

Universality of Winning Tickets: A Renormalization Group Perspective

ICML 2022

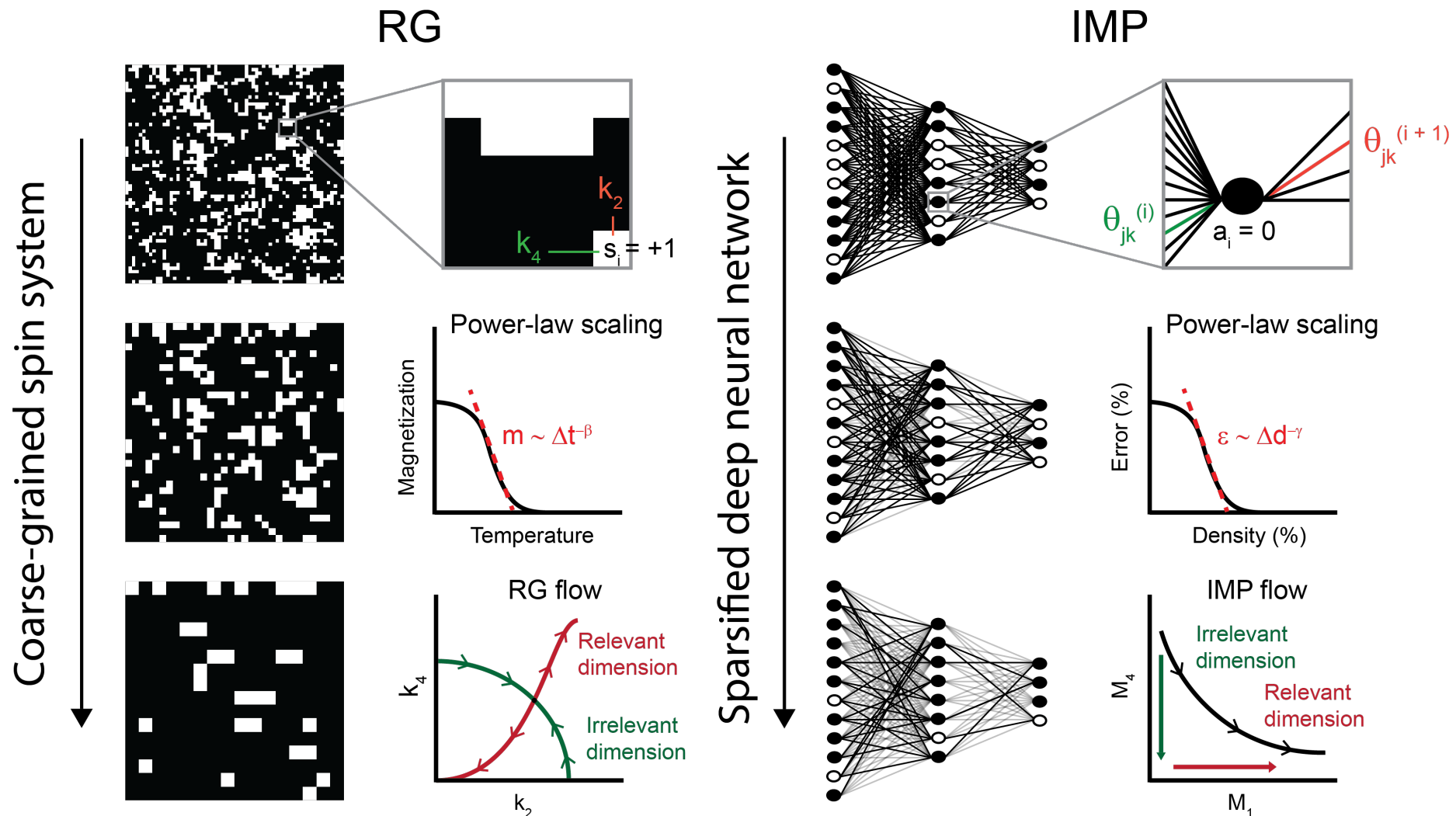
Redman, Chen, Wang, & Dogra



Corollary to Lottery Ticket Hypothesis: Winning Tickets Keep Winning

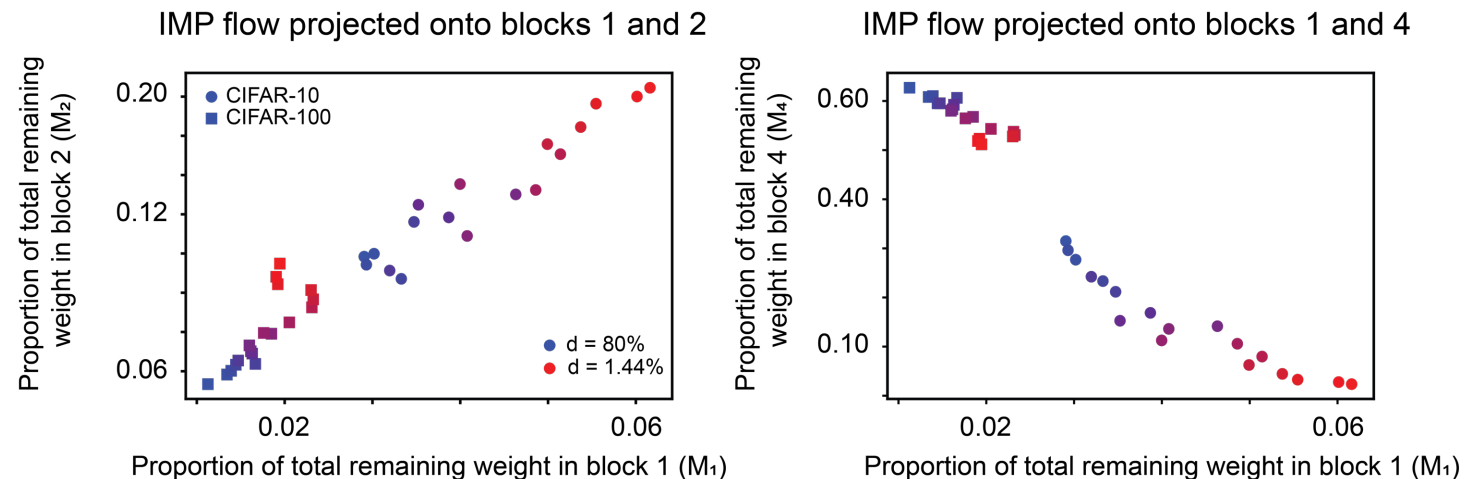
- Winning tickets (i.e. well-performing sparse subnetworks) have been found to have high performance on many tasks
- Existence of “universal” winning tickets has been proven (Burkholz et al., 2022) suggesting general phenomena
- Tools to study this universality are lacking

Iterative Magnitude Pruning (IMP) as a Renormalization Group (RG) Scheme



IMP as a Dynamic Flow

- IMP induces flow in weight space
- Can study this flow by looking at eigenvalues and eigenfunctions
- Can consider compression invariant variable $\lambda \sim c^\sigma$
- $\sigma > 0$ denotes **relevant** direction
- $\sigma < 0$ denotes **irrelevant** direction



Results

- Transferable models have the **same** relevant and irrelevant directions (ResNet-50, BERT)
- Pre-training leads to **more similar** IMP eigenvalues (ResNet-50, BERT)
- Pre-trained ResNet-50 has **dynamic** IMP flow, while pre-trained BERT has **static** IMP flow
- Smaller architectures (ResNet-14,-20) have more **homogenous IMP flow** than larger architectures (ResNet-32,-44,-56)

Outlook

- The renormalization group is a useful framework for studying winning ticket transferability
- Can likely be extended to more pruning schemes than just IMP
- Can provide a classification scheme for winning tickets and provide insight into how to best transfer winning tickets

Thank you!

Feel free to send any questions/comments to:
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