

Lecture 12

CSE 331

Please have a face mask on

Masking requirement



UB requires all students, employees and visitors – regardless of their vaccination status – to wear face coverings while inside campus buildings.

<https://www.buffalo.edu/coronavirus/health-and-safety/health-safety-guidelines.html>

Connectivity Problem

Input: Graph $G = (V, E)$ and s in V

Output: All t connected to s in G

Breadth First Search (BFS)

Build layers of vertices connected to s

$$L_0 = \{s\}$$

Assume $L_0, \dots, L_j$ have been constructed

L_{j+1} set of vertices not chosen yet but are connected to L_j

Stop when new layer is empty

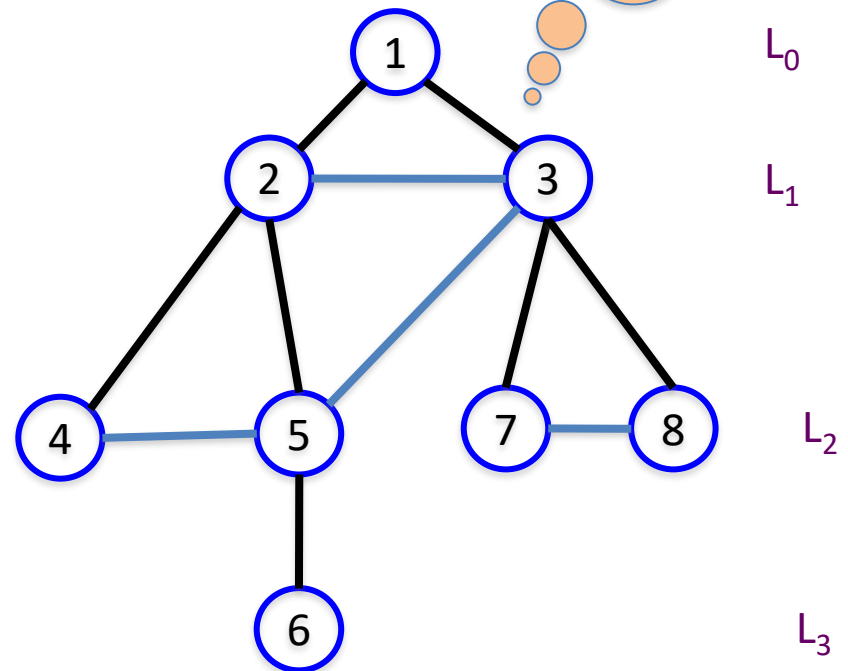
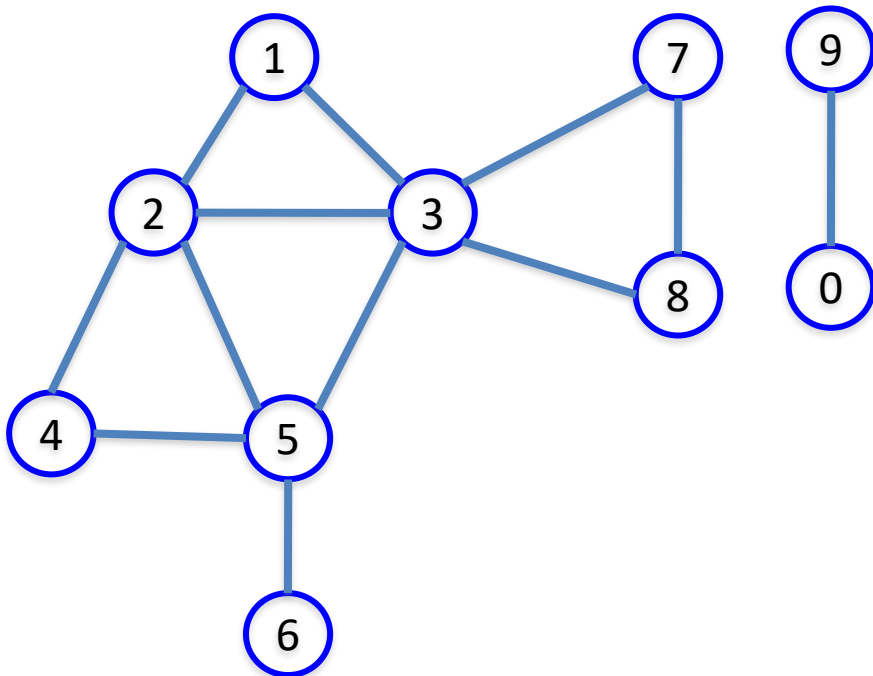
BFS Tree

BFS naturally defines a tree rooted at s

L_j forms the j th “level” in the tree

u in L_{j+1} is child of v in L_j from which it was “discovered”

Add non-tree edges



Two facts about BFS trees

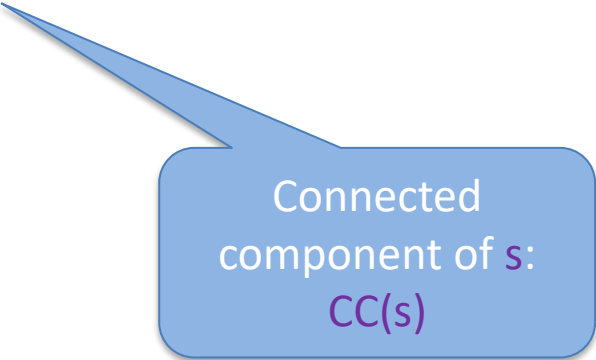
All non-tree edges are in the same or consecutive layer

If u is in L_i then $\text{dist}(s, u) = i$

Connectivity Problem

Input: Graph $G = (V, E)$ and s in V

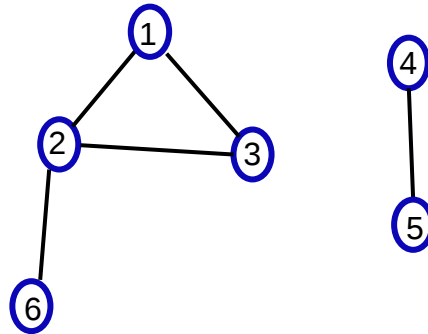
Output: All t connected to s in G



Connected
component of s :
 $CC(s)$

Connected Components

Set of all vertices connected to vertex s is called its connected component $cc(s)$.



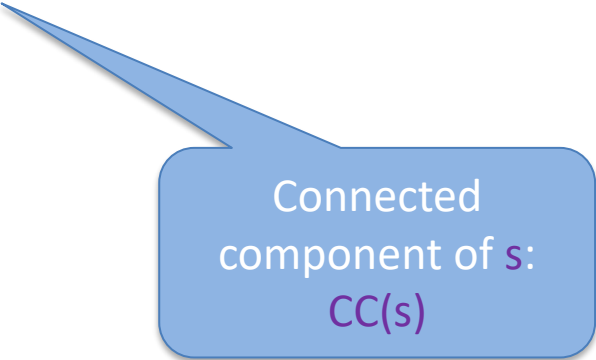
$$cc(2) = \{1, 2, 3, 6\}$$

$$cc(5) = \{4, 5\}$$

Connectivity Problem

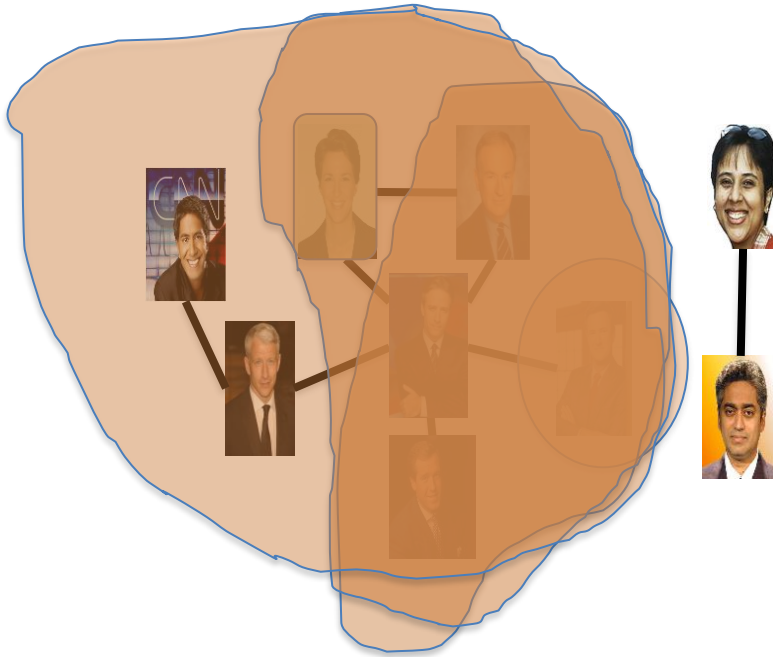
Input: Graph $G = (V, E)$ and s in V

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Connected
component of s :
 $CC(s)$

Computing Connected Component



Explore(s)

Start with $R = \{s\}$

While exists (u, w) edge w not in R and u in R

Add w to R

Output $R^* = R$

Argue correctness on the board...