Hamidreza Lotfalizadeh, Ph.D.

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SUMMARY: AI/ML Engineer and researcher with 4+ years building or researching **production GenAI systems** and **ML-powered solutions**. Expertise in **distributed training**, **model optimization** (9x speedups, 6% accuracy improvements), **systems design and engineering**, and **scalable deployment**. Strong foundation in **PyTorch**, **CUDA**, **multi-GPU systems**, and **MLOps practices** for enterprise-scale applications.

EDUCATION

Purdue University - PhD in Computer Engineering Dec 2024
***Specialization**: Graph NN/ML and Distributed ML Systems*

SKILLS

Languages/Libs: Python (Proficient), C/C++ (Proficient), Java, JS, TS, SQL, Gremlin
AI/ML: PyTorch, PyG, TensorFlow, CUDA, Deep Learning, HF Transformers, Time Series Analysis, Statistical Modeling, Anomaly Detection, Numpy, Pandas, Scikit-Learn
LLM/GenAI: Fine-tuning, PEFT, LoRA, Prompt Engineering, Word Embedding, Graph Embedding, LangChain, LangGraph, Pinecone, FAISS, RAG, Anthropic Claude API
DevOps/Infra: Full-stack, Django, Flask, Node.js, MySQL, MongoDB, RESTful APIs, Docker, SLURM, Apache Spark, MQTT, CI/CD, AWS, Google Cloud Platform, Oracle Cloud Infra
Software Dev: OOP, Functional/Multithreaded/Concurrent Programming, Linux, Embedded Systems

EXPERIENCES

Postdoctoral Researcher | Indiana University Apr 2025 - present
Skills: PyTorch, PyTorch-Geometric, CUDA, GenAI, GPU Memory Optimization, SLURM, Clustering, Graph algorithms, Python

- Researching **diffusion models** for temporal graph analysis at **1M+ node scale** with time-varying structure
- Developing **distributed PyTorch-Geometric pipeline** for **multi-GPU processing**, targeting graphs exceeding single-GPU memory capacity
- Implementing **gradient checkpointing** and **dynamic batching strategies** for memory-efficient large-scale operations
- Targeting applications in disease or rumor propagation modeling and **dynamic network analysis**

Graph Systems Specialist (Part-time consulting role) | Inertia Systems, Inc. Jul 2025 - Sep 2025
Skills: LLM, Knowledge Graph, AWS Neptune, Pinecone, RAG, Gremlin, Python, JavaScript, D3.js

- Consulted the development of a **graph-based system** for automating project conflict detection and resolution
- Developed an **LLM-based PoC pipeline** to ingest (un)structured project data and extract entities and relations to construct the **Knowledge Graph**, deployed on **Amazon Neptune GraphDB** and **Pinecone VectorDB for RAG**
- Developed a **graph querying system** using **Gremlin** for enhanced operability

AI/ML Engineering Intern | Eli Lilly and Company May 2024 - Aug 2024
Skills: DevOps, Full-stack, Docker, RESTful API, D3.js, JavaScript, Python, NetworkX, AWS Cloud DB, Graph Algorithms, Graph Visualization, Cross-functional Collaboration

- Built **full-stack application** for **enterprise knowledge graph analysis** and exploration
- Designed **backend services** for handling graph queries with **4M+ nodes** with **milli-second response time**
- Optimized methods for visualizing **large-scale knowledge graphs**

Graph Embedding and Graph ML (PhD Thesis) | Purdue University Oct 2022 - Dec 2024
Skills: PyTorch, PyTorch-Geometric, CUDA, GPU memory optimization, Multi-GPU scaling, SLURM, MLFlow, Force-Directed algorithms, Graph Neural Networks

- Invented **novel graph embedding methodology** using **force-directed approach** with mathematical proof of convergence via Brouwer's fixed point theorem
- Achieved **6% improvement over state-of-the-art** on node classification and link prediction benchmarks
- Optimized algorithm from **$O(n^2)$ to O(n log n) complexity** through smart sampling, reducing computational requirements by **99.9%** for 20K-node graphs with **9x execution speedup**, enabling billion-node scalability
- Developed **runtime memory optimization library** using dynamic batch-count optimization
- Deployed models on **multi-GPU clusters using SLURM** and implemented **experiment tracking with MLFlow**

Data Science Researcher (PhD Student) | Purdue University Dec 2019 - Apr 2022

Skills: MongoDB, MQTT, Python, Numpy, Pandas, Time Series Analysis, Entropy Analysis, Anomaly Detection

- Conducted research on **time series data analysis and prediction models** for early detection of incidents in urban buildings by analyzing **IoT data**
- Built **data pipeline** for collection and analysis of **real-time IoT data via MQTT** as multivariate time series, supporting classification and prediction procedures and underscoring ML fundamentals

DDoS attack detection and mitigation | Purdue University Sep 2017 - Aug 2022

Skills: Entropy Analysis, Time Series Analysis, Anomaly Detection, RNN, CRNN, Network Security, Group Testing, C++

- Designed a **data partitioning method** and applied on network traffic data for **DDoS attack detection and mitigation**
- Used **entropy analysis** to convert the network traffic batches into **time series data**
- Developed **deep learning classification and prediction models** (RNN, CRNN, Transformer) for **anomaly detection** on the partitioned time series

PUBLICATIONS

Under the name "Hamidreza Lotfalizadeh"
https://scholar.google.com/citations?user=yPwMRpwAAAAJ