Graphs

Ruth Anderson
UW CSE 160
Winter 2020
A graph contains nodes and edges

Seattle
San Francisco
Dallas
Salt Lake City
Chicago
+ 350 students in no romantic and/or sexual relationship
From: “Chains of Affection: The Structure of Adolescent Romantic and Sexual Networks”, American Journal of Sociology, by Peter Bearman of (Columbia), James Moody (Ohio State), and Katherine Stovel (U. of Washington);
Graphs

• A graph can be thought of as either of:
  – a collection of edges
    • Each edge represents some relationship
  – for each node, a collection of neighbors
    • The neighbors are those connected by an edge
Operations on a graph

Creation:
• Create an empty graph

Querying:
• Look up a node: Does it exist? What are its neighbors?
• Look up an edge (= a pair of nodes): does it exist? (You know the nodes it connects.)
• Iterate through the nodes or edges

Modification:
• Add/remove a node
• Add/remove an edge
networkx Graph Library

• Used in Homework 4
• Included in the Anaconda Distribution

```python
import networkx as nx

g = nx.Graph()
g.add_node(1)
g.add_node(2)
g.add_edge(1, 2)
print(g.nodes())
print(g.edges())

Note: It is also o.k. to just add an edge before you add the individual nodes; the nodes will be added for you in that case.
```
import networkx as nx
import matplotlib.pyplot as plt

g = nx.Graph()    # Creates a graph

g.add_edge(1, 2)  # Adds edge from node 1 to node 2
g.add_edge(1, 3)
g.add_node(4)     # Adds node 4

print("Edges:", g.edges())
print("Nodes:", g.nodes())
print("Neighbors of node 1:", list(g.neighbors(1)))

assert len(g.nodes()) == 4
assert len(g.edges()) == 2

nx.draw_networkx(g)  # Draw the graph
plt.show()            # Show the graph