

PhD Candidate, Computer Engineering | GPA: 4.0/4.0 | Focus: AI/ML, Computer Vision, LLMs

Iowa State University, Ames, IA 2023 – 2024

M.S., Computer Engineering | GPA: 4.0/4.0

Amirkabir University of Technology, Tehran, Iran 2015 – 2020

B.S., Computer Engineering | GPA: 3.8/4.0 | Thesis: Implementation of CNN with CUDA

TECHNICAL SKILLS

Core AI Domains: Computer Vision, Natural Language Processing (NLP), Large Language Models (LLMs), Vision-Language Models (VLMs), Deep Learning, Multi-Modal Learning

Agentic AI & Orchestration: LangChain, LangGraph, MCP Servers, Multi-Agent Systems, RAG, RAGAs, LangSmith

AI/ML Frameworks: PyTorch, Hugging Face Transformers, OpenCV, Scikit-learn

Foundation & Frontier Models: Llama, Mistral, SAM, DINO, OpenFold, PEFT/LoRA fine-tuning

Cloud & MLOps: AWS, Azure, GCP, Docker, Kubernetes, CI/CD, Git

Programming Languages: Python, C++, C, Java, JavaScript, R, PHP, SQL, MATLAB, Bash

Databases & Vector Stores: PostgreSQL, MongoDB, ChromaDB, MySQL

Web & APIs: FastAPI, React, Django, Flask, REST APIs

PUBLICATIONS

- **ZareMehrjerdi, H.**, Ganguly, S., Rairdin, A., et al. “Towards Large Reasoning Models for Agriculture.” arXiv:2505.19259, 2025.
- **ZareMehrjerdi, H.**, Coffey, L., Jubery, T., et al. “MaizeEar-SAM: Zero-Shot Maize Ear Phenotyping.” arXiv:2502.13399, 2025.
- Chiranjeevi, S., **ZareMehrjerdi, H.**, et al. “TerraIncognita: A Dynamic Benchmark for Species Discovery Using Frontier Models.” arXiv:2506.03182, 2025.
- Singh, A. K., Jones, S. E., **ZareMehrjerdi, H.**, et al. “Use of Artificial Intelligence in Soybean Breeding and Production.” Advances in Agronomy, 2025.
- Hamidi Rad, R., **ZareMehrjerdi, H.**, et al. “Recommendation System over Multi-layer Complex Networks.” SAI Intelligent Systems Conference, Springer, 2023.