

# CPS485 - 2025 Fall - Assignment#4

**DUE DATE: No later than Dec. 8th (Mon.), 2025, 11:59 PM EST.**

## REQUIREMENTS

- Each group will hand in only **one submission**.
- **Print names of all members** are required in submissions.
- **All code is required to be runnable**.
- **All conclusions need to be rigorously defended**.
- All source code and document for each submission are required to be packed in a **ZIP file**. The name of this ZIP file is suggested to follow the format:  
`CPS485_2025_Fall_[HW NUMBER]_[MEMBER NAMES].zip`.
- All submissions will be sent to Fanchao ([fmeng@misericordia.edu](mailto:fmeng@misericordia.edu)) via **emails** or using GitHub repos. Fanchao will confirm each submission. No printed submissions.
- **Late submissions are NOT accepted** unless you have the permission from Fanchao.

## Problems (100 points in total)

1. (100 pts) **Learn Node Embedding** Consider the graph below. You are required to learn the embedding of the nodes. You must explicate what characteristics of the graph are preserved by the embedding, such as the community structure and the shortest path distances. Multiple characteristics can be considered. You also must explain in detail how you design the objectives and justify your design. Technical details of your learning are required. Please show the learning process, and analyze and evaluate your resulting embedding. You will determine the dimensionality of the embedding. Hints: (1) 3-dim embedding is fair; and (2) the spectral characteristics of the graph can be utilized to capture community structures. **You are encouraged to ask for extra credits for any work beyond the requirements.**

**K=1**

