Proposal

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Group

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Question 1

Proposal

2 / 2 pts

- ✔ **– 0 pts** Correct
- **– 0.5 pts** Incomplete proposal format
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- **– 0.2 pts** 1 day penalty
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No questions assigned to the following page.

A Comparative Survey of Sparse Learning and Pruning Techniques in Neural Networks

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Abstract

Deep neural networks have revolutionized numerous fields, however, their exceptional capabilities often come at the cost of high computational demands and large model sizes. Sparse learning and network pruning have emerged as promising solutions to mitigate these issues by reducing model complexity while maintaining performance. In this survey we will provide a comprehensive comparative analysis of three different sparse learning and pruning techniques in neural networks.

1 Project Objectives

The primary objective of this survey is to conduct a comprehensive comparative analysis of three prominent sparse learning and pruning techniques in neural networks:

- **The Lottery Ticket hypothesis:** Investigate the existence of "winning ticket" subnetworks [1] within overparameterized models that can achieve comparable performance when trained in isolation.
- **Magnitude-Based Pruning Method:** Explore methods that simplify models by removing weights with the smallest magnitudes [2], based on the assumption that they contribute least to the network's output.
- **One-Shot Pruning Methods :** Analyze approaches that identify and prune unnecessary connections [3] at initialization before training begins, thereby reducing computational overhead.

Compare Performance: Analyze and compare the effectiveness of each method in terms of model accuracy, sparsity levels achieved, and computational efficiency.

2 Team Members and Responsibilities

- Anamika Lochab: Responsible for the analysis and implementation of the Lottery Ticket Hypothesis (LTH), summarizing methodologies and key findings, coordinating the overall project, and integrating team contributions.
- Atharva Parikh: Investigates magnitude-based pruning techniques, analyzes their effectiveness, compiles the comparative analysis across all methods, and assists in writing the survey.
- Zhizhen Yuan: Researches and implements the SNIP algorithm, performs experimental validation if applicable, analyzes results, and contributes to the practical implications section.

Project Proposal. CS 57800 Statistical Machine Learning.

No questions assigned to the following page.

3 Conclusion

By systematically comparing these prominent pruning methods, our survey will contribute to a clearer understanding of the current landscape in sparse neural network research.

References

[1] Jonathan Frankle & Michael Carbin (2019) The Lottery Ticket Hypothesis: Finding Sparse, Trainable Neural Networks. *ICLR* : https://arxiv.org/abs/1803.03635,

[2] Song Han, Jeff Pool, John Tran, & William J. Dally. (2015) Learning both weights and connections for efficient neural networks. *In Proceedings of the 28th International Conference on Neural Information Processing Systems - Volume 1 (NIPS'15)*. MIT Press, Cambridge, MA, USA, 1135–1143.

[3] Namhoon Lee, Thalaiyasingam Ajanthan & Philip H. S. Torr. (2019) SNIP: Single-shot Network Pruning based on Connection Sensitivity, *ICLR* : https://arxiv.org/abs/1810.02340