

# Assignment-5

GMLFA (AI60007) - Autumn,2024 - IIT Kharagpur

Release Date: [31/10/2024]

Submission Date: [15/11/2024]

Total Marks: 20

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## General Instructions:

- All graded questions are compulsory to solve, and non-graded questions are optional.
  - *Negative marking* will be there as per our *plagiarism policy* given in the course webpage.
  - You can use any language for coding questions, but '*python*' is preferred.
  - Frameworks like Pytorch and Tensorflow are encouraged to construct deeper neural network architectures.
  - A sample Python notebook is provided, and you need to complete the prompts in that notebook.
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## Submission Instructions:

Following are the Deliverables and submission instructions for the assignment:

1. **Code Notebook (.ipynb):** A notebook containing all the code, including the implementation and execution of experiments. Notebook Format: `<group_number>_assignment5.ipynb`, replace `<group_number>` with your assigned group number.
2. Make sure all prompts are included in the notebook, and it runs seamlessly to produce the expected results.
3. *As this is an open-ended research problem, grading will be based on the students' best prompt design.*

## Problem Statement: Prompt Design for Graph Level Tasks using LLama

The goal of this assignment is to design suitable custom prompts for popular graph problems. Prompt Engineering has emerged as a powerful method for downstream task adaptation in Natural Language Processing. A prompt is natural language text describing the task that an AI/ML model should perform. However, suitable prompts to solve graph problems are still not explored much.

## Instruction Video -

<https://drive.google.com/file/d/1ivm9TEr7CoS4rj4a5yZq5m6h4Mx5mh9p/view?usp=sharing>

## Tutorial Link - <https://youtu.be/GKtu34EqPjA>

## Tasks:

Design custom prompts for following graph problems.

- a. Find the existence of a Cycle in a graph. **(3 Marks)**
- b. Find the degree of all nodes in a graph. **(3 Marks)**
- c. Given a graph, find a BFS sequence. **(3 Marks)**
- d. Find the vertex cover set of a given Graph. **(3 Marks)**
- e. Find the shortest path between any pair of nodes in a Graph. **(3 Marks)**
- f. Find the Minimal Spanning Tree (MST) of a given Graph. **(BONUS Problem - 5 Marks)**

Refer to <https://algs4.cs.princeton.edu/40graphs/> for the relevant algorithms of the aforementioned tasks.

Design appropriate prompts and input them into the provided **Llama LLM** to complete the tasks in the notebook. Students are encouraged to use a variety of graph types to test the effectiveness of their prompts. *We will use our test set of graphs to assess the quality of your prompts.*