

CS2040C Semester 2 2018/2019  
Data Structures and Algorithms

**Tutorial 08 - Graph DS and Traversal**  
For Week 10

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## 1 Introduction and Objective

This tutorial marks the last  $\frac{1}{3}$  of CS2040/C: Graph. We will discuss various graph data structures and on how to explore them.

The VisuAlgo pages that are used in this tutorial are <https://visualgo.net/en/graphds> and <https://visualgo.net/en/dfsbfbs>.

## 2 Tutorial 08 Questions

### Basic Stuffs About Graph DSes

Q1). (Not optional): Tutor will draw **just one random small** graph on the **whiteboard** first and ask students to store that graph in **either** Adjacency Matrix (AM)/Adjacency List (AL)/Edge List (EL) data structure on the **whiteboard**. Then, the tutorial group can compare the answers by drawing the same small graph on <https://visualgo.net/en/graphds>.

### Not-So-Basic Stuffs About Graph DSes

Q2). Draw a Directed Acyclic Graph (DAG) with  $V$  vertices and  $V \times (V - 1)/2$  directed edges.

Q3). Prove that a complete simple graph of  $V$  nodes has  ${}^V C_2$  edges (this will be frequently used as the bound of a graph algorithm's time complexity on simple graphs).

For students who have taken CS1231, do this.

For students who are currently taking or have not taken CS1231, observe the presentation of the proof.

## Graph Modeling Exercise Part 1

Q4). The tutor will randomly imagine **one** real life scenario (that can be modeled as a graph problem) and will ask random student to model that scenario into a graph. Students have to describe what the set of vertices represent, what the set of edges represent, are the graphs weighted/directed/connected?, what are the graph (for now, limit to graph traversal) problem being asked?, etc...

## DFS/BFS Review

Q5). (Not optional): The tutor will end the tutorial by quickly reviewing DFS and BFS graph traversal algorithms using <https://visualgo.net/en/dfsdfs> starting from the same randomly drawn graph post Q1). discussion. The tutor will ask some students to join the live demonstration. We will discuss harder applications of these two graph traversal algorithms in Tut09.