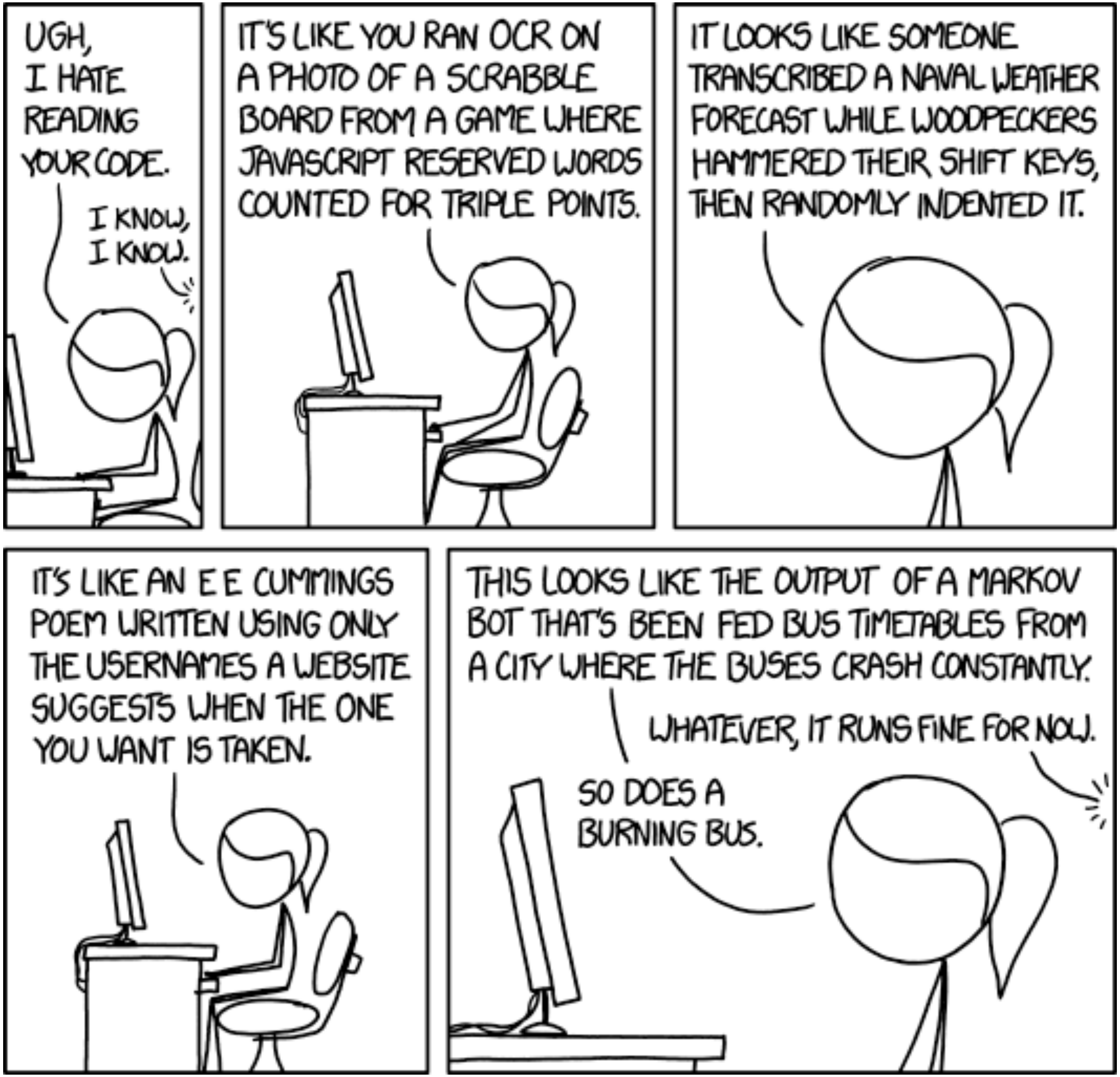

UGH, I HATE READING YOUR CODE.
I KNOW, I KNOW.
IT'S LIKE YOU RAN OCR ON A PHOTO OF A SCRABBLE BOARD FROM A GAME WHERE JAVASCRIPT RESERVED WORDS COUNTED FOR TRIPLE POINTS.
IT LOOKS LIKE SOMEONE TRANSCRIBED A NAVAL WEATHER FORECAST WHILE WOODPECKERS HAMMERED THEIR SHIFT KEYS, THEN RANDOMLY INDENTED IT.
IT'S LIKE AN E E CUMMINGS POEM WRITTEN USING ONLY THE USERNAMES A WEBSITE SUGGESTS WHEN THE ONE YOU WANT IS TAKEN.
THIS LOOKS LIKE THE OUTPUT OF A MARKOV BOT THAT'S BEEN FED BUS TIMETABLES FROM A CITY WHERE THE BUSES CRASH CONSTANTLY.
WHATEVER, IT RUNS FINE FOR NOW.
SO DOES A BURNING BUS.

https://xkcd.com/1695/

CS 55:
Security and Privacy

Privacy

Last physical security item for CS55

ICS Security Summit

How Threats Are Slipping in the Back Door

- Deviant Ollam

https://www.youtube.com/watch?v=qg-zK2zv4ng&start=866

Well, one more…

https://www.youtube.com/watch?v=iSSRaIU9_Vc&start=07

Agenda

1. Defining privacy
2. Where privacy breaks down
3. If you’ve got nothing to hide, you’ve got nothing to worry about
4. Privacy and the Internet

The right to privacy traces back to antiquity

- Code of Hammurabi provided protection against home intrusion
- Roman law did also
- England declared the home is one’s castle and had anti-eavesdropping laws by 1769

- U.S. Constitution Fourth Amendment prevents “unreasonable searches and seizures”
- Government officials must obtain judicial approval before conducting a search through a warrant supported by probable cause

We the People of the
insure domestic Tranquility, provide for the common defence
and our Posterity, do ordain and establish this Constitution
Article 1

Solove, Daniel J. *Nothing to hide: The false tradeoff between privacy and security*. Yale University Press, 2011.

Even though privacy has been around a long time, it is difficult to define

Privacy is vague and evanescent
- Miller

It’s like pornography, I know it when I see it!
- My friend

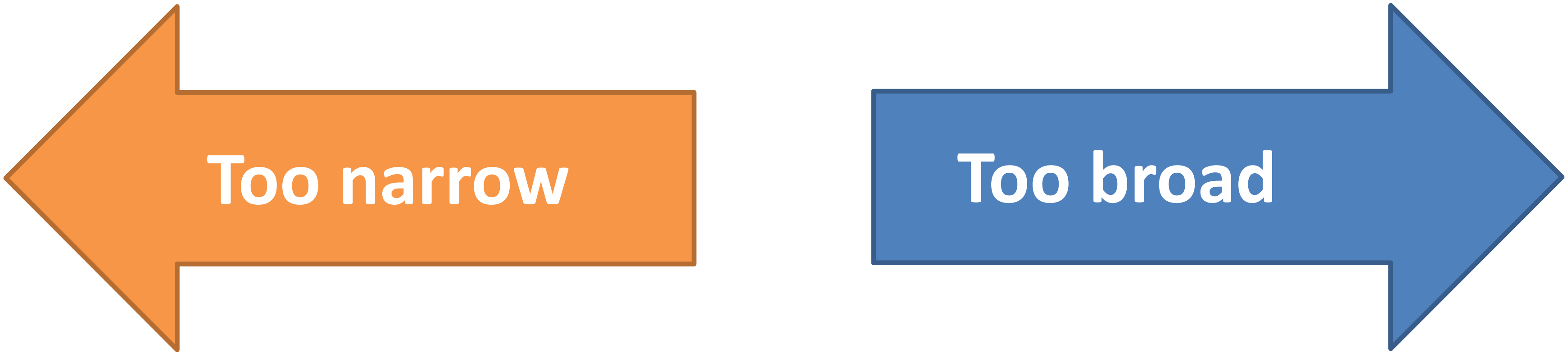
Perhaps the most striking thing about privacy is that nobody seems to have any very clear idea what it is
- Jarvis

Suffers from an embarrassment of meanings
- Scheppele

Attempts to define privacy have generally not met with any success
- Bennett

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477. (except for my friend’s quote)

It is easy to be too narrow or too broad when attempting to define privacy


Too narrow

Too broad

"Intimate information, access, and decisions"[1]

- What is intimate? Social Security Number? Religious affiliations?
- What context?
- Perhaps too narrow

Risk being too restrictive

"Right to be let alone"[2]

- What does let alone entail?
- May interactions would not be viewed as privacy violations
- If you shove and harm me, it is not a privacy problem
- Perhaps too broad

Risk being overinclusive and too vague to be useful

[1] Julie Inness

[2] Samuel Warren and Louis Brandeis

Solove, Daniel J. "I've got nothing to hide and other misunderstandings of privacy." *San Diego L. Rev.* 44 (2007): 745

Discussion

What is privacy?

Agenda

1. Defining privacy
2. Where privacy breaks down
3. If you’ve got nothing to hide, you’ve got nothing to worry about
4. Privacy and the Internet

Solove's Taxonomy of Privacy identifies four general categories of privacy problems

Privacy problems occur when an activity by a person, business, or government entity creates harm by disrupting valuable activities of others

These harms need not be physical or emotional; they can occur by chilling socially beneficial behavior or by leading to power imbalances that adversely affect social structure

Taxonomy's purpose is to shift away from vague label of privacy to prevent distinct harms and problems from being conflated or not recognized

Some concepts may be argued are not privacy, but are problems nonetheless
Boundaries are often unclear!

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477.

Solove's Taxonomy of Privacy identifies four general categories of privacy problems

Information Collection

Surveillance
Interrogation

Problems with how information is gathered

- **Surveillance: when information is collected without your knowledge or consent**
- **Interrogation: asking questions (you may feel compelled to answer)**

Social science experiment:
"Before we begin the study, can you please unlock your phone and hand it to me? I'll just need to take your phone outside of the room for a moment to check for some things."

What percentage of participants do you think complied?

What percent do you think comply with police request to search car?

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477.
Sommers, Roseanna, and Vanessa K. Bohns. "The Voluntariness of Voluntary Consent: Consent Searches and the Psychology of Compliance." *Yale Law Journal* 128.7 (2019).

Solove's Taxonomy of Privacy identifies four general categories of privacy problems

Information Collection

Surveillance
Interrogation

Information Processing

Aggregation
Identification
Insecurity
Secondary use
Exclusion

No fly list:

If your name appears on the list, you cannot board a commercial flight

- Unclear if your name is on the list
- Can use Traveler Redress Inquiry Program (TRIP) to remove yourself if your name is mistakenly on the list

Problems with how information is stored and analyzed

- **Aggregation: combining pieces of information**
- **Identification: linking information to a person**
- **Insecurity: careless protection of information**
- **Secondary use: using information collected for other purposes or by other people without consent**
- **Exclusion: when people cannot access their information or have a say in the way it is used**

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477.

Solove’s Taxonomy of Privacy identifies four general categories of privacy problems

Information Collection

Surveillance
Interrogation

Information Processing

Aggregation
Identification
Insecurity
Secondary use
Exclusion

Information Dissemination

Beach of confidentiality
Disclosure/Exposure
Increased accessibility
Blackmail
Appropriation
Distortion

Problems with how information transferred to others

- **Breach of confidentiality: breaking promise to keep confidential**
- **Disclosure/Exposure: revelation of truthful information**
- **Increased accessibility: making access easy**
- **Blackmail: threat to disclose information**
- **Appropriation: user a person’s identity**
- **Distortion: revealing false info**

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477.

Solove’s Taxonomy of Privacy identifies four general categories of privacy problems

Information Collection	Surveillance Interrogation
Information Processing	Aggregation Identification Insecurity Secondary use Exclusion
Information Dissemination	Beach of confidentiality Disclosure/Exposure Increased accessibility Blackmail Appropriation Distortion
Invasion	Intrusion Decisional interference

Interference with people’s private affairs

- **Intrusion: invasive acts that disturb one’s tranquility or solitude**
- **Decisional inference: government’s incursion into subject’s decision regarding private affairs**

Solove, Daniel J. "A taxonomy of privacy." *University of Pennsylvania Law Review* 154 (2005): 477.

Some argue we must give us privacy for security, especially in times of crisis

In national emergencies, rights must be cut back, but they'll be restored later

We must be willing to give up some privacy if it makes us more secure

I certainly respect privacy and privacy rights. But, on the other hand, the first function of government is to guarantee the security of all the people

All human beings have three lives: public, private, and secret

The American people must be willing to give up a degree of personal privacy in exchange for safety and security

Eventually all things are known. And few matter

Benjamin Franklin disagreed

In national emergencies, rights must be cut back,
but they’ll be restored later

We must be willing to give us some privacy if it
makes us more secure

I certainly respec
rights. But, on th
function of gover
security of all the

They who can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety

- Benjamin Franklin

three lives:
ret

The Ame
degree of personal privacy in exchange for safety
and security

Eventually all things are known. And few matter

Discussion

Why is privacy valuable? (or is it valuable at all?)

What harms can come from a loss of privacy?

Agenda

1. Defining privacy

2. Where privacy breaks down

3. If you’ve got nothing to hide, you’ve got nothing to worry about

4. Privacy and the Internet

Glen Greenwald on privacy

https://www.youtube.com/watch?v=pcSlowAhvUk&start=12

If a person has nothing to hide, there is no privacy problem, right?

Popular argument: If the government engages in surveillance, there is no threat to privacy unless the government uncovers unlawful activity. In which case a person has no legitimate justification to claim that their activities should remain private!

Are you sure you have nothing to hide? from anyone? at all times?

- Aleksandr Solzhenitsyn: “Everyone is guilty of something or has something to conceal [from someone]. All one has to do is look hard enough” **Can recast as: No law-abiding citizen should have anything to fear**
- If you have nothing to hide, then are you willing to me let photograph you naked? And I get full rights to the photo – I can show it to your neighbors (unlikely to happen, so weak argument)
- I have nothing to hide is saying it is OK for the government to infringe on the rights of millions of people, possibly ruining their lives. Basically equates to “I don’t care what happens, so long as it doesn’t happen to me” **Also needle-in-a-haystack argument**

Solove, Daniel J. "I've got nothing to hide and other misunderstandings of privacy." *San Diego L. Rev.* 44 (2007): 745.

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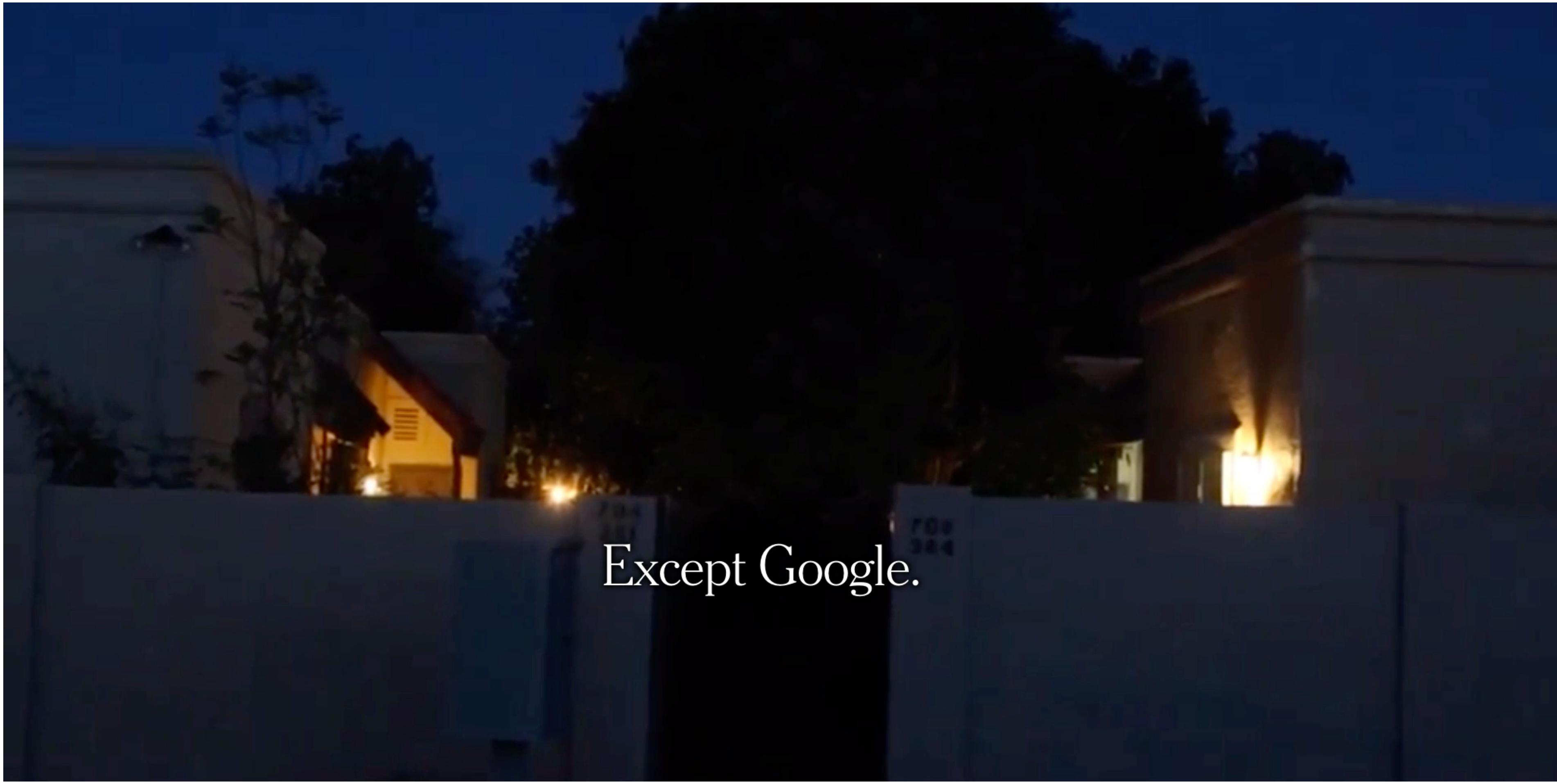
Target determined a young woman was pregnant before her father knew

- Each time you shop online, you share information with retailers
- Retailers study patterns closely to determine what you like
- Purchases tied to your credit card/browsing habits
- Also buy information from other sources (demographic, other retailers)
- How Target knew:
  - Women on Target's baby registry buy lots of lotion around second trimester
  - In first 20 weeks also buy lots of vitamins, unscented soap, and cotton balls (could also have skin infection!)
  - Used 25 products to predict pregnancy, then sent coupons to likely women
  - Buy cocoa-butter lotion, large purse (could double as diaper bag), zinc and magnesium supplements => 87% chance due within four months
- Dad confronted Target suggesting they are encouraging her to get pregnant – found out truth later
- Target now spreads out pregnancy coupons with other ones to not appear creepy
- Did it work? Sales went from $44B to $67B after profiling
- Did Target break any laws?
- What about other companies like Facebook, Twitter, Instagram?

https://www.forbes.com/sites/kashmirhill/2012/02/16/how-target-figured-out-a-teen-girl-was-pregnant-before-her-father-did

Location-based tracking via cell phones can possibly help solve murders. Good idea?



https://www.nytimes.com/interactive/2019/04/13/us/google-location-tracking-police.html

Metadata can sometimes be as telling as actual data

President Obama: “When it comes to telephone calls, nobody is listening to your telephone calls”
But they are collecting metadata on the calls!

How can metadata be a problem?

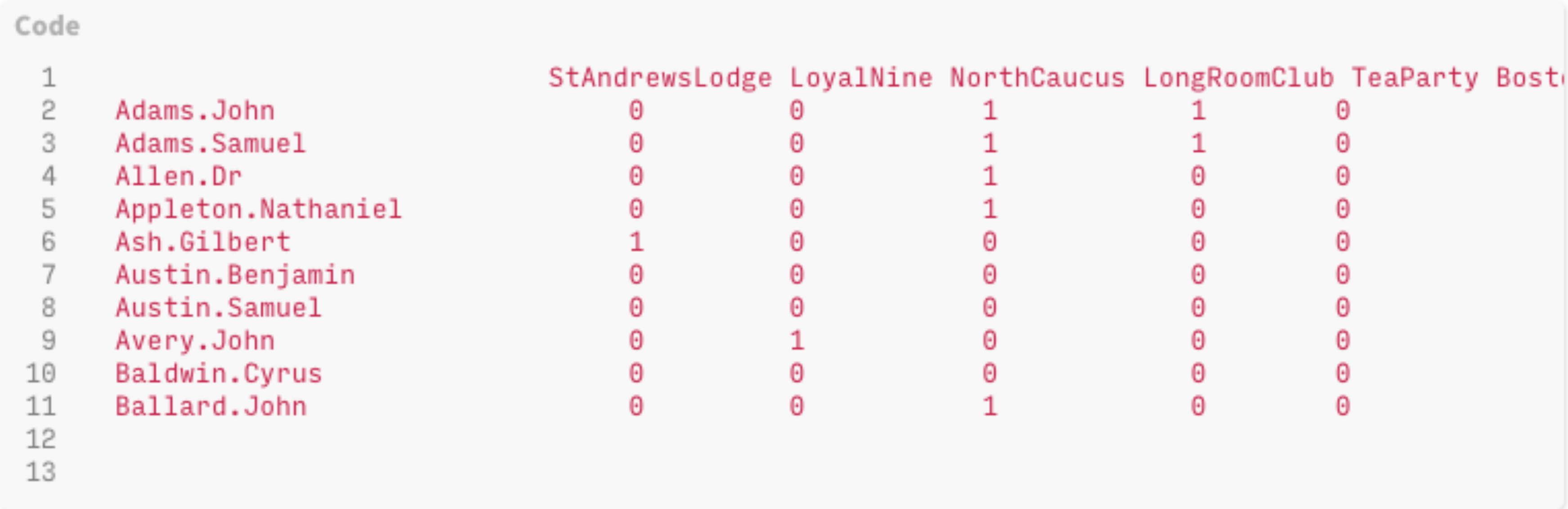
- They know you called the suicide prevention hotline from the Golden Gate Bridge, but the topic of the call was secret
- They know you spoke with an HIV testing service, then your doctor, then your insurance company, but they don’t know what was discussed
- They know you called a gynecologist, spoke for a half hour, and then called Planned Parenthood, but nobody knows what you spoke about

https://www.eff.org/deeplinks/2013/06/why-metadata-matters

If the British had metadata, could they have stopped the American revolution?

Start with a list of club members

This is an adjacency matrix from CS10!



```
                     StAndrewsLodge LoyalNine NorthCaucus LongRoomClub TeaParty Bost
Adams.John                        0         0           1            1        0
Adams.Samuel                      0         0           1            1        0
Allen.Dr                          0         0           1            0        0
Appleton.Nathaniel                0         0           1            0        0
Ash.Gilbert                       1         0           0            0        0
Austin.Benjamin                   0         0           0            0        0
Austin.Samuel                     0         0           0            0        0
Avery.John                        0         1           0            0        0
Baldwin.Cyrus                     0         0           0            0        0
Ballard.John                      0         0           1            0        0
```

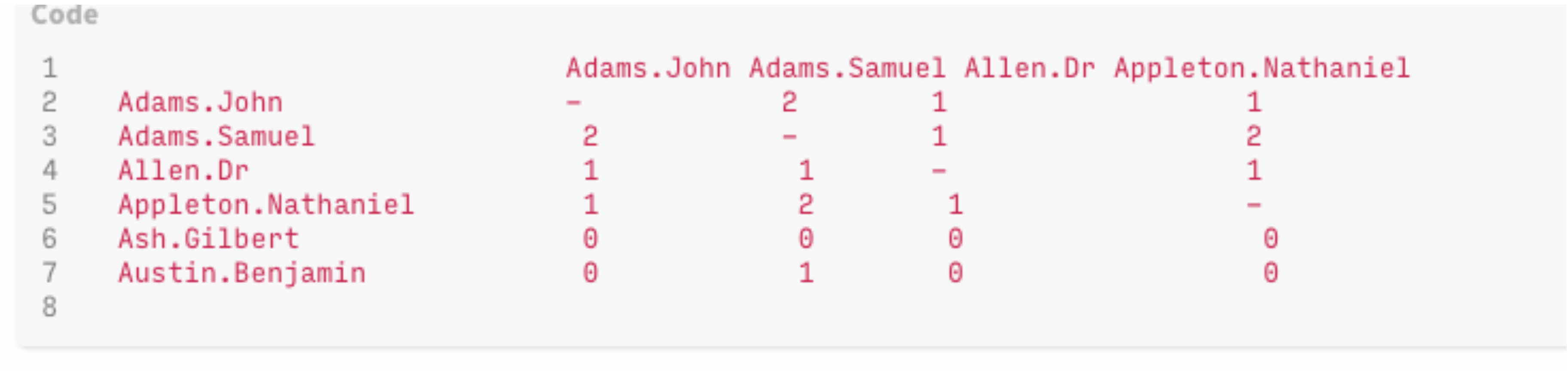
Not much data here, just a 1 if a person was a member of a club
254 people, 7 clubs

Call this matrix A

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/

If the British had metadata, could they have stopped the American revolution?

Calculate $A(A^T)$



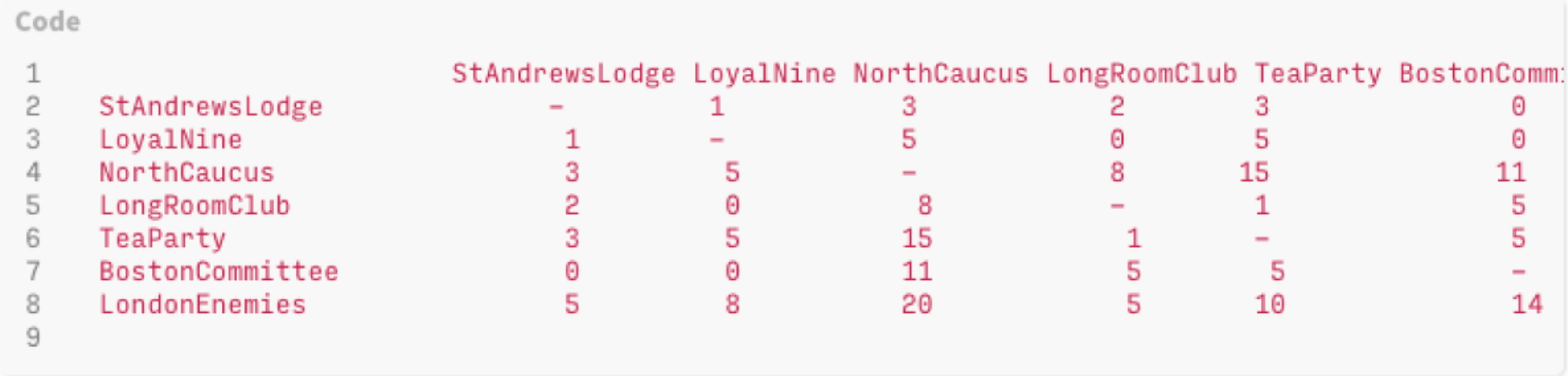
```
                    Adams.John Adams.Samuel Allen.Dr Appleton.Nathaniel
Adams.John          -          2            1        1
Adams.Samuel         2         -            1        2
Allen.Dr            1           1           -        1
Appleton.Nathaniel  1           2            1       -
Ash.Gilbert         0           0            0        0
Austin.Benjamin     0           1            0        0
```

Now have a 254x254 person matrix
Gives the number of clubs where two people are both members

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/

If the British had metadata, could they have stopped the American revolution?

Also calculate $A^T(A)$



Code

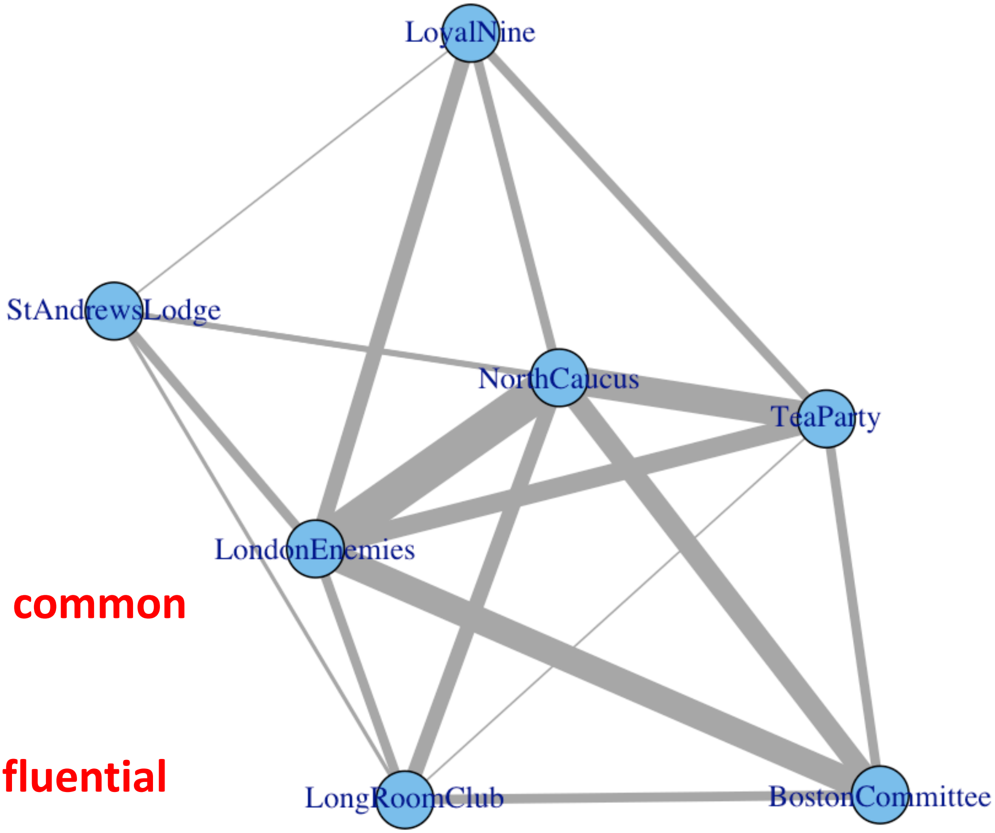
```
                      StAndrewsLodge LoyalNine NorthCaucus LongRoomClub TeaParty BostonComm
    StAndrewsLodge                 -         1           3            2        3          0
    LoyalNine                      1         -           5            0        5          0
    NorthCaucus                    3         5           -            8       15         11
    LongRoomClub                   2         0            8           -        1          5
    TeaParty                       3         5          15             1       -          5
    BostonCommittee                0         0          11             5        5         -
    LondonEnemies                  5         8          20             5       10          14
```

Now have 7x7 organization matrix
Gives the number of members organizations have in common

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/

If the British had metadata, could they have stopped the American revolution?

Plot shared members between clubs



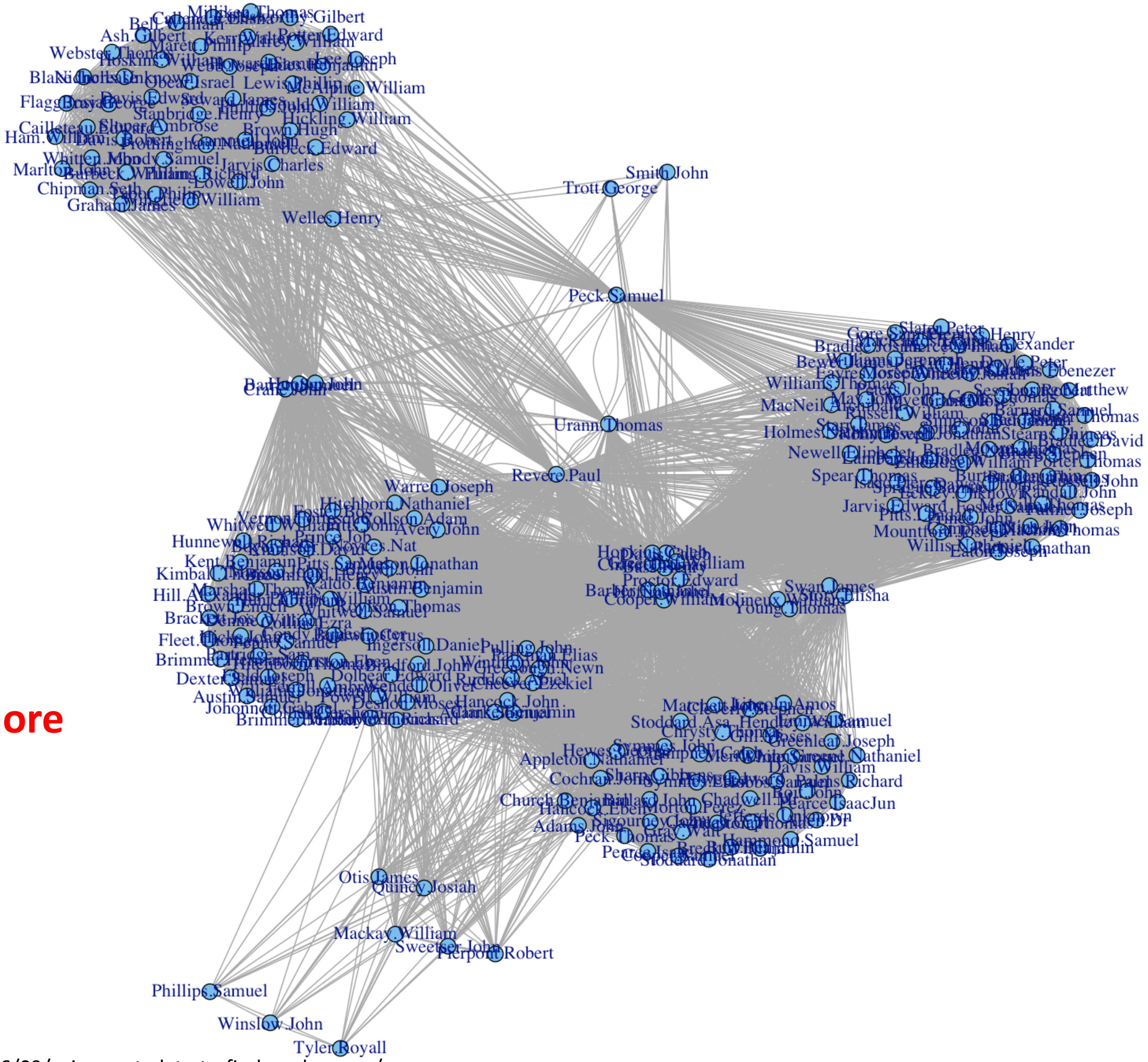
Some clubs have more common members than others

They might be more influential than others?

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/

If the British had metadata, could they have stopped the American revolution?

Plot people based on the number of clubs in common



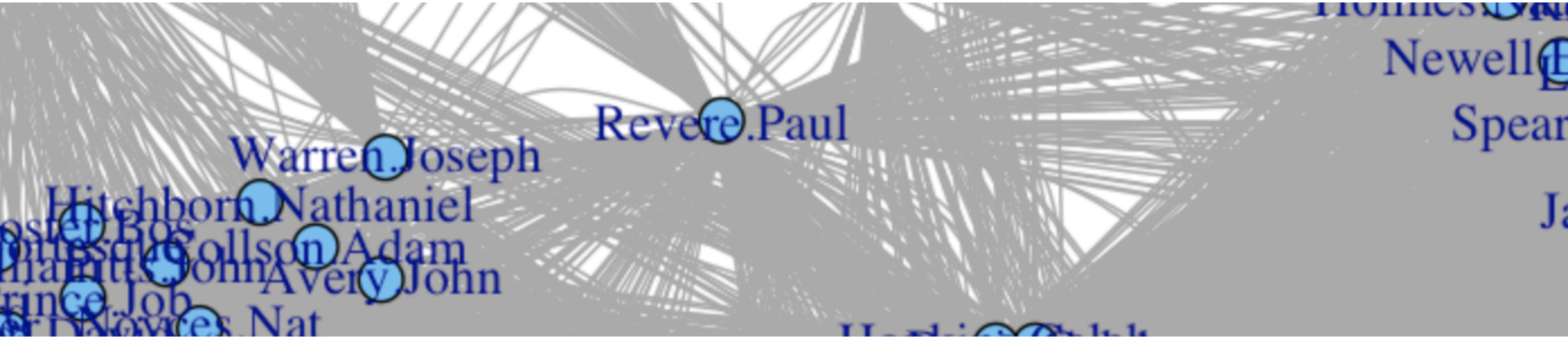
Some people have more connections to other people

They might be more influential

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/

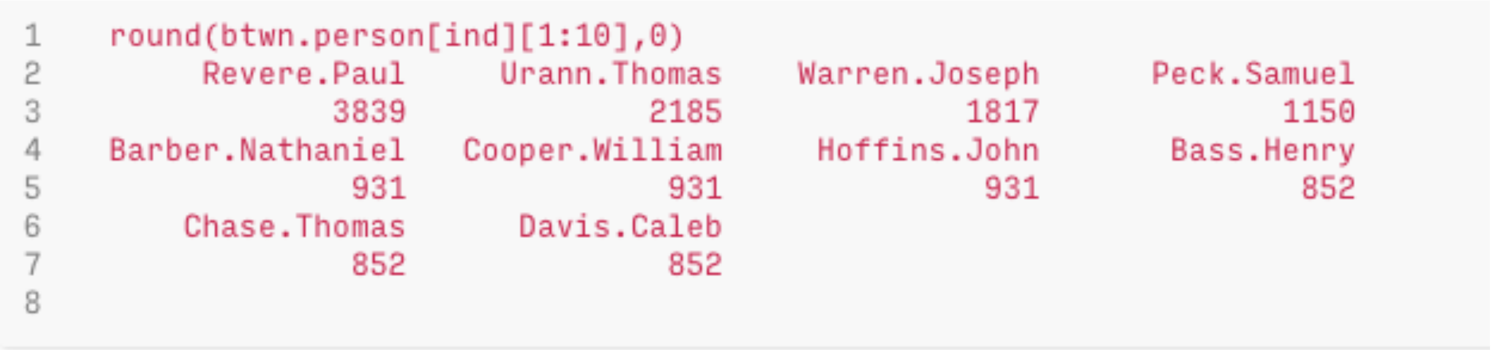
If the British had metadata, could they have stopped the American revolution?

Look at who is most connected



Maybe we should have a chat with Mr. Revere!

… and a few others



```
round(btwn.person[ind][1:10],0)
      Revere.Paul     Urann.Thomas   Warren.Joseph     Peck.Samuel
             3839             2185            1817            1150
Barber.Nathaniel  Cooper.William    Hoffins.John      Bass.Henry
              931              931             931             852
     Chase.Thomas      Davis.Caleb
              852              852
```

https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere/