CSE 332 Autumn 2026
Lecture 14: Graphs 1

Ruth Anderson

http://www.cs.uw.edu/332

Announcements

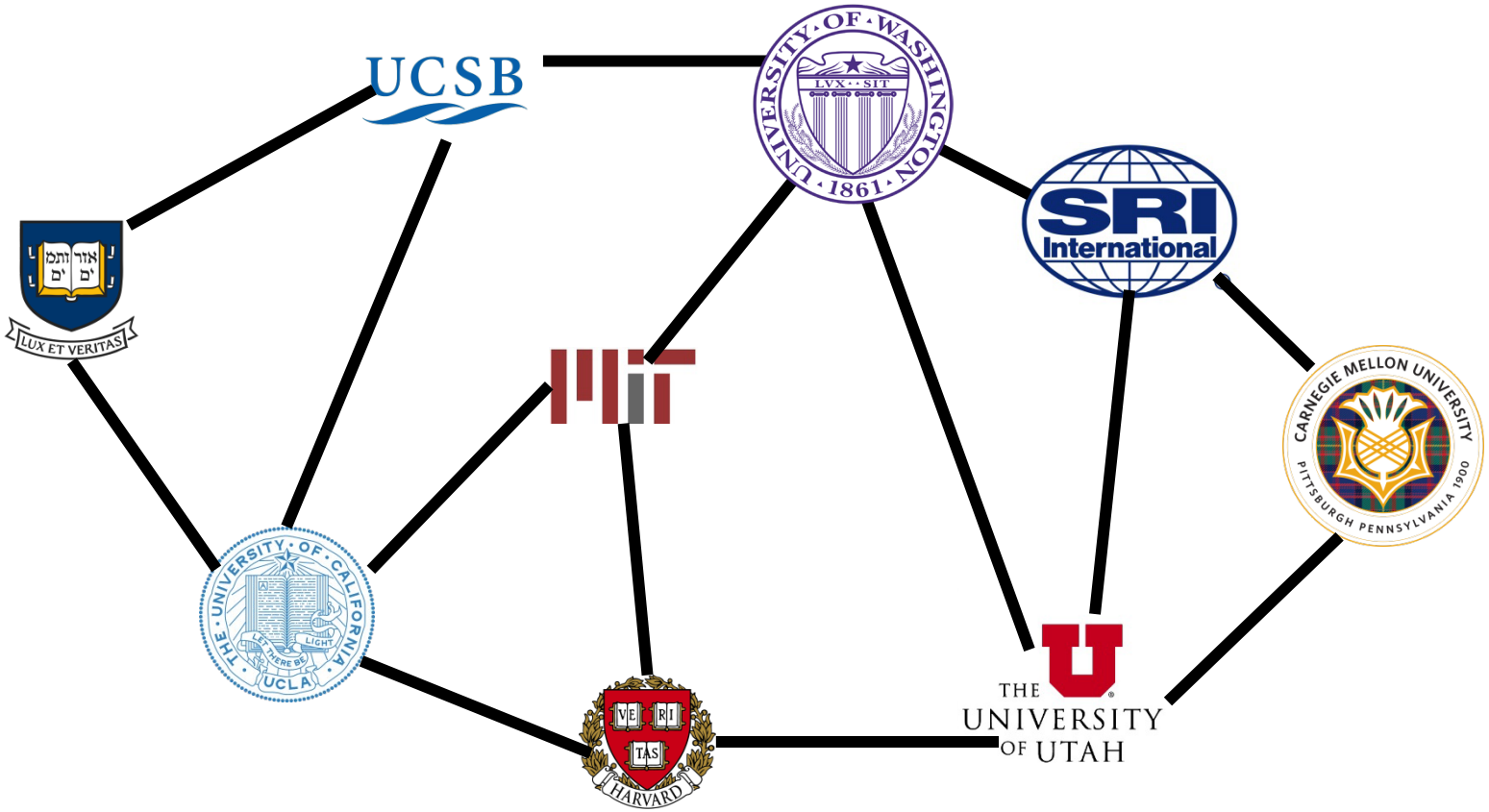
- “Meet the staff” activity – Come meet us in office hours!
  - Will keep this open thru end of week 6 (Nov 6), but will be de-prioritized in OH
- Participate in Section, earn a late day (see Ed Board post)
- Exercise 4 AVL Trees: Due TONIGHT Friday Oct 30
- Exercise 5 Hashing: Due Friday Nov 6
- Exercise 6 Sorting: Due Friday Nov 13
- Midterm: 5-6pm Monday November 9
  - Review during both lecture sections on Fri Nov 6
  - No lecture on Mon Nov 9
  - Sample exams posted! See exams page.

So far we have looked at these ADTs:

- Queues, Stacks: elements can be anything
  - enqueue, dequeue; push, pop
- Priority Queues: elements with a priority
  - insert, extract
- Dictionaries: (key, value) pairs, no duplicate keys
  - insert, find, delete

- Many data sets have **elements that relate to each other** in some way

Connecting Universities by network



ARPANET (1969: 4 nodes, 1971: 15 nodes), Internet Today: ~30 billion nodes

Undirected Graphs

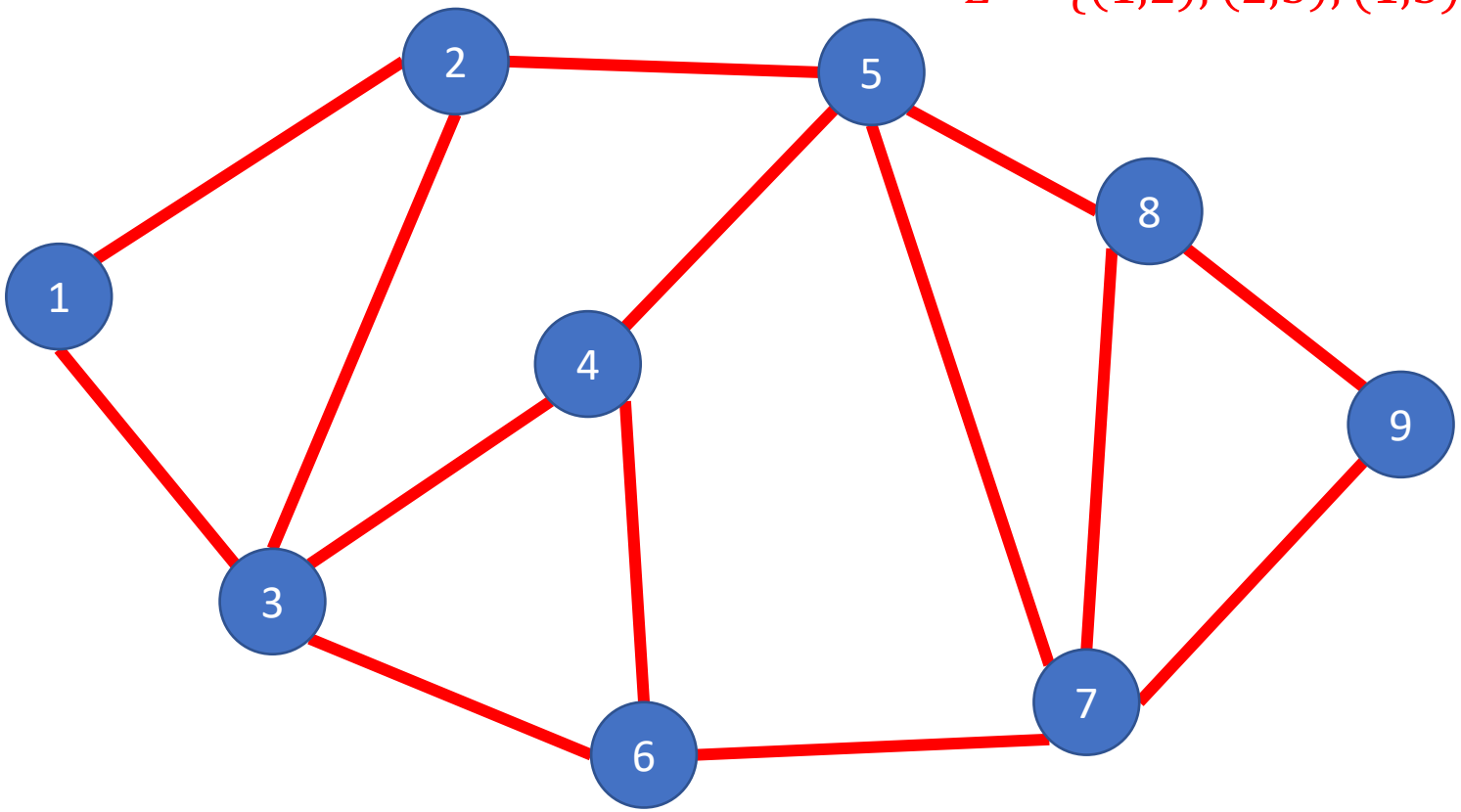
Vertices/Nodes

Definition: $G = (V, E)$

Edges

$V = \{1,2,3,4,5,6,7,8,9\}$

$E = \{(1,2), (2,3), (1,3), \dots\}$



Directed Graphs

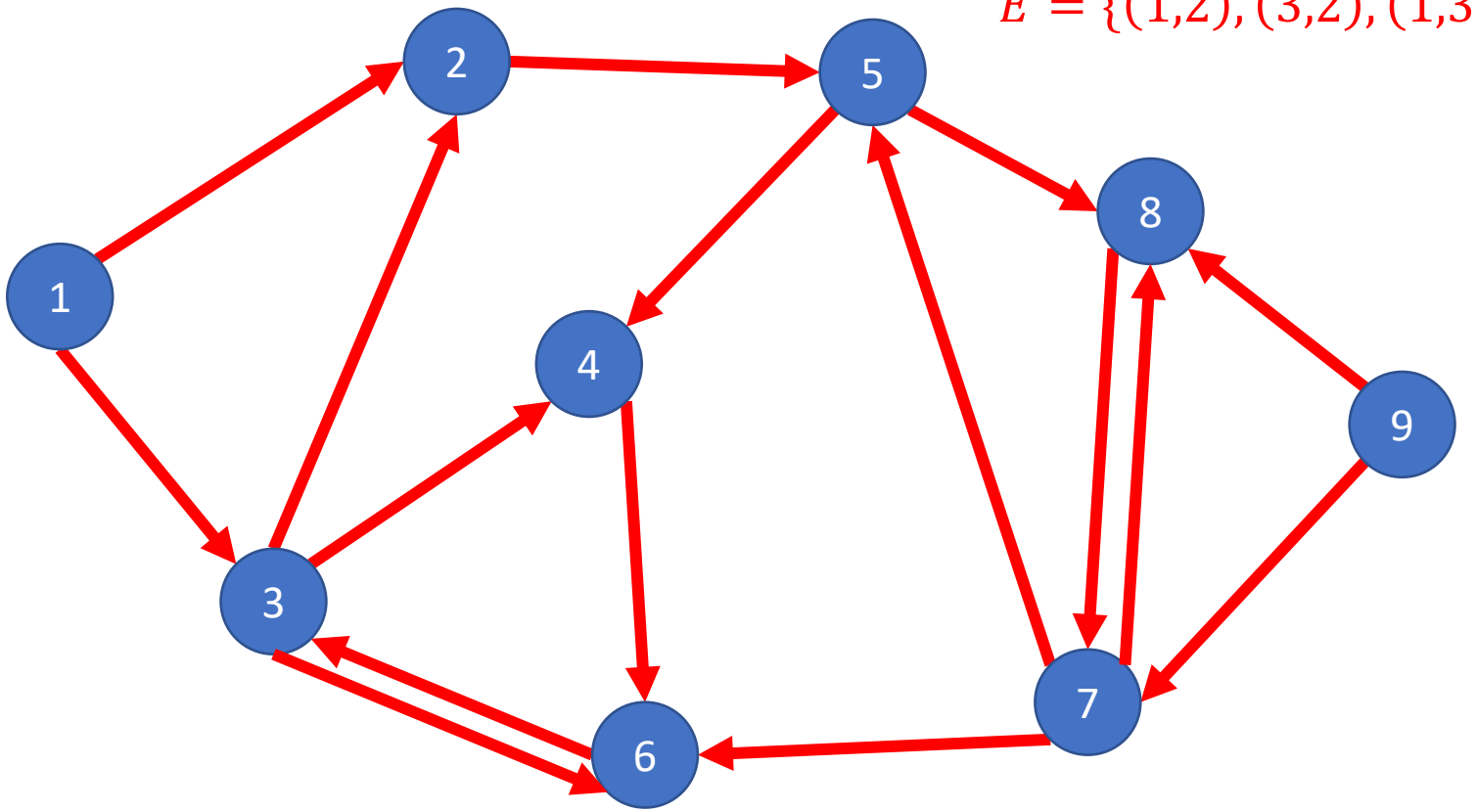
Vertices/Nodes

Definition: $G = (V, E)$

Edges

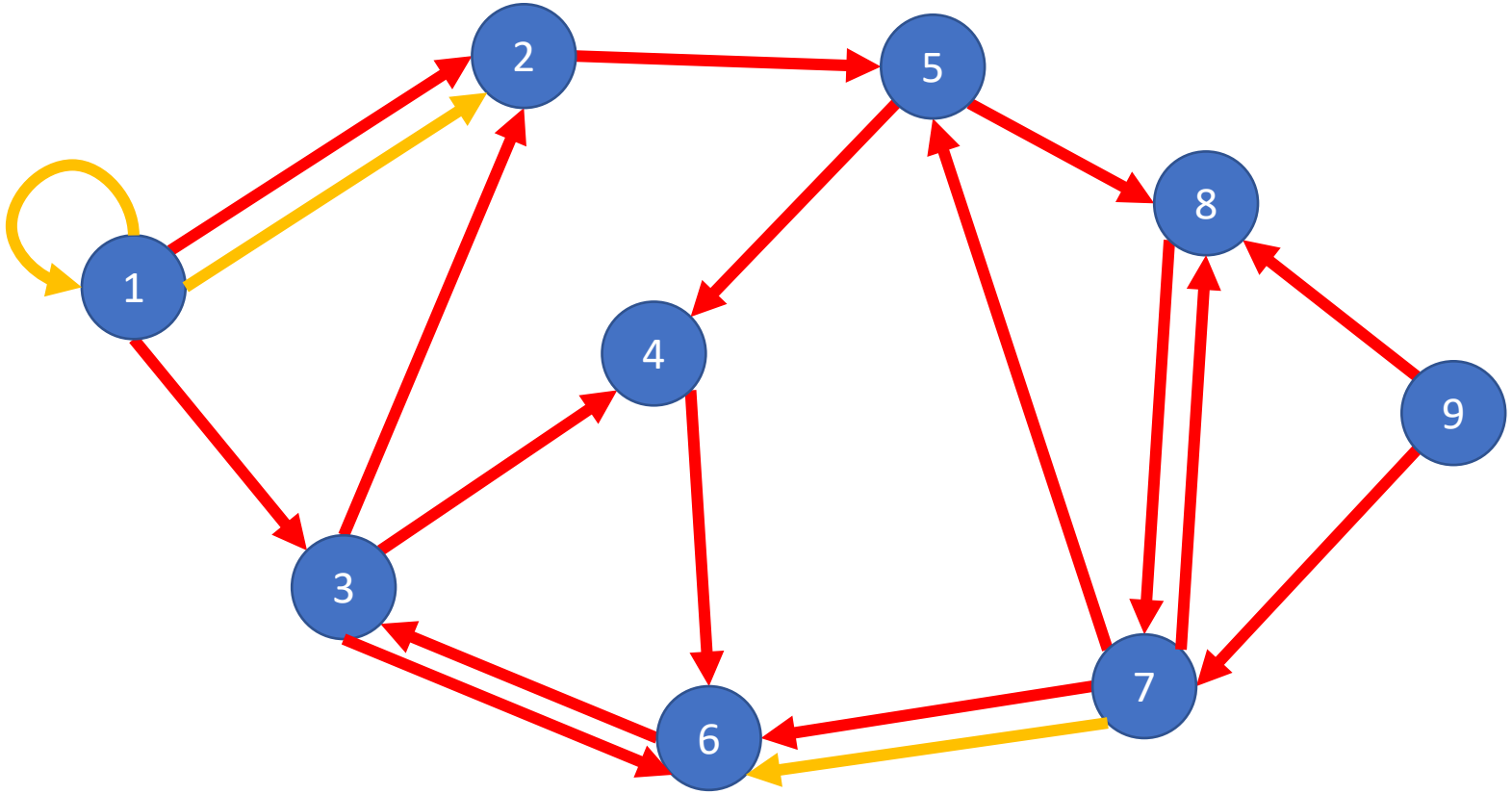
$V = \{1,2,3,4,5,6,7,8,9\}$

$E = \{(1,2), (3,2), (1,3), (3,6), (6,3) \ldots\}$



Self-Edges and Duplicate Edges

Some graphs may have duplicate edges (e.g. here we have the edge (1,2) twice).
Some may also have self-edges/loops (e.g. here there is an edge from 1 to 1).
Graph with neither self-edges nor duplicate edges are called **simple graphs**



Weighted Graphs

Vertices/Nodes

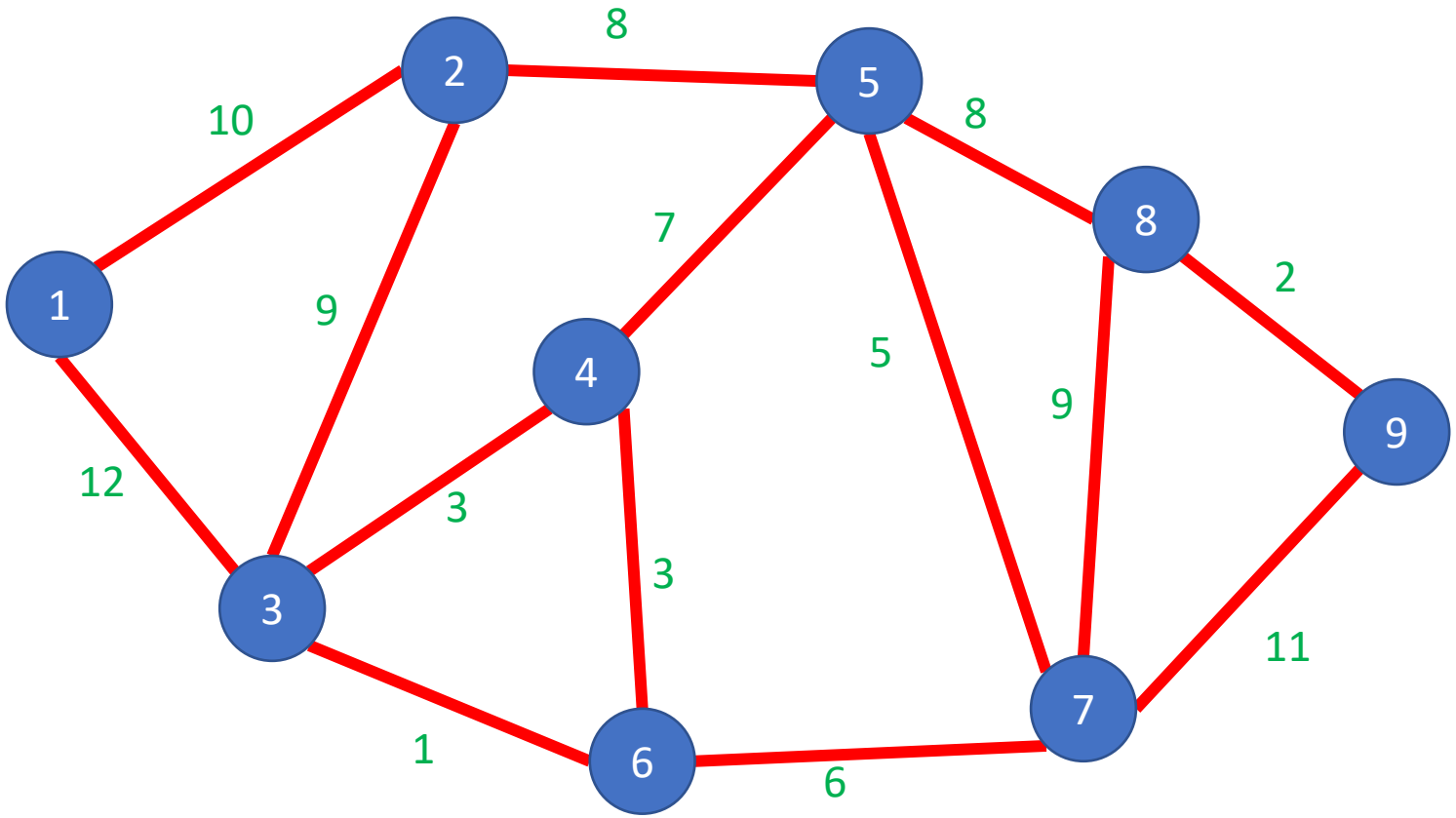
Definition: $G = (V, E)$

Edges

$w(e)$ = weight of edge e

$V = \{1,2,3,4,5,6,7,8,9\}$

$E = \{(1,2), (2,3), (1,3), \dots\}$



Graph Applications

- For each application below, consider:
  - What are the nodes, what are the edges?
  - Is the graph directed?
  - Is the graph simple?
  - Is the graph weighted?
- LinkedIn Connections
- Twitter Followers
- Java Inheritance
- Airline Routes
- Course Prerequisites