HW2 due now

HW3

- Due 9pm Wed Sept 27, 2006
- Entirely online—no paper, no email
- In lab yesterday we added question #6: **Add a post to your blog that contains an image directly hyperlinked to another website**

Publicity

Publicity

- **First to submit HW1**
  1. Meghan Madore
  2. John Garawecki-Maxwell
  3. Nicole Edine

Publicity

- **First to submit HW2 blog bookmark**
  1. Vicki Hall
  2. Natalie Fava
  3. Kristin Cicarella

Publicity

- **Most popular bookmarks so far**

1.
2.
3.

Reading

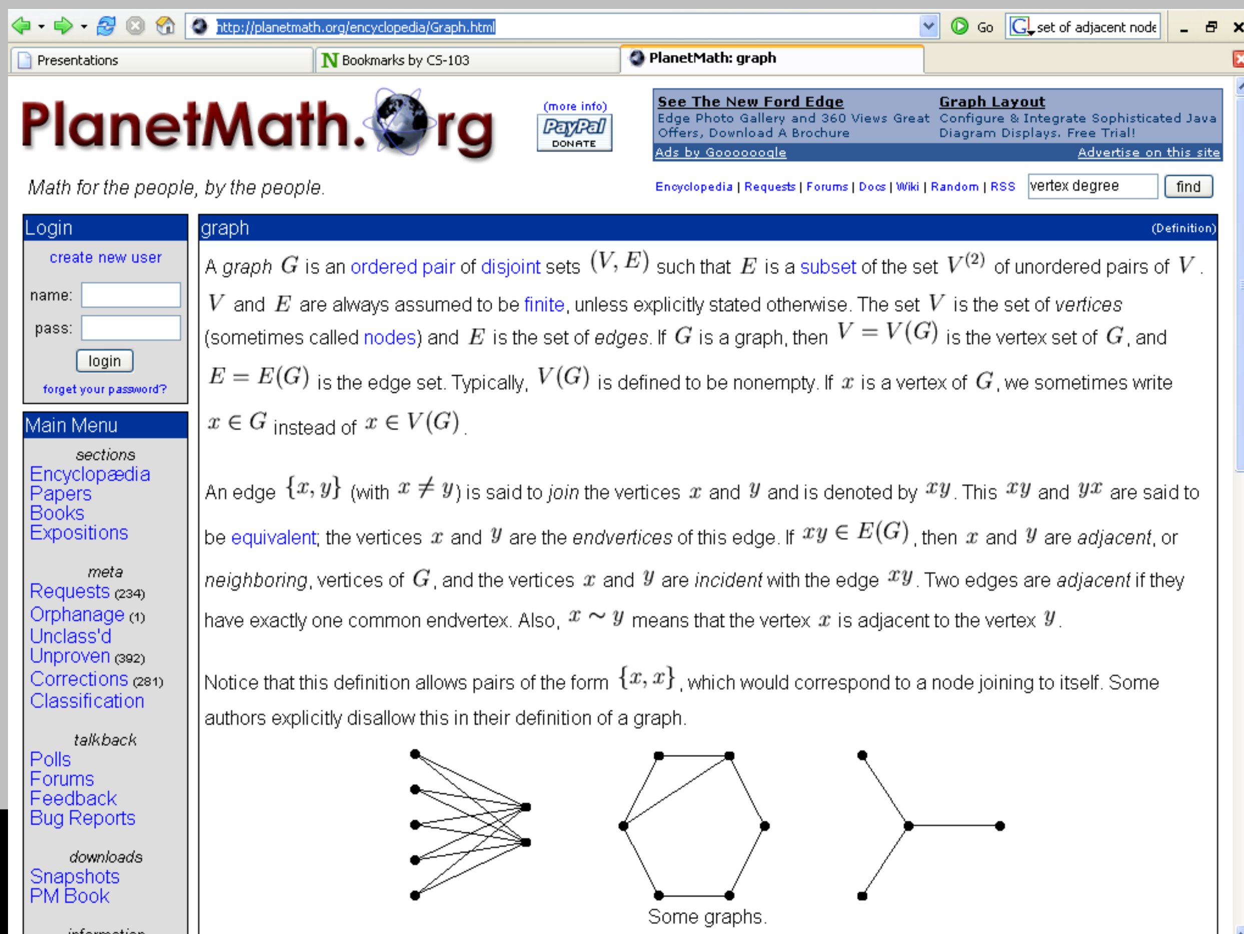
- Six Degrees Ch 2, 3
- Wikipedia
    - http://en.wikipedia.org/wiki/Social_Bookmarking
    - http://en.wikipedia.org/wiki/Web_feed

Last time: Small "worlds"

- Consider some domain and call that the "world" (e.g., Boston, BU, CS-103, all websites on the Internet)
- That "world" is small if it has the following three defining traits:
  1. I know only a small fraction of the "world"
  2. My friends know the same people I do
  3. Any two people in the "world" are connected by a relatively short path of relationships

Formalizing Small World Network

- Your books do not use mathematical notation
- We will use notation from http://planetmath.org/encyclopedia/Graph.html



Important set notation

We can list a set explicitly

{2,3,5,7}

Or implicitly

{x: x is a prime number < 10}

Or by name

P = set of prime numbers < 10

1a. How many people do I know?

Mathematically speaking:
We choose our world by defining a graph
with a set of vertices V and a set of edges E

Example:
V = registered members of Screen Actors' Guild
E = all pairs of actors who co-participated in any movie

In this context, "How many people do I know" becomes
How many vertices are adjacent to me in the graph

For any vertex x in V,
degree(x) = the number of vertices adjacent to x

1b. I know a small bit of the world

For any set V,

|V| = the number of elements in V

Also note that “<<“ means “is much less than”

“Each person knows a small fraction of the world” becomes

degree(x) << |V| for any vertex x in V

1c. How many people do I know?

We just said:

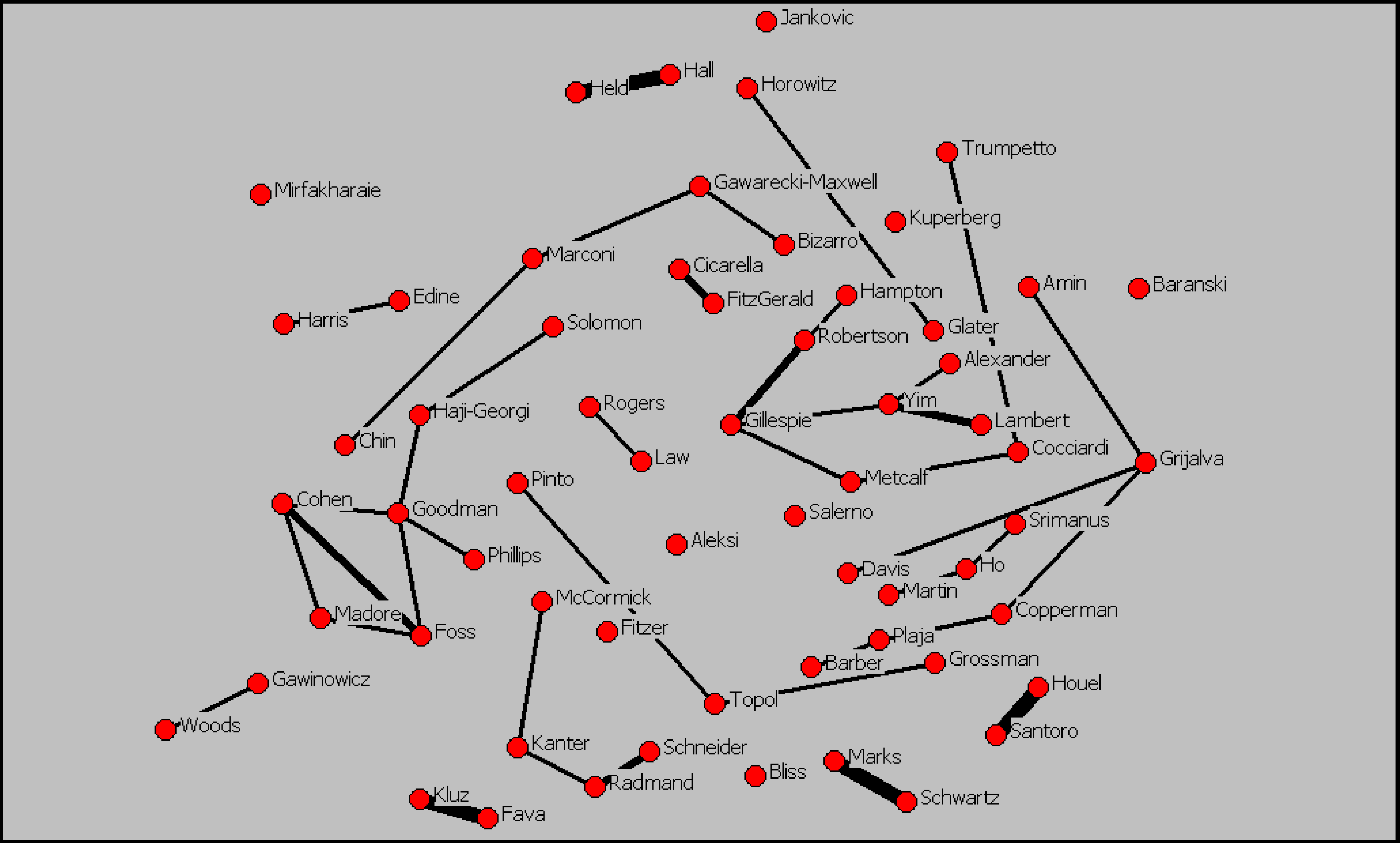
degree(x) = the number of vertices adjacent to x

For any vertex x in V, think about this:

|{y: there is an edge (x,y) in the graph}|

How are these related?

Examples of degree



2a. Who are my friends

For any vertex x in a graph

neighborhood(x) = x and the set of vertices adjacent to x

Using set notation, we can say

neighborhood(x) = {x} U {y: there is an edge (x,y) in the graph}

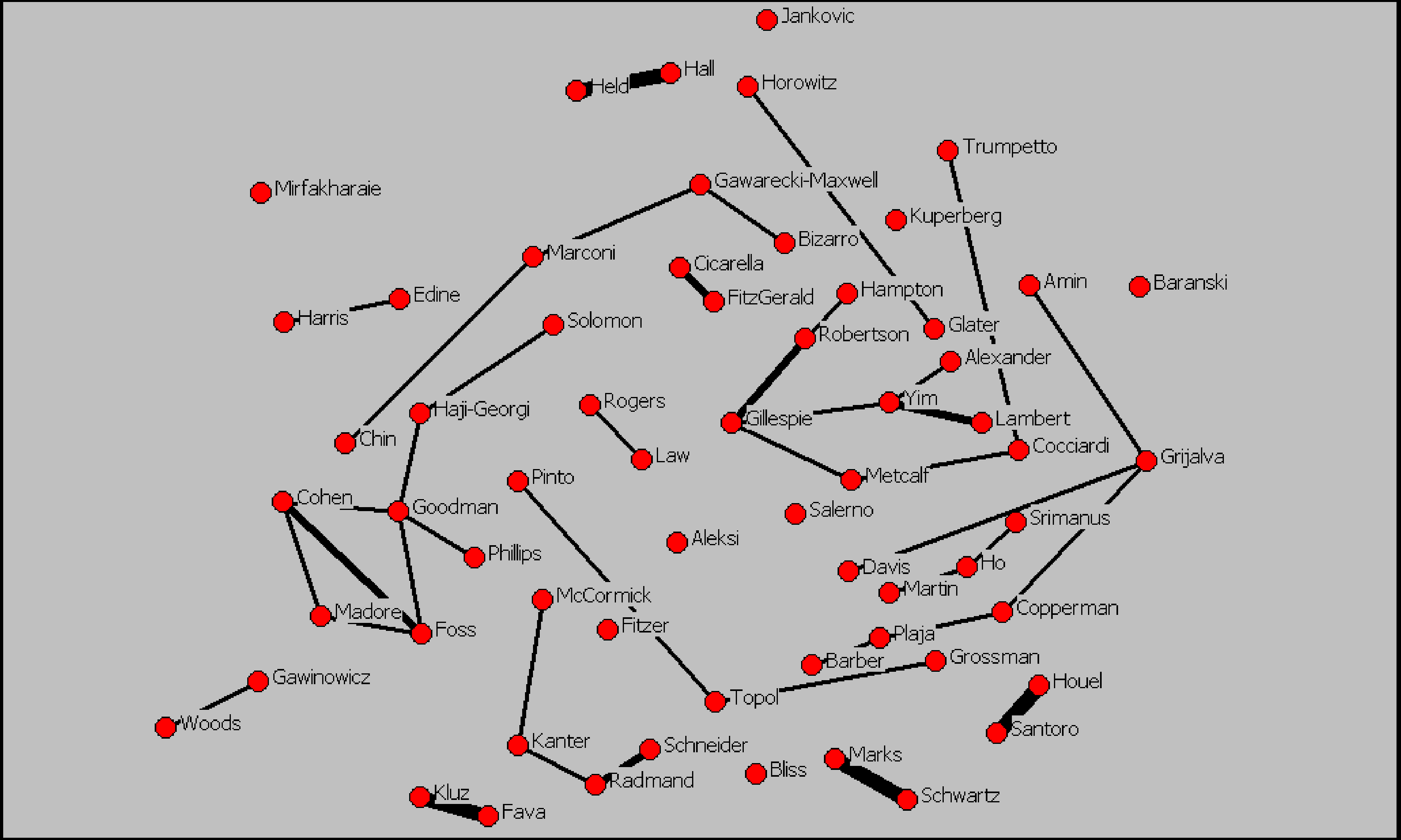
2b. Mutual friends

Notice that **neighborhood(x)** is a set of vertices

For any vertex y in neighborhood(x), what is…

- neighborhood(y)
- neighborhood(x) ∩ neighborhood(y)
- $$\frac{|\text{neighborhood}(x) \cap \text{neighborhood}(y)|}{|\text{neighborhood}(x) \cup \text{neighborhood}(y)|}$$

Examples of neighborhood



3a. What is a path

A **path** in a graph is a finite sequence of alternating vertices and edges, beginning and ending with a vertex

$$v_1\ e_1\ v_2\ e_2\ v_3\ e_3 \ldots\ e_{n-1}\ v_n$$

Such that

- every consecutive pair of vertices v_x, v_{x+1}, is adjacent
- e_x is incident with v_x and v_{x+1}

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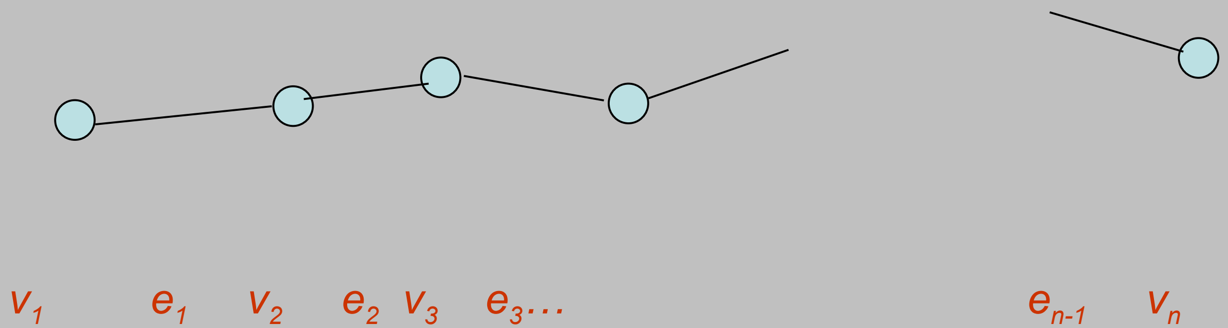


Strength of Weak Ties

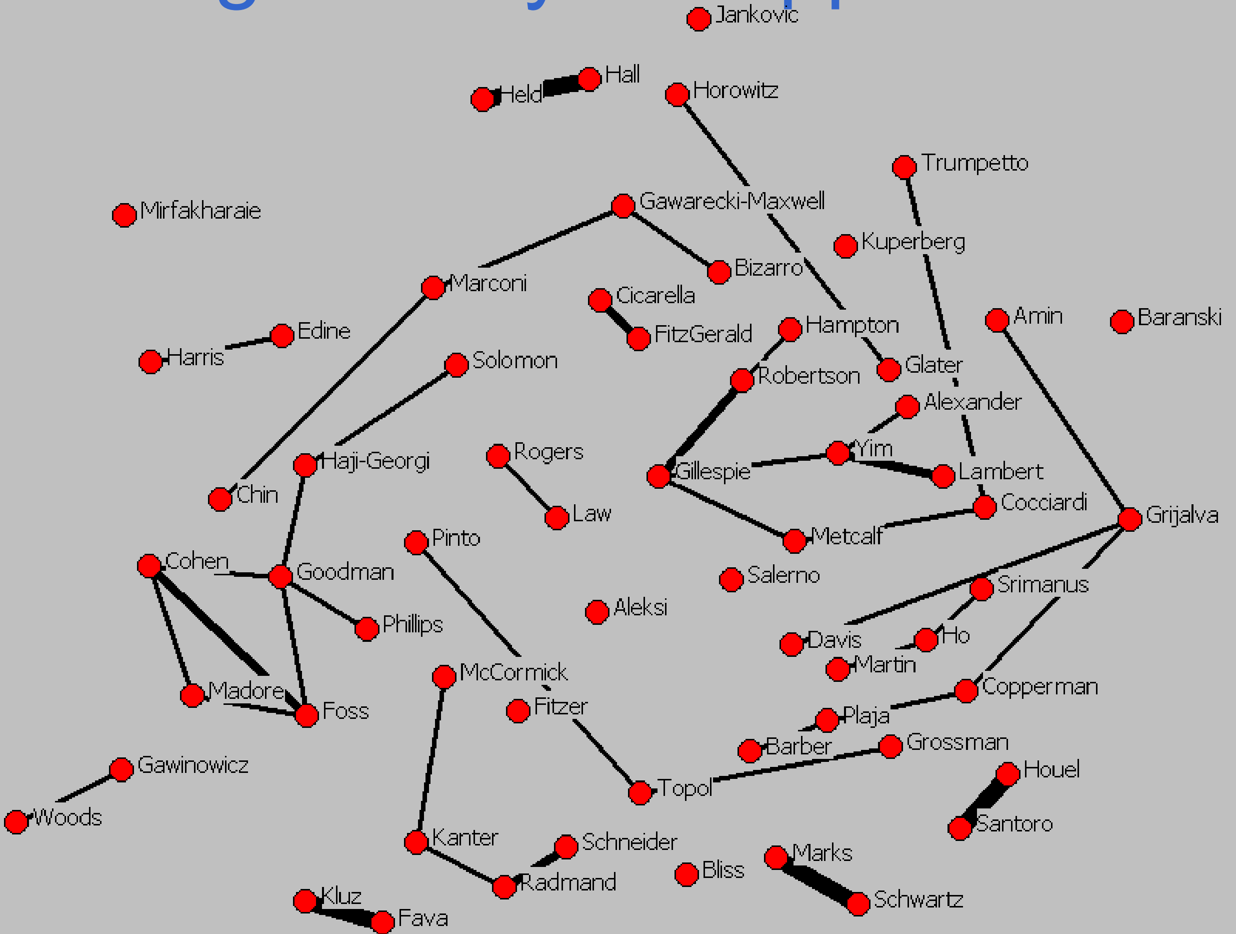
Two ways of thinking about weak ties:

3. A relationship between two people who don't know each other very well
4. A relationship between two people who don't have many mutual friends

"Weak ties" are much more important to job-hunters than "strong ties"

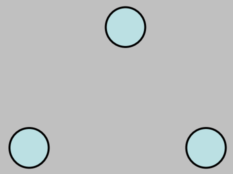
Network Dynamics

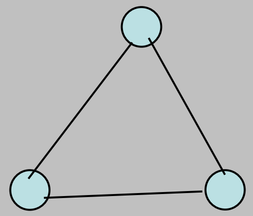
Where are new edges likely to happen?



Triadic closure

- Some social triads are stable





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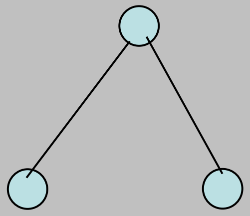

Triadic Social Network Table of the Elements