Jifeng Song

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Research Interests

Efficient Machine Learning, Explainable AI, AI for Science

Education

University of Pittsburgh, Pittsburgh, PA 2023/9 - Present
Ph.D. student, Electrical and Computer Engineering
Advisor: Prof. Zhi-Hong Mao

Huazhong University of Science and Technology (HUST), China 2019/9 - 2023/6
B.E., Electrical Engineering and Automation | **GPA: 3.77/4**
Advisor: Prof. Xiaosheng Peng

Research Experience

Research Assistant 2023/9 - Present
Dept. of Electrical and Computer Engineering, University of Pittsburgh

- **Achieving Sparse Activation in Small Language Models with Explainable AI:**
  We propose a novel attribution metric named Corrected GxO for neuron importance assessment based on eXplainable AI to achieve sparse activation in small language models (SLMs). We demonstrate that the existing magnitude-based sparse activation cannot be well applied to SLMs, and using gradient-based attribution scores for sparse activation is a better choice. By applying a corrective term onto the existing GxO attribution metric, this approach can achieve 80% sparsification ratio on SLMs with <5% accuracy loss. Also, we present a theoretical framework supporting its superiority.

Research Assistant 2021/9 - 2023/6
School of Electrical and Electronic Engineering, Huazhong University of Science and Technology

- **Transfer Learning for Short-Term Wind Power Prediction:**
  We design a Multi-task TCN-LSTM transfer learning structure for the newly built wind farm in a wind cluster. To dynamically extract the features with high correlations from the source wind farms, we proposed a novel approach to dynamically adapt the loss weights of the multi-task transfer learning model, reducing 25% prediction error compared to the traditional method.

Publications

Conference Papers

1. Jifeng Song, Kai Huang, Xiangyu Yin, Boyuan Yang, Wei Gao. "Achieving Sparse Activation in Small Language Models." *arXiv preprint* arXiv:2406.06562. **(submitted to NeurIPS 2024)**
2. Jifeng Song, Xiaosheng Peng, Zimin Yang, Peijie Wei, Bo Wang, Zheng Wang. "A Novel Wind Power Prediction Approach for Extreme Wind Conditions Based on TCN-LSTM and Transfer Learning." *IEEE/IAS I&CPS Asia'22*.

Journal Papers

1. Jifeng Song, Xiaosheng Peng, Jiajiong Song, Zimin Yang, Bo Wang, Jianfeng Che. "MTTLA-DLW: Multi-task TCN-Bi-LSTM Transfer Learning Approach with Dynamic Loss Weights based on Feature Correlations of the Training Samples for Short-term Wind Power Prediction." *Wind Energy*, 2024. **(IF=4.0, JCR Q1)**

Public Speaking

Presentations

1. "Demand Paging towards Sparse Activation in Small Language Models." Elijah Group Meeting, Dept. of Computer Science, Carnegie Mellon University, March 2024

2. "A Novel Wind Power Prediction Approach for Extreme Wind Conditions Based on TCN-LSTM and Transfer Learning." 2022 IEEE/IAS Industrial and Commercial Power System Asia (I&CPS Asia) Conference, Shanghai, China, July 2022

Teaching Experience

Teaching:

- **Teaching Assistant, ECE0101 - Linear Circuits & Systems** Fall 2024
  Dept. of Electrical and Computer Engineering, University of Pittsburgh
- **Teaching Assistant, ECE0202 - Embedded Processors and Interfacing** Spring 2024
  Dept. of Electrical and Computer Engineering, University of Pittsburgh
- **Teaching Assistant, ECE1140 - Systems and Project Engineering** Fall 2023
  Dept. of Electrical and Computer Engineering, University of Pittsburgh
- **Teaching Assistant, ECE0401 - ECE Analytical Methods** Fall 2023
  Dept. of Electrical and Computer Engineering, University of Pittsburgh

Professional Activities

Conference Reviewer:

- IEEE/IAS Industrial and Commercial Power System Asia (I&CPS Asia) 2023

Journal Reviewer:

- IEEE Transactions on Power Systems

Honors And Awards

- Outstanding Undergraduate Thesis **(Top 3%)** HUST, 2023
- Scholarship for Academic HUST, 2022
- Scholarship for Scientific and Technological Innovation HUST, 2022

Technical Skills

- **Programming:** Python, MATLAB, C/C++, LaTeX
- **ML Frameworks:** Pytorch, TensorFlow, Keras