An Anatomy of Graph Neural Networks Going Deep via the Lens of Mutual Information:
Exponential Decay vs. Full Preservation
Summary

Graph Convolutional Networks (GCN) cannot benefit from using a deep architecture!

Li et al. 2018/2019, Oono et al. 2019, identified the problem as oversmoothing.

Pillar 1. Empirical Study
- How fundamental is the decomposition strategy in GraphCNN?
- Can GCN match the accuracy of ResNet empirically?

Pillar 2. Theoretical Study
- What are the benefits introduced by graph decomposition in GraphCNN, compared with GCN?
  - Mutual information exponentially decays with number of layers in GCN!
  - The regime where GCN loses information is much larger compared to that of GraphCNN!