02-613 Week 1

Algorithms and Advanced Data Structures

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August 25, 2025

Logistics

Dates

- Midterms (7pm - 9pm):
  - Wed. Oct. 1
  - Wed. Nov. 12
- Recitations:
  - Wed. 5pm (Grad)
  - Thurs. 3pm (UG)
  - Fri. 1pm (UG)

Grading

There are two grading schemes:

- Scheme 1:
  - 20% Homework
  - 5% Recitation Participation
  - 75% Exams
- Scheme 2:
  - 100% Exams

Grading is done by module, so you can pick which scheme for each module.

Homework

- 1 Homework assignment per week
- 4-5 Oral homework in semester
- Collaboration is allowed, but no sharing answers.
- No generative AI.

Minimum Spanning Trees (MST)

- Given a graph, find a set of edges that connects all of the nodes which minimizes the total cost.
- For example, low-cost wiring of a computer network. Minimize the distance of wires between all the computers.

Graphs

- An undirected graph is defined as $G = (V, E)$, with V being the vertices (a.k.a. Nodes), and E being the edges. Vertices are a set of objects and Edges are a set of connections between objects.
  - $V = \{v_1, v_2, \ldots, v_n\}$
  - $E = \{e_1, e_2, \ldots, e_n\}$. $e \in E \ : \ e = \{u, v\}, u, v \in V$
- In an undirected graph, all edges are bidirectional. Suppose, $e_1 = \{u, v\}$, $e_2 = \{v, u\}$. In an undirected graph, $e_1 = e_2$.
- In a directed graph, edges are one-way. In this case, $e_1 \neq e_2$.

Subgraphs

Let $H = (V_H, E_H)$, a subgraph of G. This implies that $V_H \subseteq V$ and $E_H \subseteq E$. Additionally, it is required that $\forall e \in E, e = \{u, v\}$, and $u, v \in V_H$.