Pedram Akbarian

Last updated: October 2024

✉ akbarian@utexas.edu   🏠 pedakb.github.io   ⚙ github.com/pedakb

EDUCATION

The University of Texas at Austin   Aug. 2019 – Present
Ph.D. in Electrical and Computer Engineering (GPA: 4.0/4.0)   *Austin, TX*
Advisor: Prof. Nhat Ho

University of Tehran   Sept. 2014 – May 2019
B.Sc. in Electrical Engineering (*Minor* in Computer Engineering)   *Tehran, Iran*
Thesis: "Sparse Subspace Clustering (SSC); Applications in Human Motion Segmentation"
Advisor: Prof. Babak N. Araabi

RESEARCH INTERESTS

◇ **Efficient Training and Inference for Foundation Models:** Focusing on statistical efficiency and training dynamics of Mixture of Experts (MoE) to improve scalability and performance of (large) foundation models.

◇ **Time Series Foundation Models:** Focusing on fundamental limits and methodologies to develop scalable and generalizable models for time series analysis, with a focus on improving the numerical reasoning capabilities.

RESEARCH EXPERIENCE

Research Assistant, *The University of Texas at Austin, TX*   Aug. 2019 – Present
  ◇ Theoretical and Practical Aspects of **Mixture of Experts (MoE)** in Scalable and Efficient Foundation Models

Research Intern, *Toyota InfoTech Lab, Mountain View, CA*   Jan. 2024 – Present
  ◇ Developing **time series foundation models** with a focus on scalability and efficiency to handle large-scale data.
  ◇ Enhancing the **scalability and efficiency of time series forecasting models** by integrating Mixture of Experts (MoE) into transformer and non-transformer architectures.

Research Intern, *CognitiveScale, Austin, TX*   Summer 2021
  ◇ Developed methods for **counterfactual explanations** in time series data.

HONORS AND AWARDS

  ◇ **Silver Medal** recipient in the 26th Iranian National Physics Olympiad   Sept. 2013
  ◇ **Bronze Medal** recipient in the 25th Iranian National Physics Olympiad[1]   Sept. 2012
  ◇ Recipient of the **Grant** from the **National Elites Foundation**,   Nov. 2014 – Jun. 2019
     for Silver and Bronze Medals of National Physics Olympiad and outstanding academic success

PREPRINTS

[1] **Pedram Akbarian**[*], Huy Nguyen[*], Xing Han[*], and Nhat Ho. "Quadratic Gating Functions in Mixture of Experts: A Statistical Insight". *arXiv:2410.11222* (2024). Under review.

[6] Huy Nguyen, **Pedram Akbarian**[*], Trang Pham[*], Trang Nguyen, Shujian Zhang, and Nhat Ho. "Statistical Advantages of Perturbing Cosine Router in Sparse Mixture of Experts". *arXiv:2405.14131* (2024). Under review.

[7] Fanqi Yan, Huy Nguyen, Dung Le, **Pedram Akbarian**, and Nhat Ho. "Understanding Expert Structures on Minimax Parameter Estimation in Contaminated Mixture of Experts". *arXiv:2410.12258* (2024). Under review.

---

[1]One of the three students of 10th grade who won a medal among almost 10,000 participants of 10th and 11th grades.

PUBLICATIONS

[2] **Pedram Akbarian**[*], Tongzheng Ren[*], Jiacheng Zhuo, Sujay Sanghavi, and Nhat Ho. "Improving Computational Complexity in Statistical Models with Local Curvature Information". *Proceedings of the International Conference on Machine Learning (ICML)*. 2024.

[3] Huy Nguyen, **Pedram Akbarian**, and Nhat Ho. "Is Temperature Sample Efficient for Softmax Gaussian Mixture of Experts?" *Proceedings of the International Conference on Machine Learning (ICML)*. 2024.

[4] Huy Nguyen, **Pedram Akbarian**, Trungtin Nguyen, and Nhat Ho. "A General Theory for Softmax Gating Multinomial Logistic Mixture of Experts". *Proceedings of the International Conference on Machine Learning (ICML)*. 2024.

[5] Huy Nguyen, Pedram Akbarian, Fanqi Yan, and Nhat Ho. "Statistical Perspective of Top-K Sparse Softmax Gating Mixture of Experts". *The Twelfth International Conference on Learning Representations (ICLR)*. 2024.

[8] Tina Han, Jette Henderson, **Pedram Akbarian**, and Joydeep Ghosh. "Improving Counterfactual Explanations for Time Series Classification Models in Healthcare Settings". *NeurIPS 2022 Workshop on Learning from Time Series for Health*. 2022.

(* denotes equal contribution.)

SELECTED COURSE PROJECTS

Advanced Machine Learning   Spring 2023
Supervisor: Prof. Alex Dimakis
◇ Attack Adversarial Purification with Diffusion Models: [Report]

Online Learning   Fall 2021
Supervisor: Prof. Sanjay Shakkottai
◇ Linear Bandits with Stochastic Delayed Feedback: [Slides]

Advanced Topics in Machine Learning   Spring 2021
Supervisor: Prof. Qiang Liu
◇ Self-supervised Learning via Bootstraping the Latent Space Representation: [Slides]

◇ InstaHide, Phase Retrieval, and Sparse Matrix Factorization: [Slides]

Advanced Probability   Fall 2020
Supervisor: Prof. Sanjay Shakkottai
◇ Mean-field Analysis of Two-layers Neural Networks: [Report][Slides]

Combinatorial Optimization   Fall 2020
Supervisor: Prof. Constantine Caramanis
◇ Submodular Meta-Learning: [Report]

SELECTED TEACHING EXPERIENCE (Graduate courses are indicated by [†])

Graduate Teaching Assistant, *The University of Texas at Austin*

◇ **Probability & Stochastic Processes**[†]	◇ **Statistical Machine Learning**[†]
◇ **Probability/Random Processes**	◇ **Data Science Principles**
◇ **Digital Signal Processing**	◇ **Data Science Lab**

Undergraduate Teaching Assistant, *University of Tehran*

◇ **Pattern Recognition**[†]	◇ **Statistical Inference**[†]

RELEVANT GRADUATE COURSES (Graduate courses taken during undergraduate studies are indicated by [†])

◇ **Information Theory**	Spring 2022	◇ **Online Learning**	Fall 2021
◇ **Stochastic Control Theory**	Spring 2021	◇ **Advanced Probability**	Fall 2020
◇ **Combinatorial Optimization**	Fall 2020	◇ **Theoretical Statistics**	Spring 2020
◇ **Large Scale Optimization II**	Spring 2020	◇ **Statistical Machine Learning**	Spring 2020
◇ **Probabil. & Stochastic Procs.**	Fall 2019	◇ **Convex Optimization**	Fall 2019
◇ **Stochastic Processes**[†]	Fall 2018	◇ **Pattern Recognition**[†]	Fall 2017

Professional Services

◇ Reviewer at the International Conference on Learning Representations (ICLR) 2025.
◇ Reviewer at the Association for the Advancement of Artificial Intelligence (AAAI) 2025.
◇ Reviewer at the International Conference on Artificial Intelligence and Statistics (AISTATS) 2024-2025.
◇ Reviewer at the Conference on Neural Information Processing Systems (NeurIPS) 2024.

Skills

◇ **Programming Languages:** Python (*proficient*), C/C++, SQL, MATLAB, R, LaTeX

◇ **Software and Frameworks:** PyTorch (*proficient*), TensorFlow, Hugging Face, Git

References

Available upon request.