CS573 Data Privacy and Security

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Today

- Meet everybody in class
- Course overview
- Course logistics
- Poll

Instructor

- **Instructor**: Li Xiong
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  - Office: MSC E412

About Me

- Graduate teaching
  - CS550 Database systems
  - CS570 Data mining
  - CS573 Data privacy and security
- Research
  - data privacy and security
  - information integration and informatics

Meet everyone in class

- Group introduction (2-3 people)
- Introducing your group
  - Names
  - Your goals for the course
  - Something interesting about your group

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What is the course about

- Techniques for data privacy and security
- Applications

- Not about
  - Network security, system security, software security …

Definitions of Privacy

- Right to be left alone (1890s, Brandeis, future US Supreme Court Justice)
- a: The quality or state of being apart from company or observation; b: freedom from unauthorized intrusion (Merrian-Webster)
- The right of individual to be protected against intrusion into his personal life or affairs, or those of his family, by direct physical or by publication of information (Calcutt committee, UK)

Aspects of Privacy

- **Information privacy**
  - Collection and handling of personal data, e.g. medical records
- Bodily privacy
  - Protection of physical selves against invasive procedures, e.g. genetic test
- Privacy of communications
  - Mail, telephones, emails
- Territorial privacy
  - Limits on intrusion into domestic environments, e.g. video surveillance

Information Privacy

- Establishment of rules governing the collection and handling of personal data
  - Data about individuals should not be automatically available to other individuals and organizations
  - The individual must be able to exercise a substantial degree of control over that data and its use.

Models of privacy protection

- Comprehensive laws
  - Adopted by European Union, Canada, Australia
- Sectoral laws
  - Adopted by US
  - Financial privacy, protected health information
  - Lack of legal protections for data privacy on the Internet
- Self-regulation
  - Companies and industry bodies establish codes of practice
- Technologies of Privacy

A race to the bottom: privacy ranking of Internet service companies

- A study done by Privacy International into the privacy practices of key Internet based companies in 2007
- Amazon, AOL, Apple, BBC, eBay, Facebook, Google, LinkedIn, LiveJournal, Microsoft, MySpace, Skype, Wikipedia, LiveSpace, Yahoo!, YouTube

A Race to the Bottom: Methodologies

- Corporate administrative details
- Data collection and processing
- Data retention
- Openness and transparency
- Customer and user control
- Privacy enhancing innovations and privacy invasive innovations

A race to the bottom: interim results revealed

Privacy-friendly and privacy enhancing

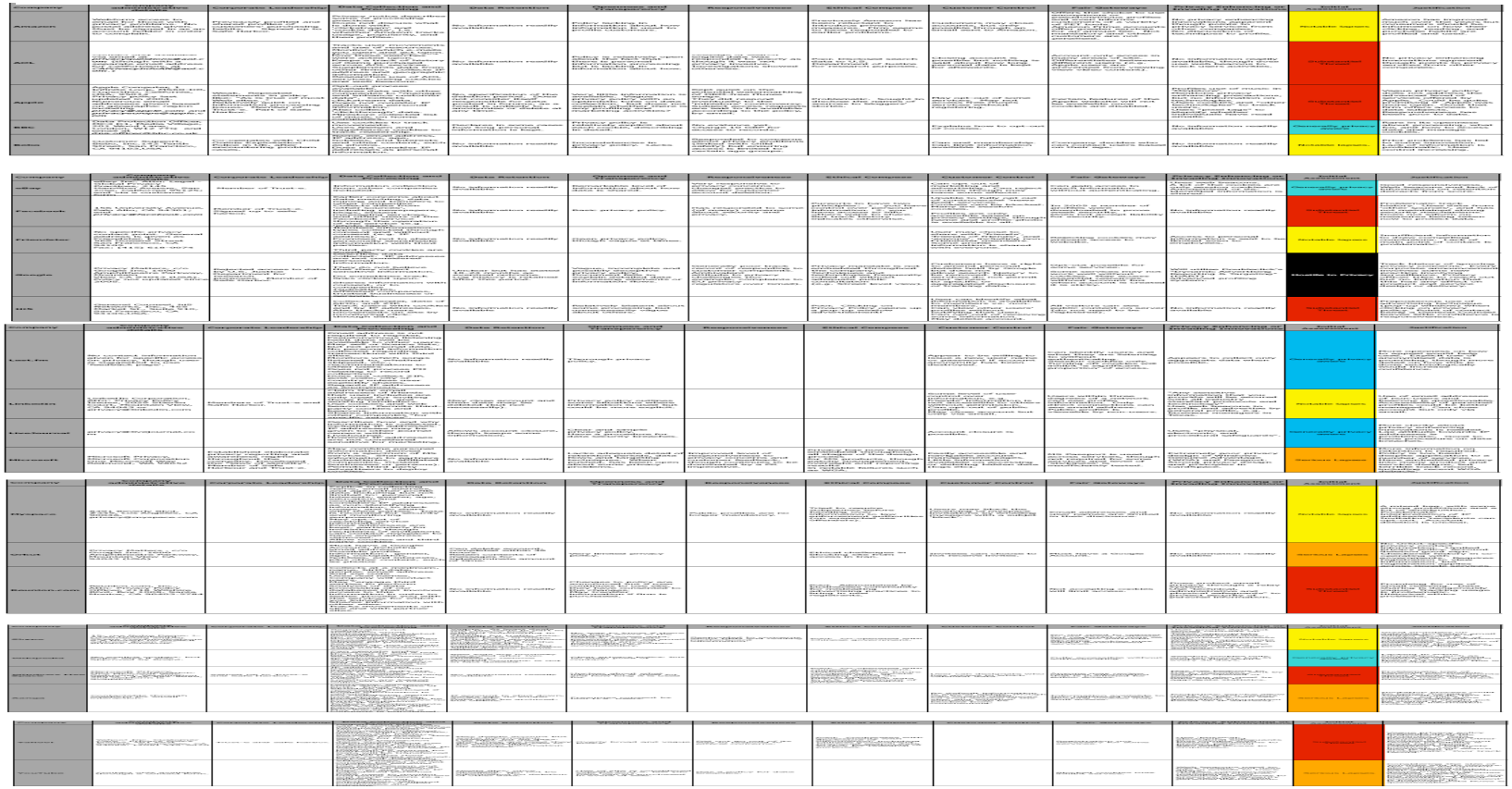
Generally privacy-aware but in need of improvement

Generally aware of privacy rights, but demonstrate some notable lapses

Serious lapses in privacy practices

Substantial and comprehensive privacy threats

Comprehensive consumer surveillance & entrenched hostility to privacy



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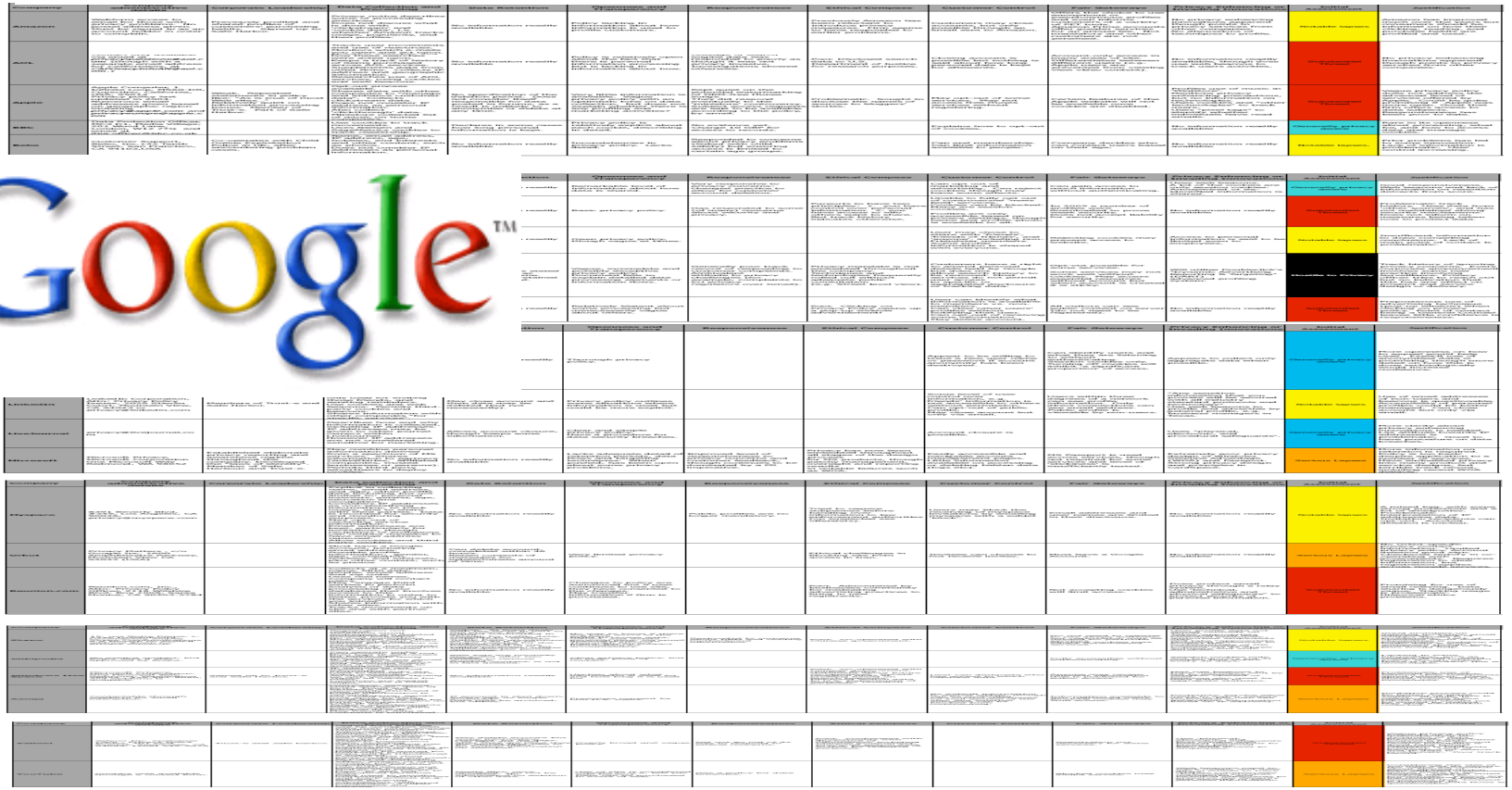


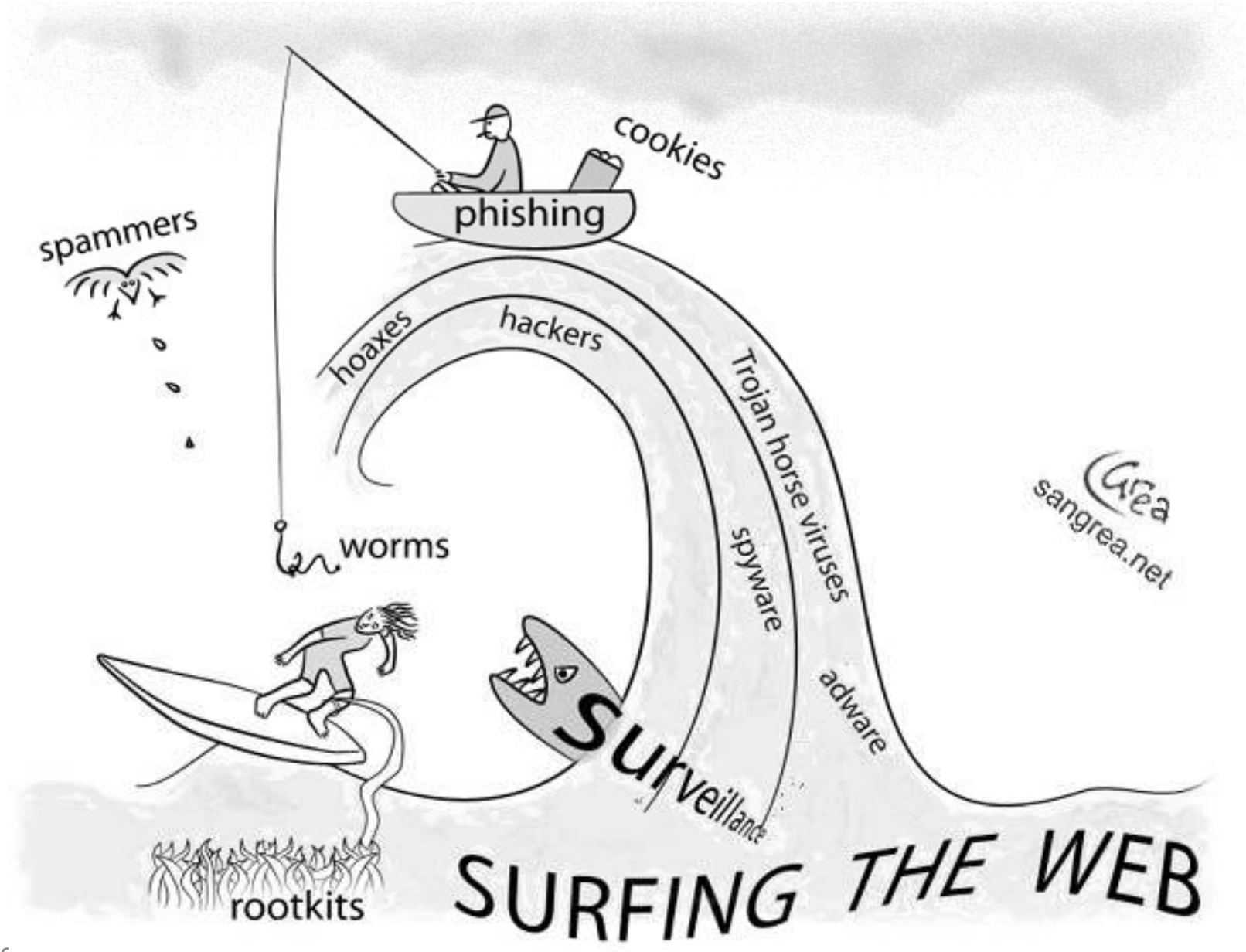
Why Google

- Retains a large quantity of information about users, often for an unstated or indefinite length of time, without clear limitation on subsequent use or disclosure
- Maintains records of all search strings with associated IP and time stamps for at least 18-24 months
- Additional personal information from user profiles in Orkut
- Use advanced profiling system for ads

Are Google and Facebook Evil?

- Targeted advertising
- Cross-selling of users' data
- Personalized experience

Online Privacy



Some improvements on transparency

- An interview by Privacy International with Google on Government access to personal information, 2010
- Google transparency reports listing the requests received by Google from government entities for the disclosure of user data in six-month blocks.

Home
Traffic
Government Requests
Country Detail
Map
Content Removal Requests
User Data Requests
Raw Data
FAQ
Visible Changes

Like other technology and communications companies, Google regularly receives requests from government agencies and courts around the world to remove content from our services and hand over user data. Our Government Requests tool discloses the number of requests we receive from each government in six-month reporting periods with certain limitations.

These numbers represent the requests we received from government entities for the disclosure of user data in six-month blocks. We continue to look for new ways to organize information and provide more detail. For example, starting with the July-December 2010 reporting period, we began to disclose the percentages of user data requests we comply with in whole or in part. And starting with the January-June 2011 reporting period, we began to disclose the number of users or accounts about which data was requested.

◄ January to June 2011 ►

Country	User Data Requests	Percentage of data requests fully or partially complied with	Users/Accounts Specified
Argentina	134	32%	188
Australia	361	73%	412
Belgium	90	67%	111
Brazil	703	87%	1,822
Canada	50	48%	75
Chile	118	42%	143
France	1,312	47%	1,552
Germany	1,065	66%	1,759
Hong Kong	123	42%	123
Hungary	81	2%	82
India	1,739	70%	2,439
Israel	60	60%	67
Italy	934	60%	1,263
Japan	75	87%	82
Mexico	48	42%	73
Netherlands	64	48%	213
Poland	266	11%	319
Portugal	161	50%	323
Russia	42	0%	47
Singapore	106	75%	126
South Korea	259	37%	530
Spain	460	63%	709
Switzerland	36	69%	42
Taiwan	155	81%	267
Turkey	73	0%	74
United Kingdom	1,279	63%	1,444
United States	5,950	93%	11,057

They are always watching … what can we do?

Who cares? I have nothing to hide.

If you do care …

- Use cash when you can.
- Do not give your phone number, social-security number or address, unless you absolutely have to.
- Do not fill in questionnaires or respond to telemarketers.
- Demand that credit and data-marketing firms produce all information they have on you, correct errors and remove you from marketing lists.
- Check your medical records often.
- Block caller ID on your phone, and keep your number unlisted.
- Never leave your mobile phone on, your movements can be traced.
- Do not user store credit or discount cards
- If you must use the Internet, encrypt your e-mail, reject all "cookies" and never give your real name when registering at websites
- Better still, use somebody else's computer

Privacy Protection Techniques

- Finding balances between privacy and multiple competing interests:
  - Privacy vs. other interests (e.g. quality of health care; movie recommendation)
  - Privacy vs. interests of other people, organization, or society as a whole (e.g. insurance companies, healthcare research; movie recommendation for others).

Security

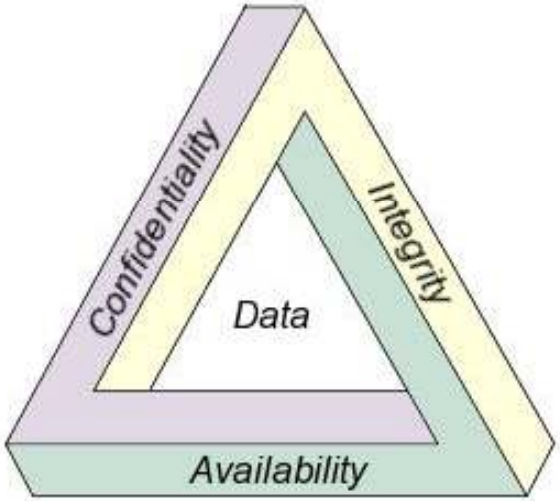
- The quality or state of being secure: as a: freedom from danger; b: freedom from fear or anxiety (merrian-webster)
- National security
- Individual security
- Information security
  - Computer security
  - Data security

Security vs. Privacy

- Data surveillance
  - Surveillance cameras
  - Sensors
  - Online surveillance

Principles of Data Security – CIA Triad

- Confidentiality
  - Prevent the disclosure of information to unauthorized users
- Integrity
  - Prevent improper modification
- Availability
  - Make data available to legitimate users



Privacy vs. Confidentiality

- Confidentiality
  - Prevent disclosure of information to unauthorized users
- Privacy
  - Prevent disclosure of personal information to unauthorized users
  - Control of how personal information is collected and used

Data Privacy and Security Measures

- Access control
  - Restrict access to the (subset or view of) data to authorized users
- Inference control
  - Restrict inference from accessible data to additional data
- Flow control
  - Prevent information flowing from authorized use to unauthorized use
- Encryption
  - Use cryptography to protect information from unauthorized disclosure while in transmit and in storage

Course topics

- Access control
- Inference control
- Secure multi-party computations
- Applications: healthcare, social networks

- Disciplines: databases, information security, data mining, statistics, cryptography

Access Control

- Identification and Authentication
- Authorization
- Access control policies
  - Discretionary access control
  - Mandatory access control
  - Role based access control
- Accountability and auditing

Security Measures

- Access control
  - Restrict access to the (subset or view of) data to authorized users
- **Inference control**
  - Restrict inference from accessible data to additional data
- Flow control
  - Prevent information flowing from authorized use to unauthorized use
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Inference Control

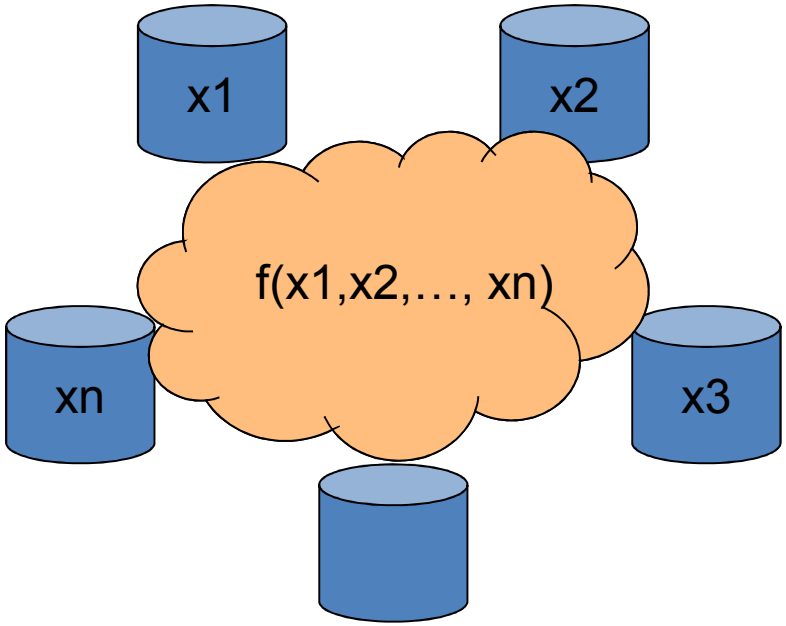
- **Inference control**: Prevent inference from de-identified, anonymized, or statistical information (accessible) to individual information (not accessible)
- Attack Incidents
  - Massachusetts Group Insurance Commission (GIC) medical encounter database
  - AOL search queries
  - Netflix prize

Inference Control

- Data anonymization
  - Data generalization
  - Data aggregation
  - Data perturbation
- Statistical database
  - Query restriction
  - Output perturbation
- Privacy preserving data mining
  - Data perturbation
  - Output perturbation

Secure Computations

- Multi-party secure computations
  - Cryptographic protocols
  - Absolute security/privacy vs. approximation



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Logistics

- Materials
  - Papers, online articles
- Prerequisite
  - Some database and statistics background
  - Programming skills
- Class webpage
  - Lecture notes
  - Link to readings
  - Project/assignments

  http://www.mathcs.emory.edu/~cs573000

Workload

- ~2 programming assignments (individual)
- ~2 reading assignments
- ~1 paper presentation
- 1 open-ended course project (team of up to 2 students) with project presentation
  - Application and evaluation of existing algorithms to interesting data
  - Design of new algorithms to solve new problems
  - Survey of a class of algorithms
- 1 midterm
- No final exam

Late Policy

- Late assignment will be accepted within 3 days of the due date and penalized 10% per day
- 1 late assignment allowance, can be used to turn in a single late assignment within 3 days of the due date without penalty.

Grading

- Assignments/presentations 40%
- Final project 30%
- Midterm 30%

And now …

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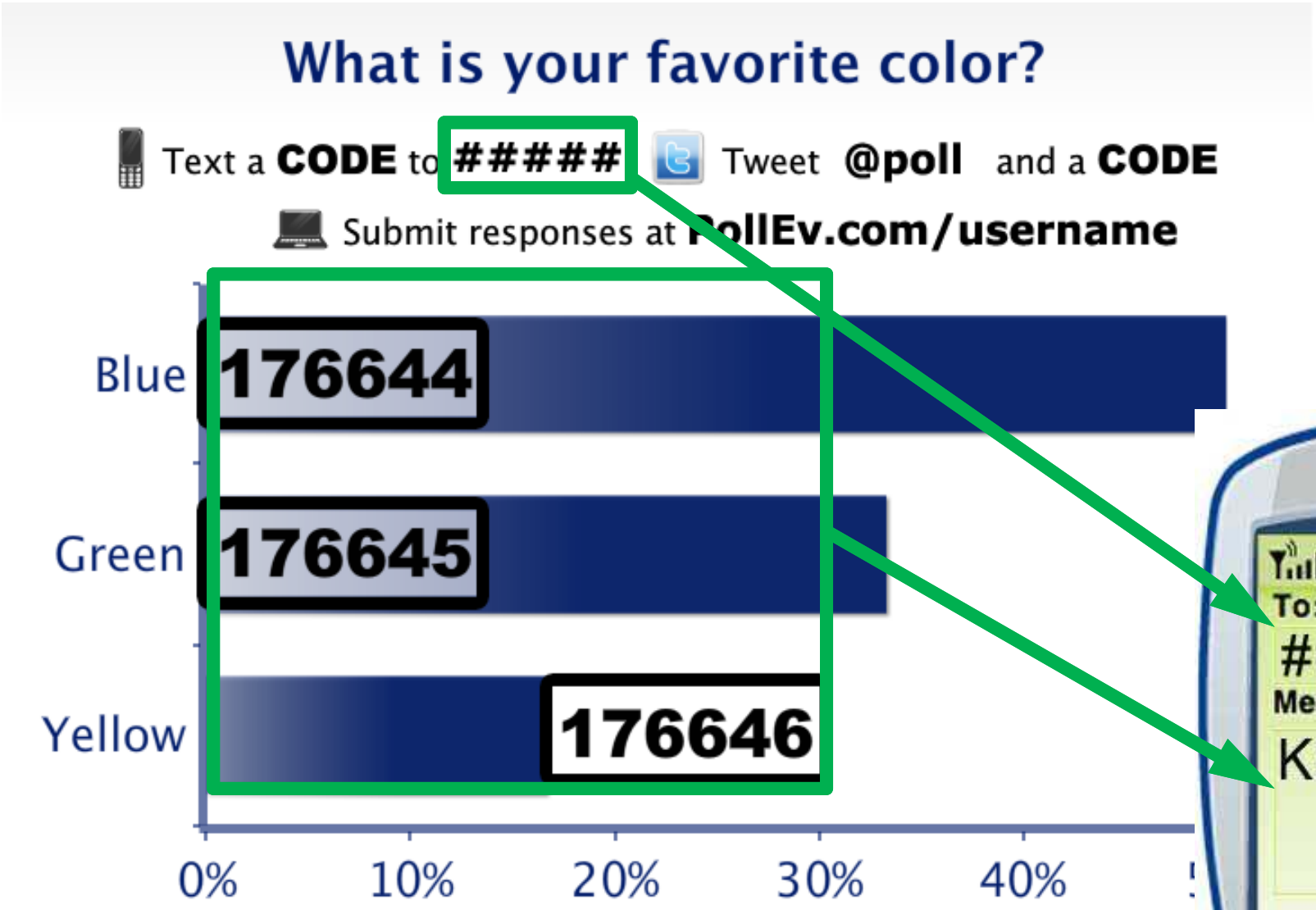
http://www.polleverywhere.com



TIPS

1. Standard texting rates only (worst case US $0.20)
2. We have no access to your phone number
3. Capitalization doesn't matter, but spaces and spelling do

Online recording

How concerned would you say you are with the following aspects of the Internet?

Companies recording your online habits and using the data to generate profit through advertising

- Very concerned 44%
- Somewhat concerned 37
- Not very concerned 15
- Not at all concerned 4
- Not sure <1

Online tracking

Do you believe law enforcement should have to get a warrant to track where you go on the Internet, like they have to get one to wiretap phone conversations?

- Yes 79%
- No 12
- Not sure 9

Government for online privacy

Do you believe government regulators should play a larger role in protecting online consumer privacy?

- Yes 49%
- No 36
- Not sure 16

Online anonymity

- Statement A: "I think anonymity on the Internet has to go away. People behave a lot better when they have their real names down. … I think people hide behind anonymity and they feel like they can say whatever they want behind closed doors."
- Statement B: "Many people believe that requiring real names will solve the problems of trolls and bad behavior, but they don't -- and that policy can have negative consequences in terms of suppressing dialogue about important topics.“

Online Anonymity

Which statement comes closest to your opinion?

Statement A: "I think anonymity on the Internet has to go away. People behave a lot better when they have their real names down. … I think people hide behind anonymity and they feel like they can say whatever they want behind closed doors."

Statement B: "Many people believe that requiring real names will solve the problems of trolls and bad behavior, but they don't -- and that policy can have negative consequences in terms of suppressing dialogue about important topics.“

- Anonymity on the Internet has to go away 21%
- Requiring real names suppresses dialogue 49%
- Neither 19%
- Not sure 12%

Online Privacy

Would you consider someone posting a picture of you in a swimsuit to be an invasion of your privacy?

- Only 35.6 percent of 18-24 year-old consider it an invasion of privacy
- 65.5 percent of other respondents