- Project 4: code reviews due in one week
- Project 5:
  - Due in one week
  - Code reviews due the last day of classes
- Project 5: questions?
- Recursion

Ethical Theories

Slides derived from the work of Dr. Amy McGovern

And from *Gift of Fire*: Dr. Sarah Baase

Technology

What is *technology*?

Technology

What is *technology*?

- Making, usage of, knowledge of: tools, machines, techniques, crafts, systems
- Methods of organization in order to solve a problem or perform a specific function

Technology

- Technology changes society for better ***and for worse***
- Responsibility of Computer Scientists
  - Create/use technology ethically
- Problem: laws lag in technology
  - Less problematic for most other engineers because their laws—just like their disciplines—are older

Ethics in Technology: Sources

- Ethical theories
- ACM has a code of ethics:
  - http://plone.acm.org/membership/COE_Flyer.pdf
  - http://www.acm.org/about/code-of-ethics
  - http://www.acm.org/about/se-code
- IEEE has a code of ethics:
  - http://www.ieee.org/about/corporate/governance/p7-8.html

Good Side of Technology

- Distributed research groups:
  - Researchers here and in Chicago work on the same problem applied to the same robot
- What else?

Good Side of Technology: General

- eBay—selling and buying used goods
- Facebook—social connections
- Google—finding information (and it's all true!)
- Cell phones—safety, social connections, pictures
- Online retailers—more variety, lower prices
- Distance learning—accessibility
- Robots performing boring and dangerous jobs

Bad side of technology

???

Bad Side of Technology

- Cyber stalking, cyber bullying
- Craigslist killings
- Spam
- Potential future employers checking Facebook
- Differential ability to access internet fully
- Identity theft
- Loss of non-work life
- Loss of small businesses from towns

Professional Ethics

Primarily a problem solving process

1. Recognize that a situation has ethical implications
   - Textbook will be very helpful in this process
2. Generate possible solutions
3. Evaluate solutions according to ethical theories/principles
4. Select (or advocate for) most acceptable solution

Deontological Theories (non-consequentialist)

Three of the key rules:

- Universality: Rules of behavior should apply to everyone
- Rationality: Use reason and judgment, rather than emotions, when making ethical decisions
- Respect: Other people have their own intrinsic value—they should not be merely means to an end

Deontological Theories

Example: Creating game software that surreptitiously collects data to be sold to advertisers

- What if the software is free?
- What if the customers are informed?
- What if the customers have to opt-in? Opt-out?

Consequentialist Theories

- The outcome of the act is the important thing
- Utilitarianism is one branch of this type of theory
  - Do the greatest good for the greatest number of people
    - Spock? The good of the many outweighs the good of the individual

Utilitarianism

- Act utilitarianism: applies to individual actions
  - Dangers
    - Calculating utility is not straightforward
    - Has no absolute prohibitions or individual rights
- Rule utilitarianism: general ethical rules that attempt to do the greatest good for the greatest number

Natural Rights

- Life
- Liberty
- Property

- Process is important - actions are ethical if they involve :
  - Voluntary interactions
  - Knowingly and freely made exchanges

Example

Should the university scan the hard drives of student computers connected to the network looking for unlicensed videos/music?

- Deontological?
- Utilitarian?
- Natural Rights?

Example

How about scanning your email? How about looking for seditious activity? Is there a justifiable point, and if so, where?

Negative vs Positive Rights

What is the distinction?

Negative vs Positive Rights

What is the distinction?

- Negative rights (liberties): rights of noninterference from others
- Positive rights (claim rights): imposes an obligation on others to provide the right

Many issues can be viewed from both perspectives

Other Principles…

- Golden rule: reciprocity
- Virtuous life: contributing to society

Using Ethical Theories

- Results of applying an ethical theory are tertiary: ethically obligatory, ethically prohibited, ethically acceptable
- Each theory could produce different results in a given situation

- Veil of Ignorance: analyze a situation by taking your specific properties (e.g., age, gender, ethnicity) out of the analysis

Using Ethical Theories

The process of reasoning about ethics and trying to find and broker solutions that meet the requirements of multiple theories often results in more ethically acceptable decisions being made

Law and Ethics

What is the relationship?

Law and Ethics

Not all laws are ethical

- Prohibition
- Slavery
- Women and slaves not permitted to own property or to vote

Law and Ethics

- Categories of laws (not exclusive)
  - Enforce ethical rules
  - Rules for interacting with strangers
    - Should be consistent with ethics
  - Laws created by political influence—often not ethical
- Breaking the law is not necessarily unethical
  - It can, however, have consequences

Other Issues

Wrong and Harm

- What is the relationship?

Other Issues

Wrong and Harm

- Just because someone is harmed, does not make an act wrong
  - Example: Assigning failing grades to some students

- Just because an act is wrong does not imply that harm has been done

Other Issues

Goals and actions

- Do they have ethical value?

Other Issues

Goals and actions

- Actions have ethical values, not generally goals
- Example: Nothing unethical about having a goal of making money
  - The ethical value comes from the actions used to achieve that goal

Privacy

Where does our understanding of privacy come from?

Privacy

Where does our understanding of privacy come from?

- Deontological theories: Respect: individuals have their own intrinsic values
- Natural rights: liberty, property

Privacy

4th amendment of the US Constitution:

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Privacy

- Freedom from intrusion
- Control of information about oneself
- Freedom from surveillance

Loss of Privacy

Many avenues:

- ???

Loss of Privacy

Many avenues:

- Intentional use of personal information
- Unauthorized use/release
- Theft
- Unintentional leakage
- Data collection
- By choice

Privacy in the Computing/Information World

These threats to privacy are dramatically enhanced by our current use of computing/communication systems

- Lots of data stored in digital media
  - Security of data often ad hoc
- Much of these data must be communicated between locations
- Many opportunities for others to log/record data
- Easier than ever to connect different pieces of data

Privacy in the Computing/Information World

Because we deal with data and information, often about people, we have an obligation to safeguard their privacy

- This is required by law, in some cases: FERPA, HIPAA
- Privacy should be built into our designs from the beginning & should not be an afterthought

- Project 4: wrap up code reviews today
- Project 5:
  - Due today
  - Code reviews by the end of the week
- Course reviews: only 19% are complete.
  - Need 85% by the start of next class
- Lab 15:
  - Bring: Book + Bill of Rights + ACM code of ethics

Net Neutrality

Net Neutrality

- In court last week (US Court of Appeals): FCC defending its 3rd set of new rules
- Decision expected next year

- If the judges throw out the FCC rules, then ISPs will be able to collect money for "fastlanes"

Browser Cookies

Browser Cookies

Small bits of information that a web site leaves with your web browser

- Aid in presenting consistent information from one click to the next
- Often unique signatures which could be connected to your identity, gender, age, …
- Other web sites can “see” aspects of your other browser activities

Browser Cookies

What are the good and bad of cookies?

Data Mining

Data Mining

Data Mining is the process of finding patterns in large data sets

- These learned models can then be used to make predictions about the future
  - What will the traffic be like?
  - What movies will you watch?
  - What will you buy?
  - What web sites will you visit?
  - Will the search results be “good”?

Medical Data

- Any information that connects an individual with their medical data is subject to special protections in the US
- Without these protections, there are many opportunities for abuse

Medical Data

We starting to see individuals voluntarily making their medical data public

- If we can make connections between overall health, lifestyle and eating habits, medication, the outcomes of specific medical tests and DNA, we could make tremendous progress in individualized medicine

Encryption

Encryption

The mathematics of hiding information in plain sight

- Protect our data
- Have private conversations
- Verify the identity of someone
- Verify the validity of a message/file

Encryption

Some current techniques are good enough to ensure privacy, but not all …

Encryption Threats

???

Encryption Threats

- Improper use
- Legalities
- Back doors
- Purposefully injecting weak methods into standards
- Future: developing better techniques to break today's encryption

Metadata

???

Metadata

- US law interprets privacy in communication in terms of protecting the content of the communication
- The issue is much less clear for the *metadata* – the data that describe the other aspects of the dialog
  - Identities of the parties
  - Locations of the parties
  - Timing/size of individual messages

Bulk Collection of Metadata

- US currently stores metadata for many forms of communication: email, snailmail, phone, social media …
- Agencies can then search these data, looking for certain patterns of activity
- Status of this program is in question

Smartphones

Smartphones provide many opportunities for information leakage

???

Smartphones

Smartphones provide many opportunities for information leakage

- Many types of personal information in one location
- Can collect data themselves
- May be subject to digital or physical attack
- Many different apps: how can we trust them to use our information appropriately?

Our Obligations as Software Designers

- Informed consent:
  - What information is being collected?
  - How will it be used?
  - With whom will it be shared?
  - Allow users to opt out or opt in
- Secure the data storage and the transport

Property Rights

Property Rights

What is the distinction between property and intellectual property?

Property Rights

What is the distinction between property and intellectual property?

- Property: tangible, limited supply, hard to replicate
- Intellectual property: ideas. Intangible, easy to use, and easy to communicate.
  - In the case of ideas expressed digitally, they are easy to copy

Property Rights

What are the commonalities between property and intellectual property?

Property Rights

What are the commonalities between property and intellectual property?

- Original creation requires effort/labor/resources
- For some of us, it ***is*** our job to create intellectual property

- Course reviews: finish now
- Grading:
  - Labs through #12
  - Projects (mostly) through #4
  - Homework and quizzes complete
- Wrap up project 5 code reviews this week (note added hours)
- Lab tomorrow: same structure as last week

What are the Ethical Tensions Brought Forward by Intellectual Property?

What are the Ethical Tensions Brought Forward by Intellectual Property?

Two conflicting principles:

- Individuals should have ownership/control over the fruits of their labor
- Society as a whole benefits from the use of new ideas

Intellectual property law tries to balance these

Protection of Intellectual Property: Copyright vs Patent

Protection of Intellectual Property: Copyright

- Protect the creative work in the medium of the work
  - Expression not content
- Copyright holder can:
  - Make copies, produce derivative works
  - Transfer copyright to other entities
- Limited period: lifetime of author + ~100 years

Protection of Intellectual Property: Patent

- Protect specific ideas/processes
- Patent holder:
  - Has monopoly on the use of the patent
  - Can restrict its use by others
  - Can license or sell the patent
- Duration: 20 years

Fair Use Doctrine

What does it mean for me to buy a book?

Fair Use Doctrine

What does it mean for me to buy a book? I can:

- Read it
- Make commentary or art with it (using small pieces of the work)
- Sell or share with someone else
- Make full copies of it?

What about software or other digital objects?

Fair Use Doctrine

What does it mean for me to buy software or a movie?

- Would like to have all that applies to the books be true here, too
- But: the digital form makes it so much easier to make and distribute copies to others

Fair Use Doctrine

No hard-and-fast rules (except specific cases).
Factors include:

- Purpose of the copying matters (e.g., non-profit vs for-profit activities; education)
- Amount of the copyrighted work that is copied
- The form of the original work
- The effect on the market for the copyright holder

Fair Use Doctrine

Long (and continuing) history of tension between (some) intellectual property holders and fair use

- IP holders have introduced many mechanisms to prevent copying
  - Digital Rights Management systems
- Many of these mechanisms infringe on fair use

Digital Millennium Copyright Act

- Illegal to reverse engineer a security mechanism
- ISPs and web servers are not necessarily responsible for trafficked information
  - But must respond appropriately to “take-down” requests of copyrighted material

Digital Millennium Copyright Act

- Illegal to reverse engineer a security mechanism
- ISPs and web servers are not necessarily responsible for trafficked information
  - But must respond appropriately to “take-down” requests of copyrighted material

… many cases where the law is abused

Digital Millennium Copyright Act

Using take-down requests to censor speech that is protected

- Scientific analyses (e.g., of computer security mechanisms)
- Clips of video/music used for educational purposes
- Competing ideas/products
- …

Digital Millennium Copyright Act

Toner Cartridges

Digital Millennium Copyright Act

IPhone connection to the Apple App store

Fair Use and Search Engines

Fair Use and Scanning Books

New Models of Protection: CopyLeft

GNU Public License:

- Anyone can use the software
- Anyone can create derivative works of software and release the derivative
  - Derivative works must also be “GPL’d”

New Models of Protection: CopyLeft

Derivative works must also be “GPL’d”

- Tainting model of software: in the extreme interpretation, any software that uses GPL’d code must also be GPL’d

New Models of Protection: Creative Commons

Recent attempt at creating rational sharing licenses:

- Human-readable: allow us to easily understand the license
- Lawyer-readable: specific enough to be legally binding
- Machine-readable: other programs can identify the license within the source (e.g., search engines)

New Models of Protection: Creative Commons

Properties can be selected:

- Attribution
- Commercial vs non-commercial
- Derivative works allowed/not allowed
- Share-a-like: derivative works must be shared

Derivative works must carry the same license

Our Responsibilities

Responsible to our customers and to our employers

- Making use of “freely” available software can increase productivity and quality of the work
- But, tread cautiously:
  - May contain things we don’t expect (security vulnerabilities)
  - May expose customers & employers legally and financially

Our Responsibilities

Many principles at place. ACM code of ethics asks us to:

- Respect property rights
- Give credit for intellectual property
- Be honest and trustworthy
- Avoid harm

Employer will often have policies in place about the use of open source code