Fatemeh Doudi

Ph.D. Student in Electrical Engineering
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LinkedIn GitHub

Education

Ph.D. in Electrical Engineering
Texas A&M University Jan 2023 – Present
Advisor: Prof. Dileep Kalathil
GPA: 4.0/4.0
Selected Courses: Deep Learning, Reinforcement Learning, Convex Optimization, Advanced Optimization, Classical Analysis, Stochastic Systems, Probability for Statistics, Bandit algorithms for Learning

M.Sc. in Electrical Engineering
Sharif University of Technology Oct 2020 – Dec 2022
Advisors: Prof. F. Ashtiani, Prof. M. A. Maddah-Ali
GPA: 17.78/20
Selected Courses: Stochastic Modeling, Game Theory, Queuing Theory, Software-Defined Mobile Networks, Information Theory and Coding, Data Networks, Parallel Programming

B.Sc. in Electrical Engineering
Sharif University of Technology Sep 2015 – Dec 2019
GPA: 16.77/20

Research Interests

- Generative AI, Transformer Models, In-Context Learning
- Reinforcement Learning, Multi-Arm Bandits
- Stochastic Modeling, Queueing Theory, Game Theory

Projects

Transformers Learn Mixture of Experts In-Context
Texas A&M University Jan 2024 – Aug 2024
Supervisors: Prof. Dileep Kalathil, Prof. Debdeep Pati

- Analyzed the capabilities of transformer models in in-context learning for Mixture of Experts (MoE).
- Trained GPT-2 transformers to empirically demonstrate their ability to learn MoE.
- Implemented one-layer, one-head transformers from scratch to demonstrate the attention mechanism's expressive capabilities.
- Theoretically demonstrated the ability of attention mechanisms to represent MoE.

Exploring Large Language Models in the Electric Energy Sector
Texas A&M University Jan 2024 – Mar 2024
Supervisors: Prof. Dileep Kalathil, Prof. Le Xie
Publication Link

- Investigated the capabilities and limitations of large multimodal models for power grid management.
- Implemented Retrieval-Augmented Generation (RAG) for power system protocols using Langchain.
- Developed prompt engineering techniques with GPT-4 to detect faulty insulators in power grids.

Delay Analysis of Full Parallelization Distributed Computing: a Queueing-Network Approach
Sharif University of Technology June 2021 - Sep 2022
Supervisor: Prof. Farid Ashtiani and Prof. Mohammad Ali Maddah-Ali

- Developed a mathematical model for full parallelization in distributed computing using queuing networks.
- Created a framework to calculate the mean computational delay.
- Implemented the framework and validated its performance through simulations, showing excellent results.

Impact of Simulated Climate Data on Wind Power Prediction and Long-term Grid Planning
Texas A&M University June 2023 - Aug 2023
Supervisor: Prof. Le Xie
Presented at NAPS 2024 – Available Soon

- Evaluated the quality of climate data with a focus on spatial resolution and temporal correlation with historical records.
- Implemented Multi-Layer Perceptron (MLP) and Long Short-Term Memory (LSTM) networks for wind power prediction using climate data to assess the effectiveness of different time scales for prediction.

Skills

- **Programming:** Python, MATLAB, C/C++
- **Methodologies:** Machine Learning, Deep Learning, Generative Models, Queueing Theory

Achievements and Awards

- ECEN Merit Fellowship, Texas A&M University
- Ranked 4th in M.Sc. National Entrance Exam (20,000 participants)
- Ranked 57th in B.Sc. National Entrance Exam (180,000 participants)