

Homework Assignment 8

Due Date: 6pm on Tuesday April 18th

1. Reading summary (6 points)

Hamilton W L, Ying R, Leskovec J. Representation learning on graphs: Methods and applications[J]. arXiv preprint arXiv:1709.05584, 2017.

Please summarize the reading material in your own words. This exercise will help you comprehend the main objectives in the reading besides the technical details. Your summary should consist of three parts:

1. One-sentence summary
2. One-paragraph summary
3. Half-page summary

2. Questions (4 points)

Please select **Three** questions to answer from the following list, and write down **one** question that you have about reading material. Your question can be about a specific concept that is difficult to understand, a line of confusion, or something you would like to learn more about.

- What are the key ideas and challenges of representation learning methods, and how do they differ from previous methods for representing graph structures?
- What are graph representation learning methods introduced in the paper? Please briefly describe their principles and characteristics.
- What are the differences between DeepWalk and Node2vec in node embedding methods? How does this difference affect the learning performance?
- Please briefly describe the differences between Spectral-based and Spatial-based methods in graph representation learning.
- What are the differences between the convolution operation of GCN and traditional image convolution operations? Why is it necessary to redefine the convolution operation?
- What are the differences between Variational Graph Autoencoder and traditional Autoencoder?
- How to embed subgraphs, and what are the differences compared to embedding individual nodes?

Open question:

- Graph neural networks mainly focus on static graph data. How can we extend them to dynamic graph data?
- How can we ensure the interpretability of graph neural networks?