Lottery Ticket Hypothesis

Second week of machine learning workshop

Outline

- Pruning
    - Weight pruning
    - Activation (neuron) pruning
    - One-shot vs iterated pruning

- Lottery ticket hypothesis: FINDING SPARSE, TRAINABLE NEURAL NETWORKS
    - Difficulty of training sparse pruned sub-network, when initialized randomly
    - lottery ticket hypothesis: dense, randomly-initialized, feed-forward networks contain subnetworks (winning tickets) that—when trained in isolation— reach test accuracy comparable to the original network in a similar number of iterations
    - Algorithm for finding winning ticket

- Stabilizing lottery ticket hypothesis
    - Why iterative magnitude pruning fails on deeper networks?
    - How to modify lottery ticket hypothesis for working on deeper networks?
    - Two notion of stability
    - The lottery ticket hypothesis with rewinding

- Deconstructing Lottery Tickets
    - What is the effect of different masks instead of magnitude pruning?

- o Making behave like training: there is a huge amount of information in the masking which lead to good performance of pruned sub-network even at the first iteration and without training
- o Supermask: Finding sparse sub-network that performs well on the task before training; finding optimal innate structure for each task
- o Innate structure and evolution: are there optimal innate structures for each task?

References

1. Frankle, Jonathan, and Michael Carbin. "The lottery ticket hypothesis: Finding sparse, trainable neural networks." arXiv preprint arXiv:1803.03635 (2018).
2. Frankle, Jonathan, et al. "The Lottery Ticket Hypothesis at Scale." arXiv preprint arXiv:1903.01611 (2019).
3. Zhou, Hattie, et al. "Deconstructing lottery tickets: Zeros, signs, and the supermask." arXiv preprint arXiv:1905.01067 (2019).
4. Gaier, Adam, and David Ha. "Weight Agnostic Neural Networks." arXiv preprint arXiv:1906.04358 (2019).