

# Lecture 10

CSE 331

Sep 20, 2017

# Mini Project choice due Sep 25

note stop following 123 views

## Mini project needs groups of size EXACTLY 3

A gentle reminder that your group composition is due in just over a week (11:50pm on Monday, Sep 25).

The important thing to note is that you need to send me **groups of size EXACTLY three**. This means you are responsible for finding two other students in 331 to form your group. I will **not** make any group assignments.

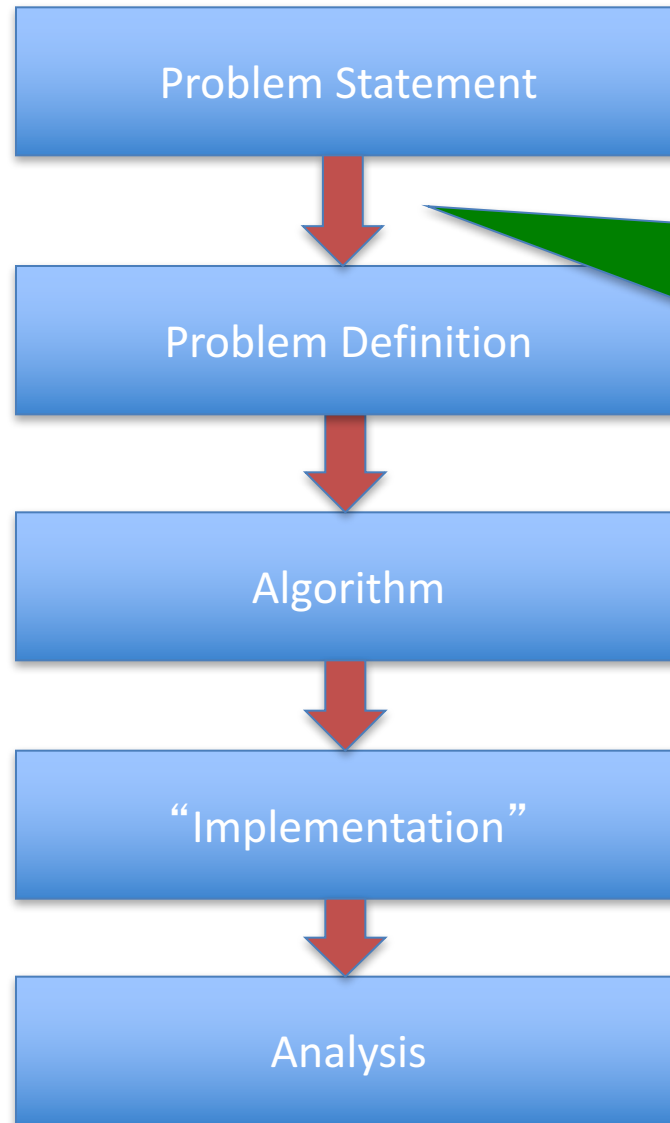
Feel free to use the comments on this post to try and find others who are still looking to form a group.

#pin

mini\_project

edit good note 0 Updated 2 days ago by Atri Rudra

# Up Next....

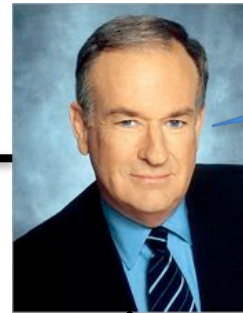


A generic tool  
to abstract  
out problems

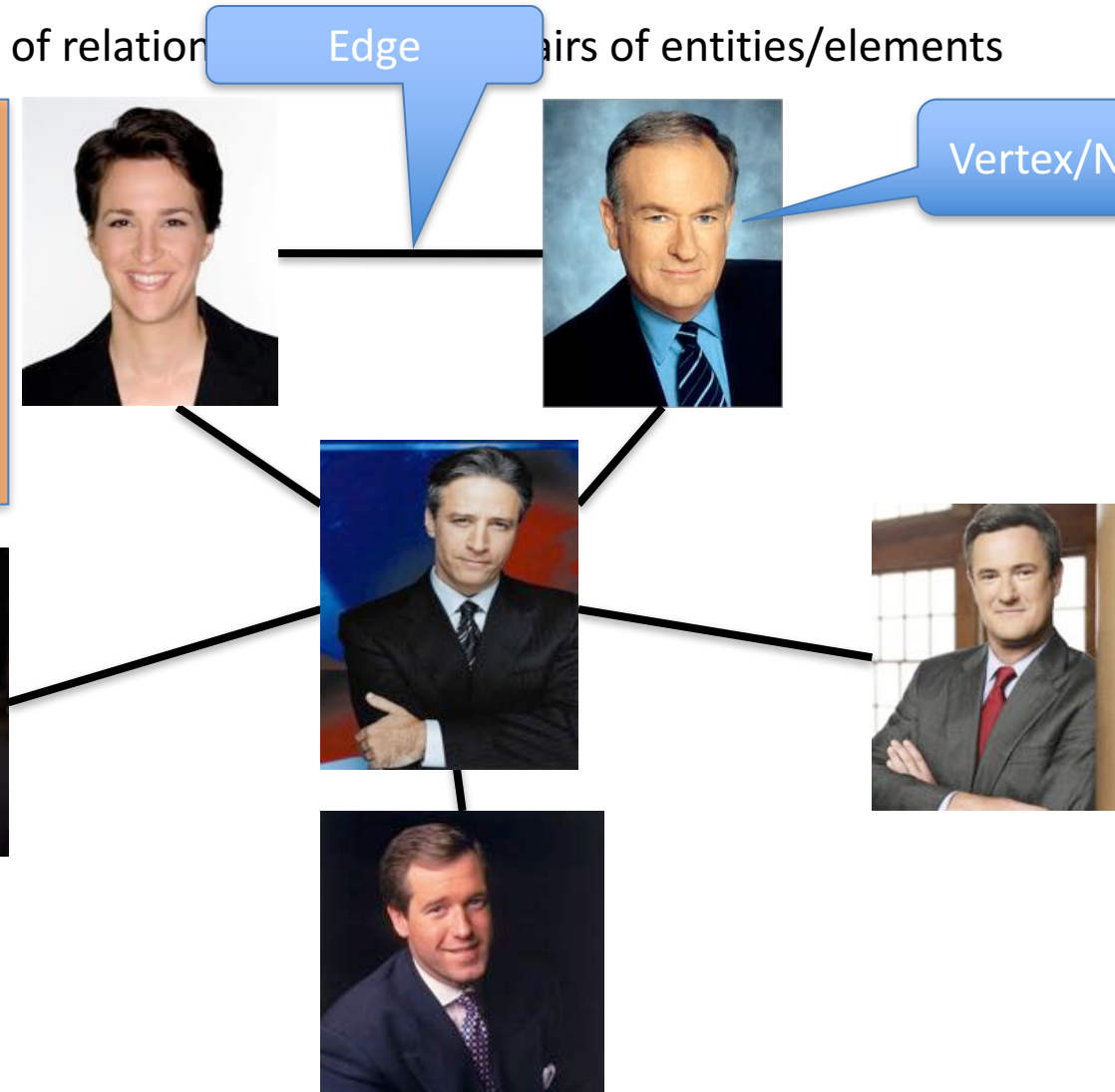
# Graphs

Representation of relation **Edge** pairs of entities/elements

Entities: News hosts  
Relationship: Mention  
in other's program



Vertex/Node



# Graphs are omnipresent



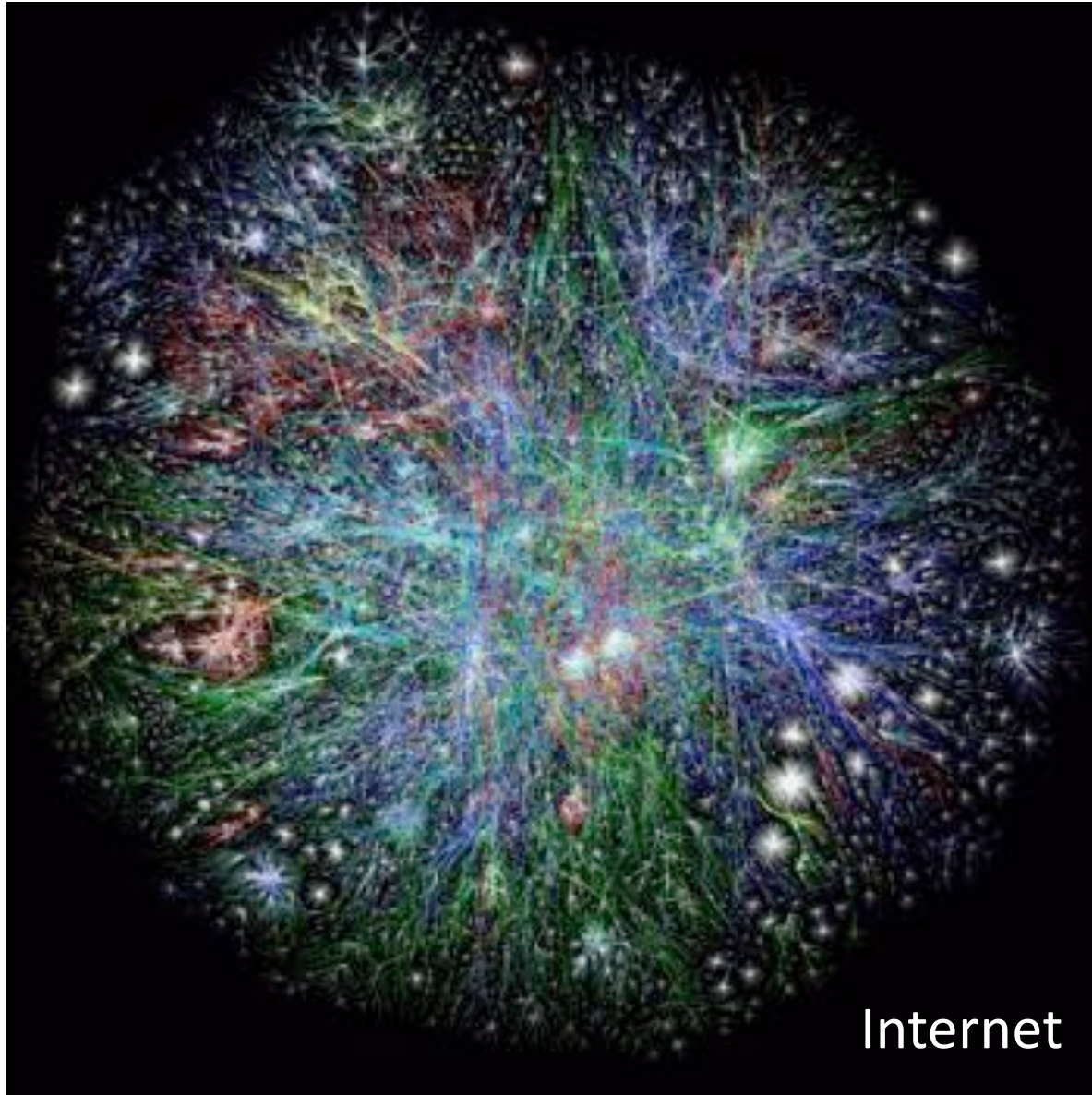
Español • Help • Speak up

## Airline Route maps

Book travel • Manage your flights • Travel deals • Where we jet • TrueBlue® program

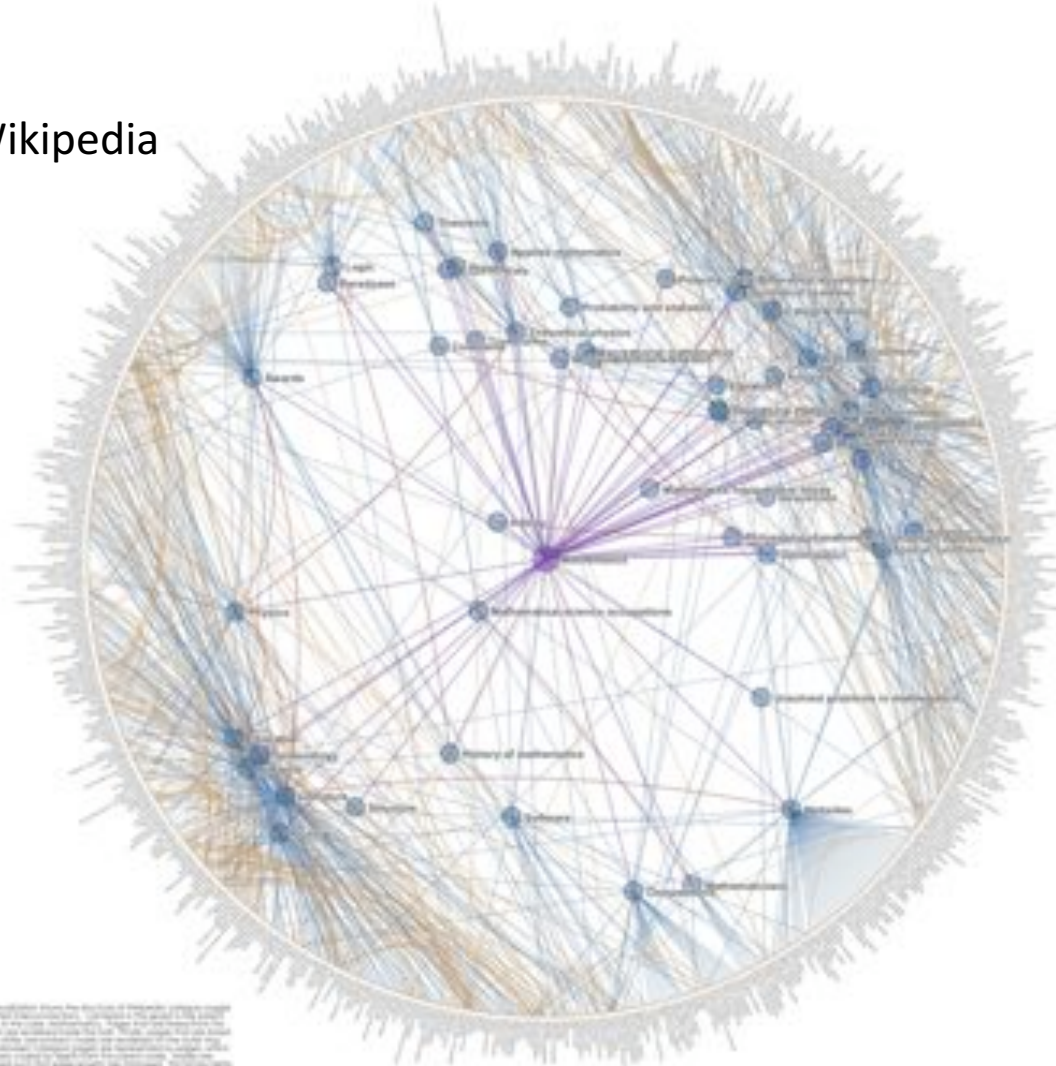


# What does this graph represent?



# And this one?

Math articles on Wikipedia



Visualization of the network of interlinks between math articles on Wikipedia. The nodes represent the articles and the edges represent the links between them. The size of the nodes is proportional to the number of links they have. The colors represent different clusters of articles. The graph is a complex network with many connections between nodes.

And this one?

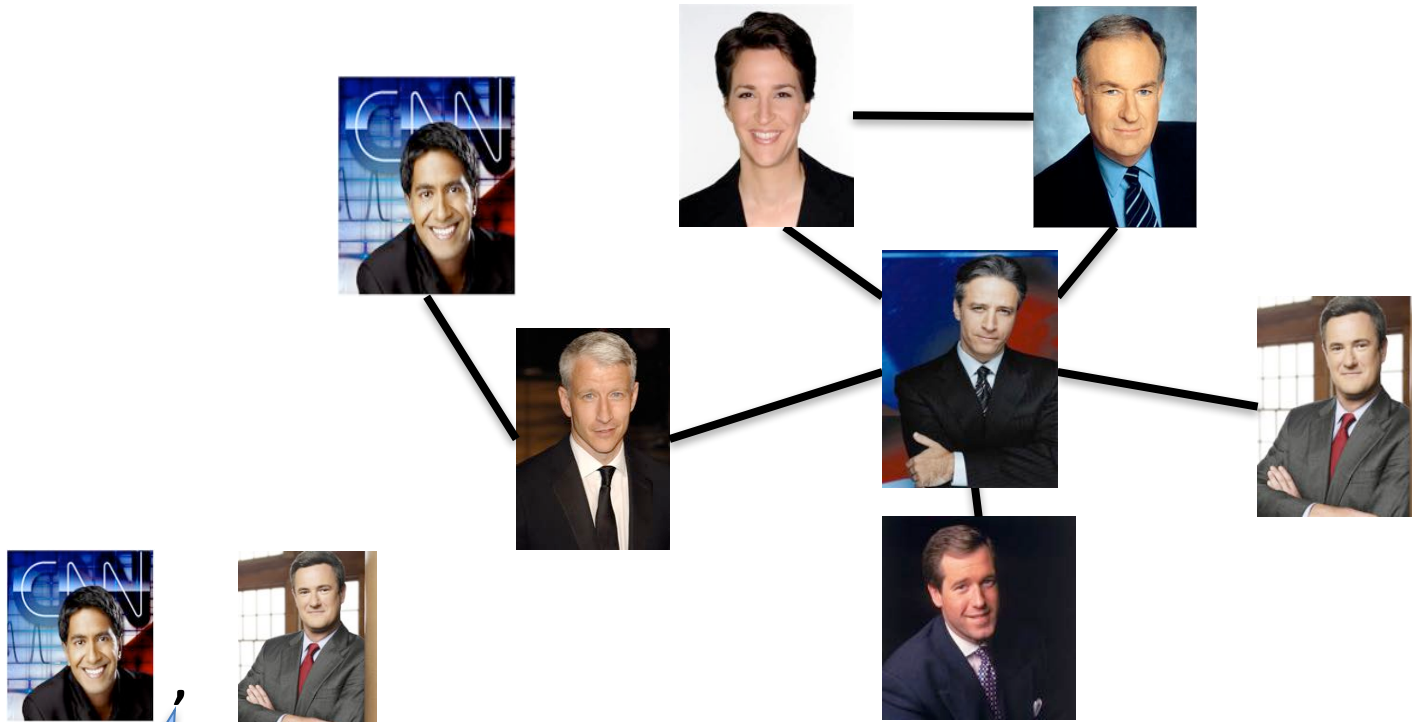




# Rest of today's agenda

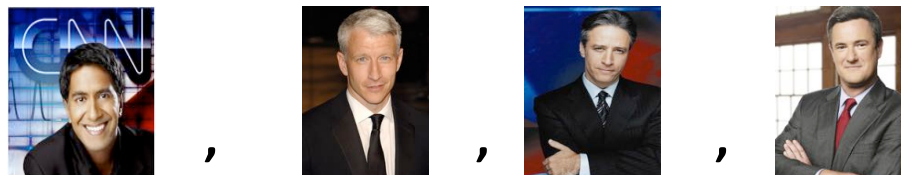
Basic Graph definitions

# Paths



Sequence of vertices connected by edges

Connected



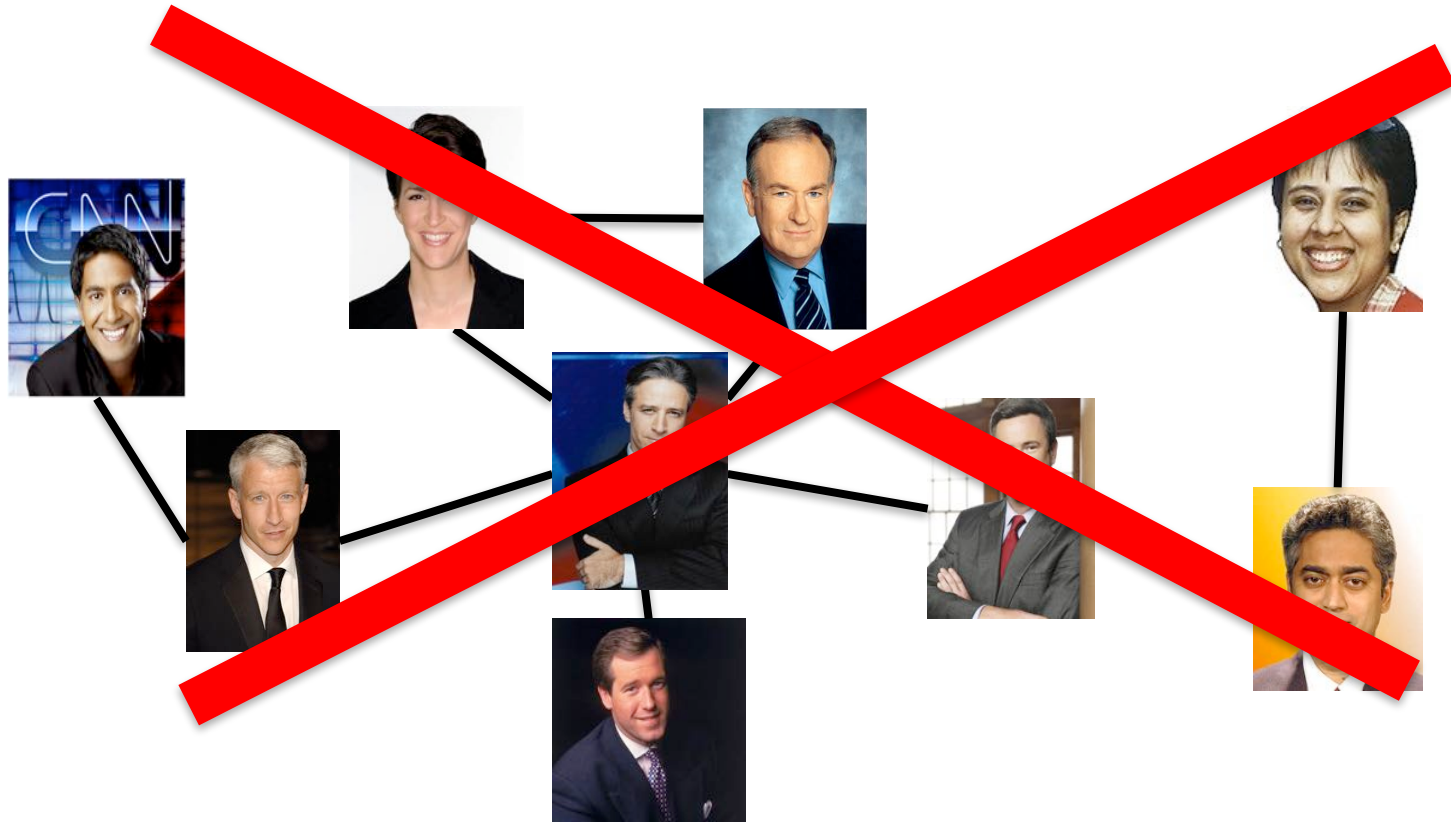
Path length 3

# Connectivity

$u$  and  $w$  are connected iff there is a path between them

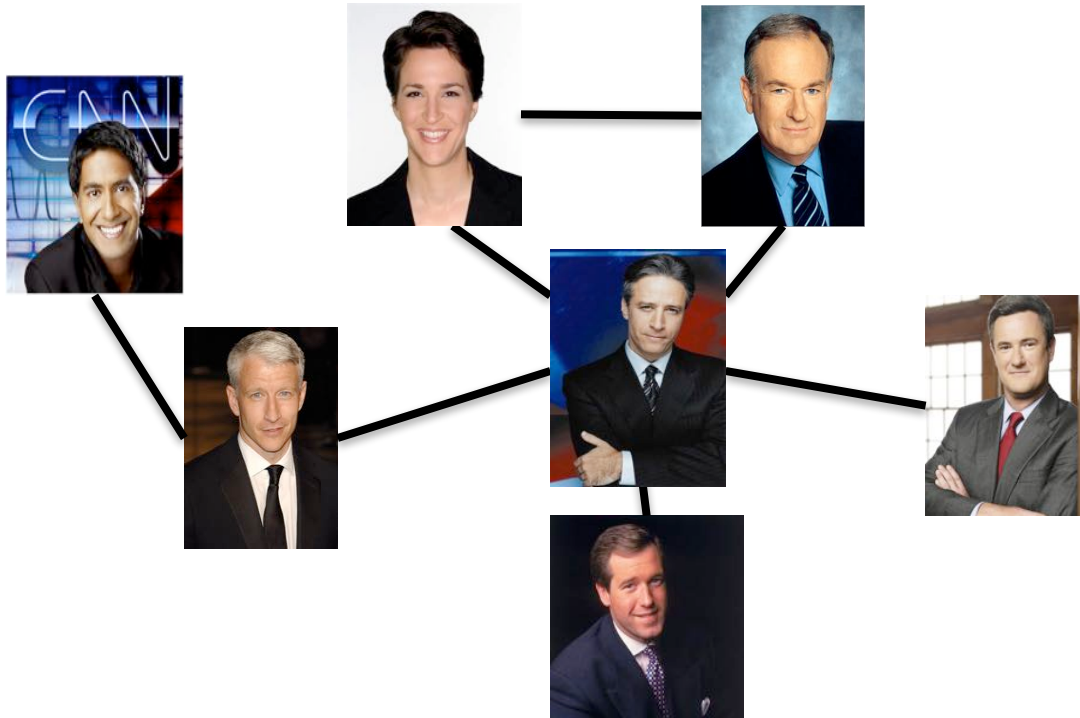
A graph is connected iff all pairs of vertices are connected

# Connected Graphs



Every pair of vertices has a path between them

# Cycles

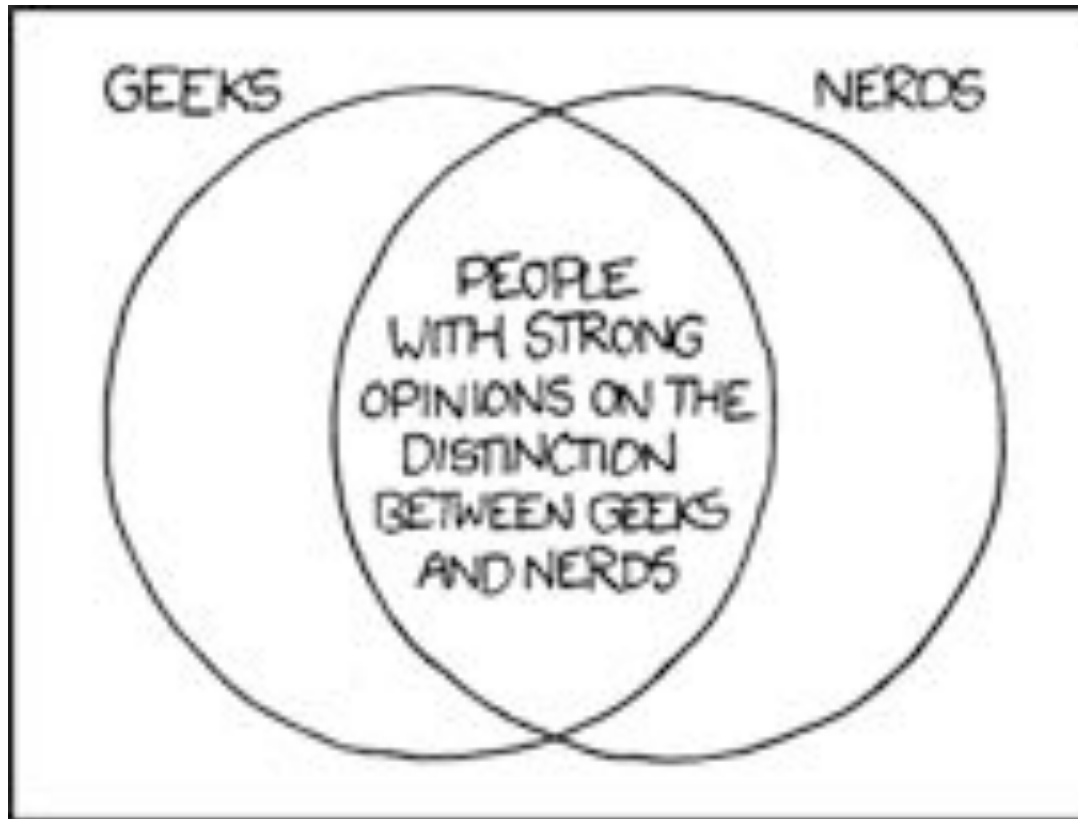


Sequence of  $k$  vertices connected by edges, first  $k-1$  are distinct





# Formally define everything



[http://imgs.xkcd.com/comics/geeks\\_and\\_nerds.png](http://imgs.xkcd.com/comics/geeks_and_nerds.png)

# Rest of Today's agenda

Formal definitions of graphs, paths, cycles, connectivity  
and trees

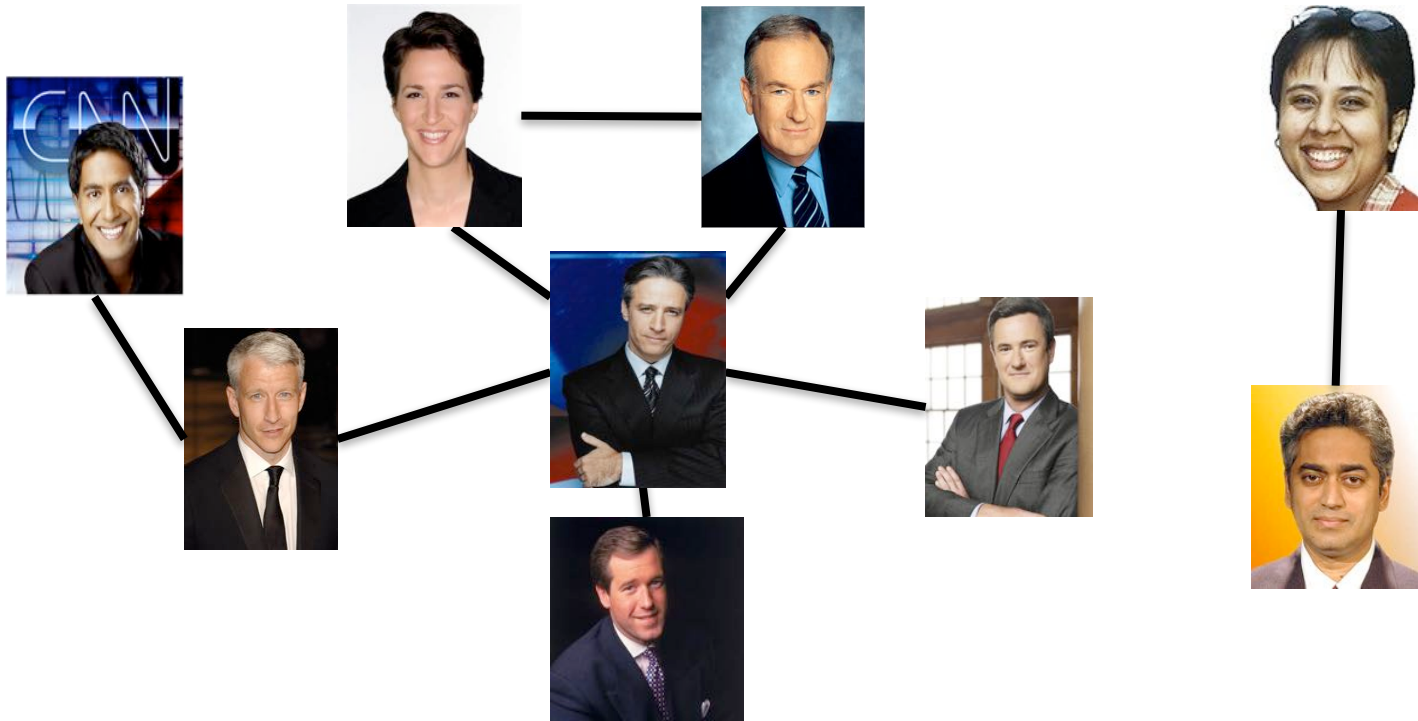
Prove  $n$  vertex tree has  $n-1$  edges

Algorithms for checking connectivity



# Tree

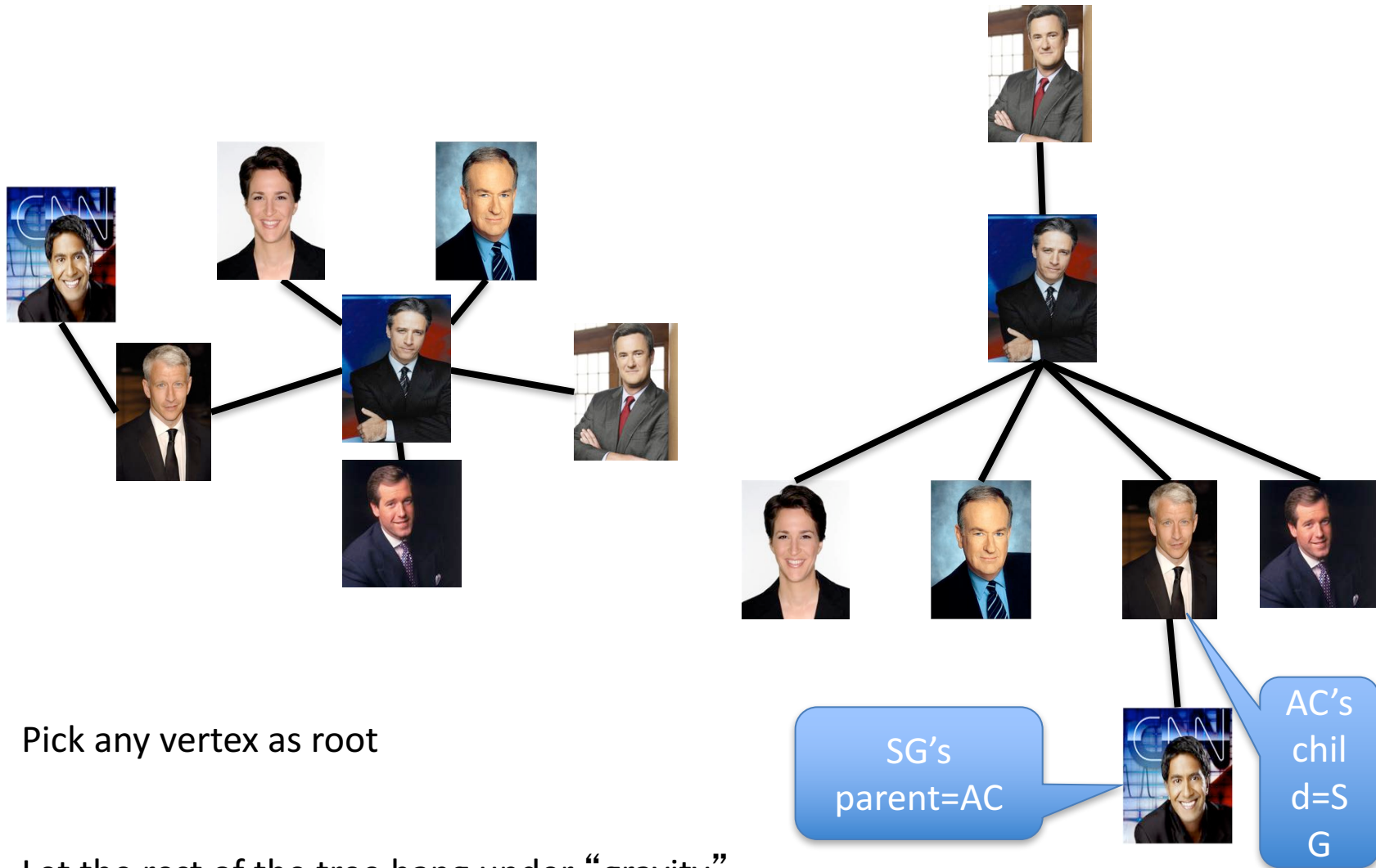
Connected undirected graph with no cycles



# Rooted Tree



# A rooted tree

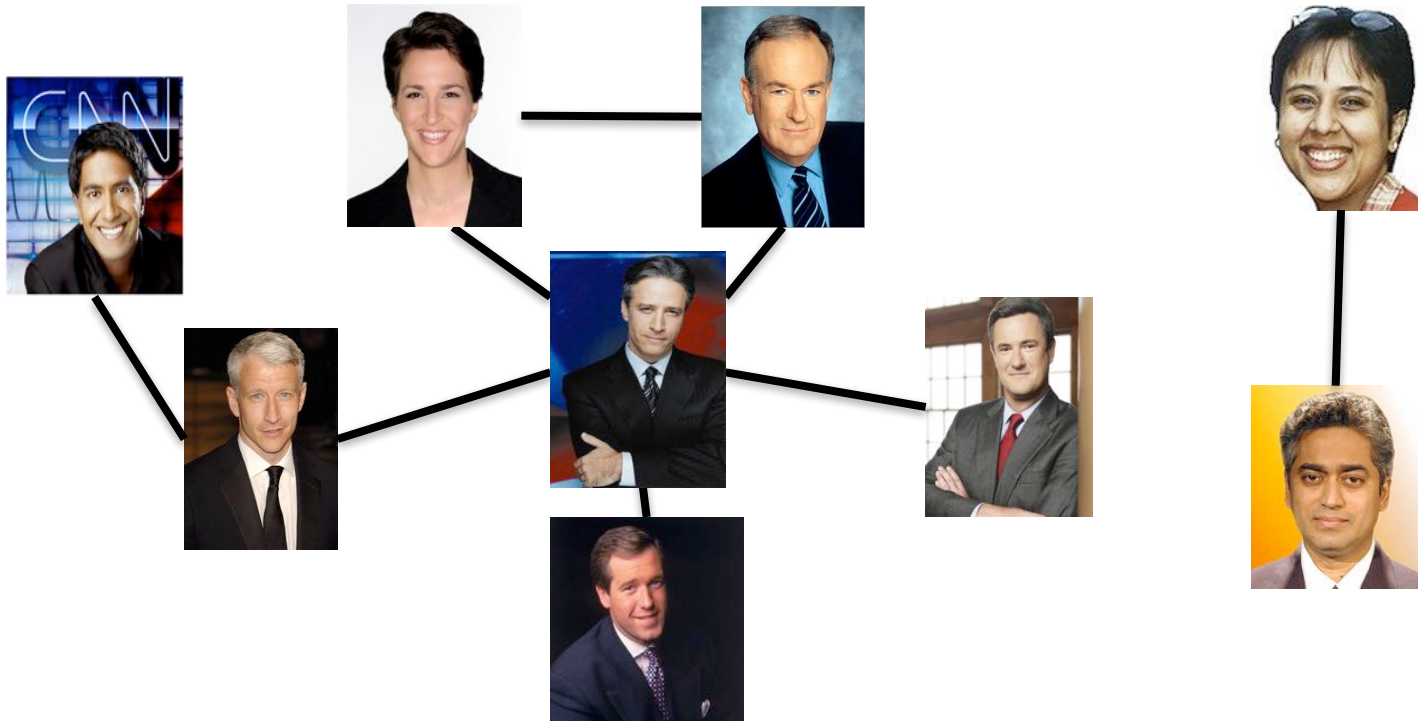


# Rest of Today's agenda

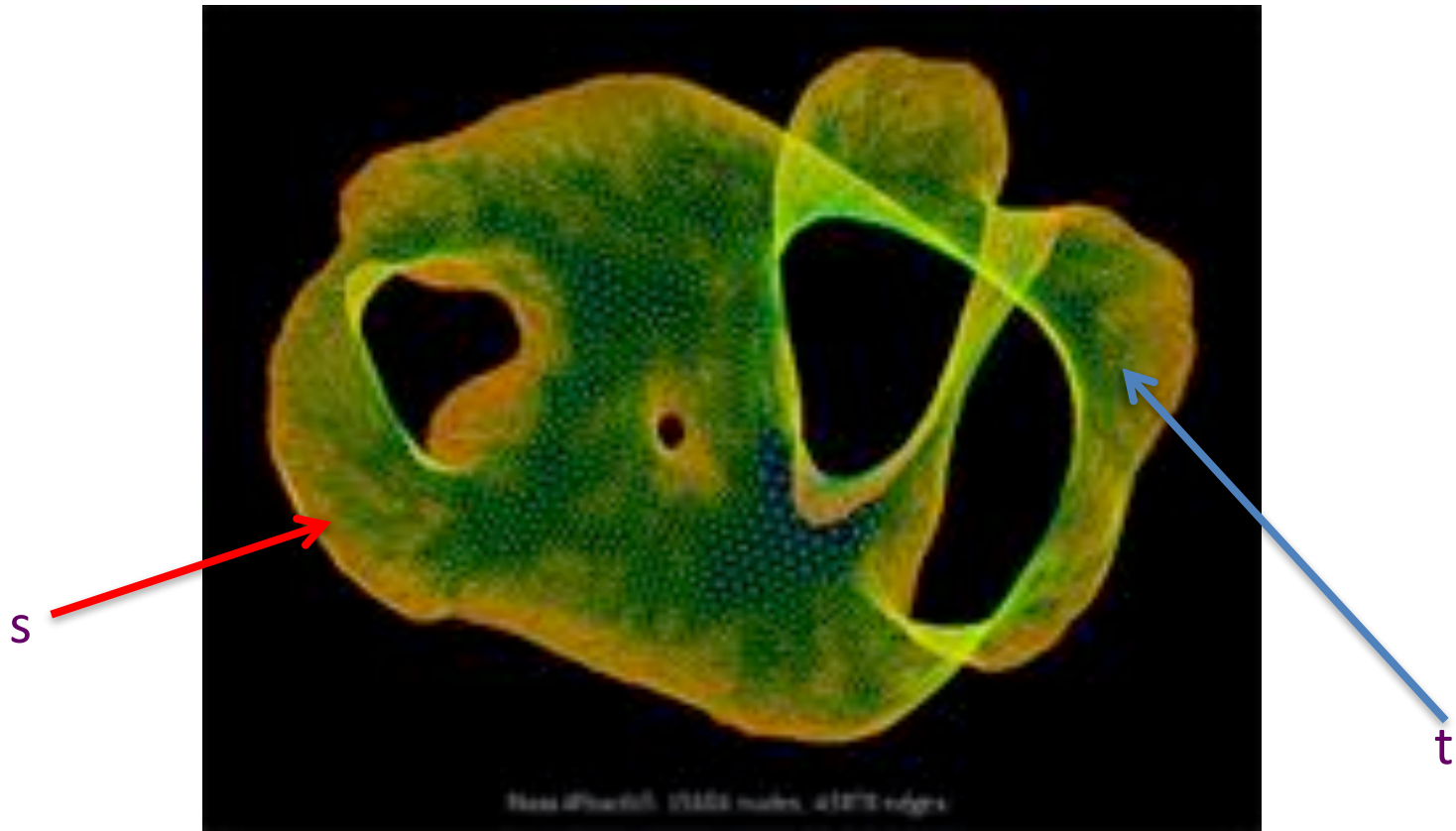
Prove  $n$  vertex tree has  $n-1$  edges

Algorithms for checking connectivity

# Checking by inspection



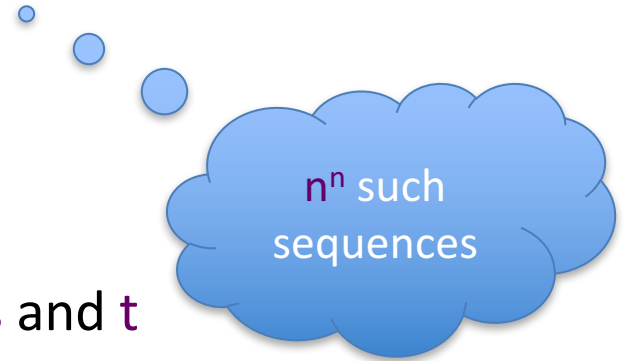
# What about large graphs?



Are  $s$  and  $t$  connected?

# Brute-force algorithm?

List all possible vertex sequences between  $s$  and  $t$



Check if any is a path between  $s$  and  $t$

# Algorithm motivation

