CS 280

Risk and Reward in the Information Society

Professional Issues

Outline

- How Tech changes work
- Economics
- Professional codes of conduct
- Professional Ethics

Impact of Computers on Work

- Some jobs have been eliminated.
- Other jobs have been created.
- Repetitious or boring jobs are now done with computers.
- There is more time for creativity.
- Some workers “telecommute.”
- Employers can better monitor their workers.
- Health issues have been associated with computer usage.

Job Destruction and Creation

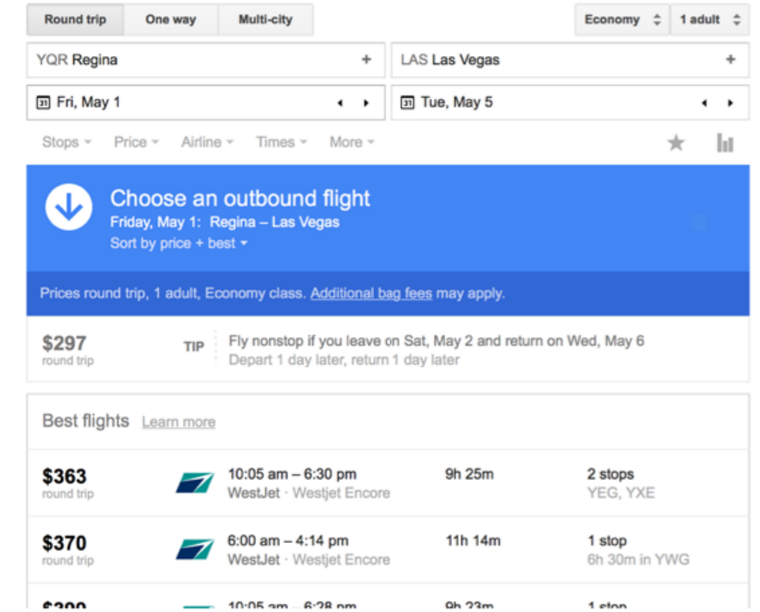
- Computers and Unemployment:
  - Automation leads to loss of jobs.
  - Computerization eliminates some jobs.
  - Computer efficiency means fewer jobs.

- Reasonable estimates suggest 40% unemployment in 10 years if AI proceeds on pace.

- Q: does better technology makes new better jobs for people?


Self checkout


ATM


Round trip
One way
Multi-city
Economy
1 adult
YQR Regina
LAS Las Vegas
Fri, May 1
Tue, May 5
Stops
Price
Airline
Times
More
Choose an outbound flight
Friday, May 1: Regina – Las Vegas
Sort by price + best
Prices round trip, 1 adult, Economy class. Additional bag fees may apply.
$297
round trip
TIP
Fly nonstop if you leave on Sat, May 2 and return on Wed, May 6
Depart 1 day later, return 1 day later
Best flights
Learn more
$363
round trip
10:05 am – 6:30 pm
WestJet · Westjet Encore
9h 25m
2 stops
YEG, YXE
$370
round trip
6:00 am – 4:14 pm
WestJet · Westjet Encore
11h 14m
1 stop
6h 30m in YWG


PIENSE
THINK
DENKE
PENSER
$300,000
Who is Stoker?
$ 1,000
$1,000,000
Who is Bram Stoker?
$ 17,973
$200,000
$5600

45% of the workforce is in jobs that could easily be automated by robots with today's artificial intelligence

Occupation	Number of Workers
Transportation	3,628,000
Retail salespersons	3,286,000
First line supervisors	3,132,000
Cashiers	3,109,000
Secretaries	3,082,000
Managers, all other	2,898,000
Sales representatives	2,865,000
Registered nurses	2,843,000
Elementary school teachers	2,813,000

Machine Creativity

- Computers write music for movies, computers write jokes, computers write thousands of pages of sports journalism, business strategy, and legal discovery.

Automated Sports Journalism

Tuesday was a great day for W. Roberts, as the junior pitcher threw a perfect game to carry Virginia to a 2-0 victory over George Washington at Davenport Field.

Twenty-seven Colonials came to the plate and the Virginia pitcher vanquished them all, pitching a perfect game. He struck out 10 batters while recording his momentous feat. Roberts got Ryan Thomas to ground out for the final out of the game.

Tom Gately came up short on the rubber for the Colonials, recording a loss. He went three innings, walked two, struck out one, and allowed two runs.

The Cavaliers went up for good in the fourth, scoring two runs on a fielder's choice and a balk.

Turing: 9 objections to AI (1950)

- Religious: Computers will never have a soul
- Head in the sand: It’s too terrible to think about
- Mathematical: Godel’s incompleteness theorem
- Consciousness: "not until a machine can write a sonnet or compose a concerto because of thoughts and emotions felt…”
- Disabilities: there will never be a computer that can ___

Turing: 9 objections to AI (1950)

- Originality: a computer can only do what we program it to do
- Continuity: computers are digital but brains are analog
- Informality of behaviour: any system governed by laws is predictable
- ESP (we'll let this one slide…)

Creativity and intelligence

“Computers will never be intelligent because they never will be able to be kind, resourceful, beautiful, friendly, have initiative, have a sense of humor, tell right from wrong, make mistakes, fall in love, enjoy strawberries and cream, make someone fall in love with it, learn from experience, use words properly, be the subject of its own thought, have as much diversity of behaviour as a man, do something really new.”

Against the “argument from disability”

- a computer ***can*** be programmed to make mistakes
- a computer ***can*** be programmed to observe its own processes
- a computer ***can*** be programmed to learn from experience
- a computer ***can*** be programmed to be friendly

Janken (rock-paper-scissors) Robot with 100% winning

Job Destruction and Creation

- Complex factors result in changes in employment
- Example: “Big Bands” no longer exist
  - 1930s and 40s: live music with 10-20 musicians
  - Now: 3 -5 musicians in a typical band
    - Changes in musical style
    - Harder to start a big band
      - Find musicians, play the clubs, split the door 20 ways…
  - youtube, patreon etc means there can be a market again

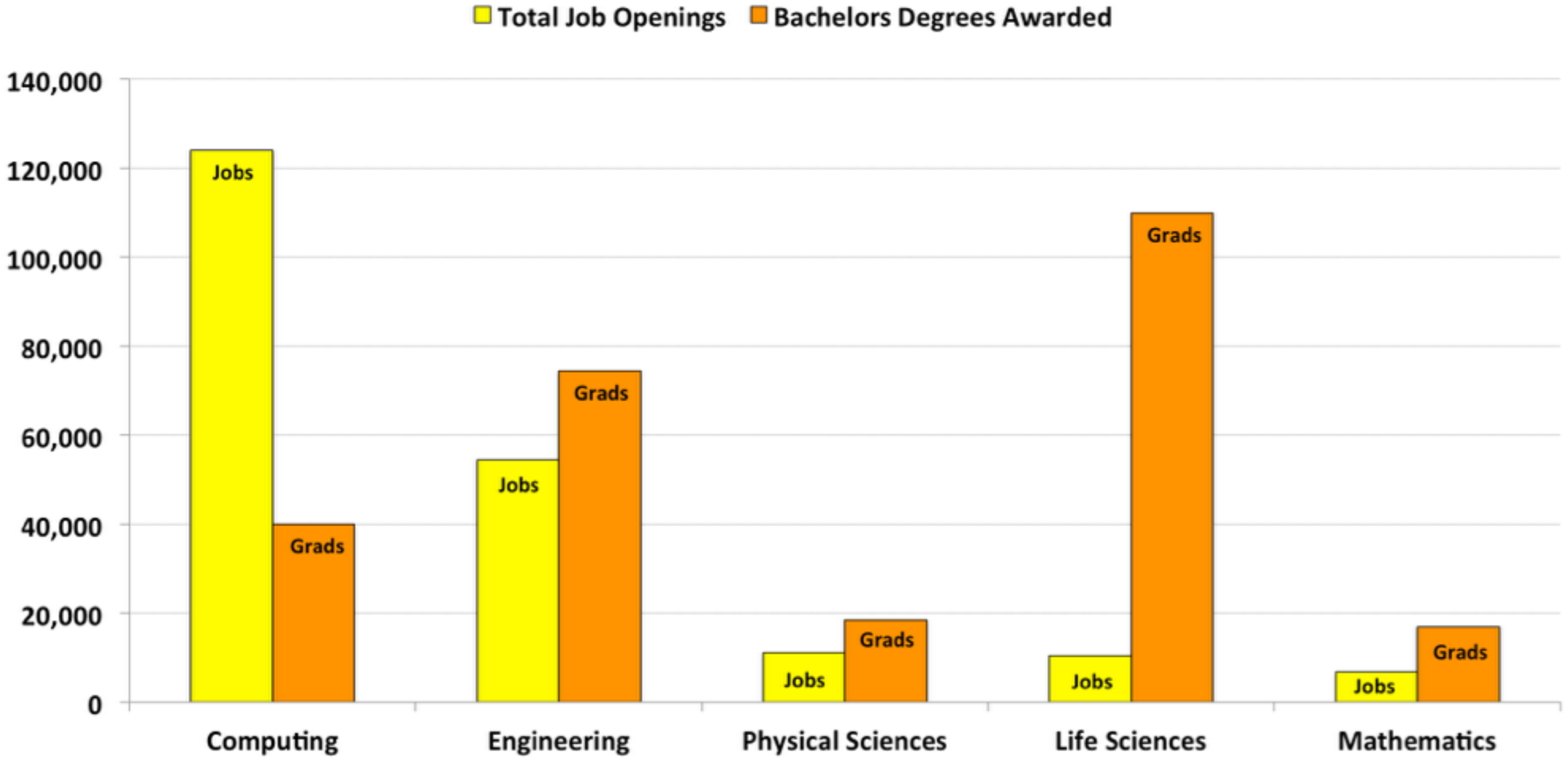
Job Destruction and Creation

- Computers and increased Employment:
  - computer designers, builders, programmers.
  - growing computer networks creates jobs for administrators.
  - training, sales and technical support.
  - computers make many products affordable to more people, increasing demand for these products and the related jobs
- Q: Do these jobs exist merely to fix the problems made by technology?

Technology jobs

- Growth sector: many new jobs in technology and supporting industries
  - Modern-day “Coal miners”?
    - Large number of young people entering
    - Code monkeys doing the “dirty work” for fat cats
  - Tech job shortage?
    - In 2000s, after dot-com bust, there was a fear that we’re producing too many computing graduates
    - lead to reduced university entrance
    - Currently, a shortage of high-tech grads
    - Just now are enrolments increasing again

Annual Total U.S. STEM Jobs Thru 2022 vs. Recent College Grads



Data Sources: US-BLS Employment Projections, 2012-2022 (*www.bls.gov/emp/ep_table_102.htm*)
National Science Foundation NCSES (*www.nsf.gov/statistics/nsf13327/pdf/tab26.pdf, tab33.pdf, tab34.pdf, tab35.pdf, tab46.pdf*)

2016 top average base salaries

(source: glassdoor)

1. Physician: $212,270
2. Pharmacy Mgr: $131,099
3. Software Architect: $130,891
4. Software Devt. Mgr: $ 123,747
5. Finance Mgr: $123,534
6. Solutions Architect: $121,522
7. Lawyer: $120,424
8. Analytics Mgr: $115,725
9. IT Manager: $115,642
10. Tax Mgr: $114,966
11. Pharmacist: $114,715
12. Product Mgr: $113,959
13. Physician Asst: $110,871
14. Supply Chain Mgr: $106,632
15. Data Scientist: $105,395
16. Security Engineer: $102,749
17. QA Manager: $101,330
18. Computer HW Engineer: $101,154
19. Marketing Mgr: $100,229
20. Database Admin: $97,258
21. UX Designer: $96,855
22. Human Resources Mgr: $96,406
23. Software Engineer: $96,392
24. Business Devt. Mgr: $95,139
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CS careers

- IT analyst
- IT specialist
- Computer Technician
- Computer Programmer
- Programmer/Analyst
- Network Technician
- Computer Operator
- Help Desk
- Service Desk
- Digital Media Developer
- Web Developer
- App Developer
- Game Developer
- Software Support
- Application Specialist
- Computer Architect
- Network Architect
- Infrastructure Architect
- QA / Testing
- Animator

CS careers

- Java developer
- Javascript Developer
- C++ developer
- Swift developer
- Objective-C developer
- Cobol developer
- Python developer
- Android developer
- iOS developer
- .net developer
- Sharepoint developer
- AWS developer
- Full Stack developer
- IOT developer
- Front end developer
- back end developer

CS careers

- Desktop support specialist
- Mobile support specialist
- API support specialist
- Network support specialist
- Internet support specialist
- Database support specialist
- Microsoft Dynamics CRM Functional Consultant

How Has Computer Technology Affected:

- Hourly wages?
- Fringe benefits?
- Spending on leisurely activities?
- The number of working hours?
- The percentage of taxes we owe?
- Our productivity?
- Employer productivity?

Technology and Leisure: quotes

- Technology makes our lives easier, but we're working more (e.g. video game industry)
  - … the amount of genuine leisure available in a society is generally in inverse proportion to the amount of labor-saving machinery it employs. ~E.F. Schumacher (1911-1977)
  - It is questionable if all the mechanical inventions yet made have lightened the day's toil of any human being. ~John Stuart Mill (1806-1873)
  - For a list of all the ways technology has failed to improve the quality of life, please press three. ~Alice Kahn (contemp.)

A Global Workforce

- jobs move away from wealthy countries
- Pay rates are lower in less wealthy countries.
- Internet saves transportation of people (teleconferencing) and paper (e-mail)
- Internet means information technology (e.g. software updates), service jobs (e.g. technical support) can be far from customers or employers.
- Q: When you call Customer Service for a large company, where is the service representative?

Employee Monitoring

- Data entry, Phone Work, and Retail
  - Keystroke: check quotas, employee on-task.
  - Phone: to determine customer satisfaction and proper use of phone resources.
  - Transactions: to reduce theft.
- Location
  - Badges: to replace worker keys or track down workers.
  - GPS tracking systems: to locate vehicles; employee driving speed and driving habits.

Employee Monitoring

- Some Reasons Employees Are Monitored:
  - Find needed business information when employee is not available.
  - Protect proprietary information.
  - Prevent or investigate possible criminal activities.
  - Prevent personal use of employer's facilities.
  - Check for violations of company policy.
  - Investigate complaints of harassment.
  - Check for illegal software.

Legal aspects of employee monitoring

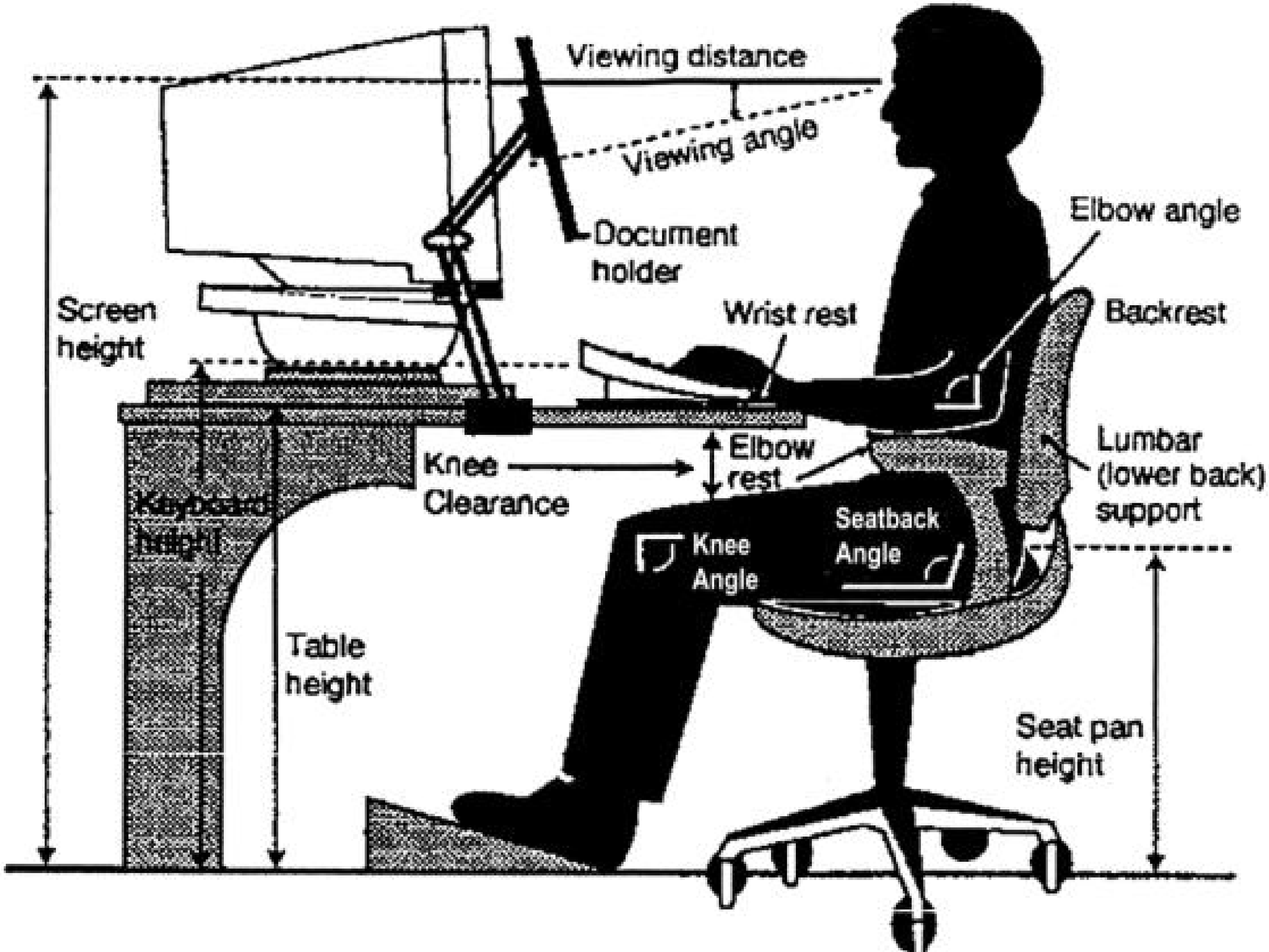
- Few laws address employee privacy
  - When you're hired, you agree to the policies
- There may be a case for limiting monitoring
  - if invasive and/or serves no business purpose
- Monitoring Issues
  - Do the benefits of location monitoring justify invasion of privacy?
  - How much privacy should be expected at work?
  - Should employers follow monitoring guidelines?
    - What should they be?
  - How should workplace monitoring be controlled?

Telecommuting

- Benefits:
  - Flexible schedule and work options.
  - Reduced overhead.
  - Reduction in transportation and parking resources.
- Problems:
  - Less productive or overworked employees.
  - Social isolation, distractions.
  - Tax issues? zoning issues?
- Q: Would your current or future job lend itself to teleworking?

Repetitive Strain Injury (RSI)

- Some Possible Causes:
  - Extended use of computer terminal and/or mouse.
  - Extended use of other tech, e.g. bar-code scanner.
  - Improper user technique or posture.
  - Poor ergonomic work area.
- Some Solutions (trends emerge):
  - Ergonomically-designed work area.
  - Sit-stand desks / treadmills
  - Retraining proper technique (including rest breaks).


Viewing distance
Viewing angle
Elbow angle
Document holder
Screen height
Wrist rest
Backrest
Lumbar (lower back) support
Elbow rest
Knee Clearance
Keyboard height
Seatback Angle
Knee Angle
Table height
Seat pan height

The Computer Professional at work

- Help Desk
  - “No, mom, I will not fix your computer”
  - “Is it plugged in, sir?”
- Coding
  - Who owns your code?
  - Revision control and CVS
    - Working on large-scale projects in a team
  - Non-disclosure agreements

Non-disclosure (confidentiality) agreements

- … contracts in which the parties agree not to disclose the secret information they share and not to make unauthorized use of such information.
- Doesn't include stuff you already knew
  - but you need to be able to show in writing
- Doesn't give you copyrights on the info
- must return or destroy info when done (or fired)
- Doesn't negate a court order (but you need to tell the other party about it so they can resist)
- Non-transferrable

“I have a great idea for an app.”

- Everyone has a great idea for an app.
- Step one: Get paid.
  - If you’re not being paid, you’re on the hook for marketing, financing, user base development, testing, social, Absolutely everything.
  - The “idea” is worth maybe five percent of the profit. After development costs and expenses.
- If a person comes with an idea, a marketing plan, and a user base, then maybe it’s worth 10 percent of the profit.
- If they don’t like it, let them learn coding themselves.

Economic issues

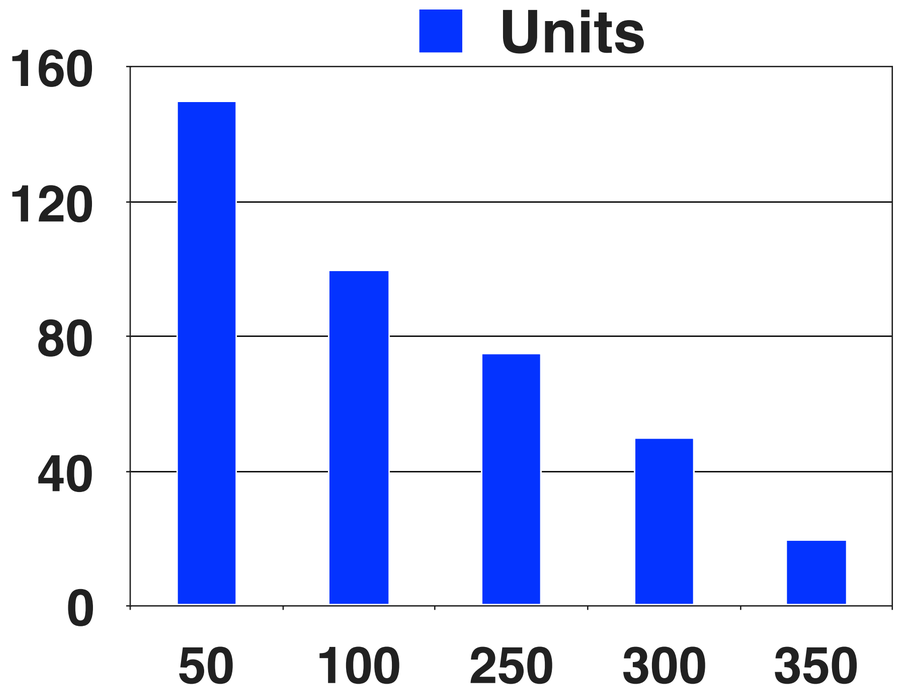
- Computer companies hold enormous economic power
  - manufacturing, writing software
- Power often breeds suspicion
  - “Planned obselence” in hardware/software?
  - How do software companies set their prices?
  - Major companies receive more attention and criticism than smaller companies

Pricing strategies

- How do you set the price for a piece of software?
  - Most economic theory assumes it costs something to produce an individual instance of a product
    - Software is essentially free to duplicate
    - Huge up-front development cost.
  - Price of an individual unit contributes only to making back the development cost
  - Price depends on market forces - how much will people pay.

Pricing strategies: Cost versus units

- Imagine I'll sell 100 units if I charge $100
  - I'll probably sell more units if I charge less
  - Maximize Profit



Pricing strategies

- Where do these numbers come from?
  - Focus groups, market analysis, =RND()
- Incremental costs
  - Each unit costs $x more to produce
    - small in software, we'll ignore
- sell for around $275 to maximize profit
  - But some people will pay more than that
  - And some won't buy at that price
  - called "Consumer Surplus"

Capture the consumer surplus

- Charge people more if “willing” to pay more
  - called “segmentation”: split the market into segments and charge what the market will bear
- Segmentation methods
  - Ask each customer what they are willing to pay…
  - Seniors discounts / matinee movie prices
  - corporate / vacation / last minute airfares
    - Stay over a Saturday = cheaper. business people like to get home to their families on weekends
  - In-app purchases, loot boxes

More market segmentation

- Multiple brands of (basically) the same product
  - Old Navy / banana republic
- Software segmentation - versions
  - Corporate users will buy “Pro” editions
    - bigger budgets, not their money, can’t possibly get any work done with the “home” edition
  - Personal users get a discount for fewer features
    - looks better than charging a premium for pro
- Usually make three versions, expect most will buy the middle version

Segmentation can backfire in customer loyalty

- Intel 486 vs 486SX
  - SX had the FPU disabled, charged less
  - People found out and were angry
- If customers know, they will rebel
  - Use academic pricing to buy computers for all family and friends
  - No-frills airlines to reduce segmentation, drive prices down
    - Doesn’t affect higher tier prices, lets regular airlines do less

Segmentation issues

- Site licenses
  - give price breaks to big purchasers that can afford to pay more
  - will increase customer loyalty, reduce profit
- Corporate spending
  - Many other factors including corporate credit card limits
- Downward demand curve?
  - price = status, so you might sell MORE units at a higher price
    - What teenager wants $20 shoes?

Ebooks and Pricing Failures

- When music was new on the market, record companies wanted to maintain $20 albums, sold complete
- Apple Music would not budge on 99c songs, $9.99 albums.
  - It's a price people would pay
- Ebooks, on the other hand, are often the same price or more than paper books. Especially textbooks
  - Apple guilty of fixing the price of ebooks (wanted agency model instead of retailer pricing)
  - Ebooks could have been huge, but they were too expensive.

Software Pricing strategies

- Historically: Four classes of software
  - freeware, shareware, consumerware, corportateware
- Today:
  - subscription/SAAS (software as a service)
  - Ad-supported
  - Microtransactions / IAP (in-app purchase)
    - Free to play
  - Pay once and play
    - No micro transactions

Market complements

- Complement = something you need when you buy something else
  - Gas and cars, flights and hotels
- Demand for a complement goes up when cost of the other thing goes down
  - Cheap flights to Maui = more demand for hotels
- Cheapest price is the commodity price
  - open market price (indistinguishable competitors)
- if you can commoditize your product's complements, you can maximize demand

Software and hardware are complements

- IBM manufactured PCs with an off-the shelf architecture and a well-documented interface structure
  - Commoditized the peripheral market
  - increased demand for PCs
- Microsoft licensed their OS to IBM and to other manufacturers
  - equalizing and thus commoditizing the PC market
  - increasing the demand for their OS

Contemporary Complement markets

- Hardware is commoditized: almost everyone has a phone and OSes are free. How to sell hardware?
- Inverse complement
  - Require hardware after you buy software
  - Amiibo, Lego Dimensions, Skylanders, Disney Infinity
  - Each physical object you buy gives you a new in-game character, tool, etc
- IOT, fitness, VR are new complement markets
  - You need new hardware for this new domain.

Professional Ethics: Computer Professionals

- Experts in your field, (or you will be)
- Customers rely on your expertise and honesty
- Your products (and related risks) affect many people,
- have professional standards and practices,
- Maintain an expected level of competence and are up-to-date on current knowledge and technology,
- Educate the non-computer professional.

Professional Codes of ethics and practice

- ACM
  - The Association of Computer Machinery
- IEEE CS
  - The Institute of Electrical and Electronics Engineers Computer Society
- ACM / IEEE CS have a code
  - Software Engineering Code of Ethics and Professional Practice
- ACM has a code
  - ACM Code of Ethics

Ethical Behaviours

- The computer professional
  - Is honest and fair;
  - respects confidentiality;
  - maintains professional competence;
  - understands relevant laws;
  - respects and protects personal privacy; avoids harming others;
  - respects property rights.

History of the ACM and IEEE CS

- The Association for Computing Machinery (ACM) was founded in 1947 as the world's first scientific and educational computing society.
- The IEEE Computer Society traces its origins to the 1946 formation of the Subcommittee on Large-Scale Computing of the American Institute of Electrical Engineers (AIEE).
- The IEEE formed in 1963 with the merger of the AIEE (American Institute of Electrical Engineers, 1884), and the IRE (Institute of Radio Engineers, 1912).

ACM Code of Ethics: GENERAL MORAL IMPERATIVES

- 1.1 Contribute to society and human well-being.
- 1.2 Avoid harm to others.
- 1.3 Be honest and trustworthy.
- 1.4 Be fair and take action not to discriminate.
- 1.5 Honor property rights including copyrights and patent.
- 1.6 Give proper credit for intellectual property.
- 1.7 Respect the privacy of others.
- 1.8 Honor confidentiality.

ACM Code of Ethics: PROFESSIONAL RESPONSIBILITIES

- 2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
- 2.2 Acquire and maintain professional competence.
- 2.3 Know and respect existing laws pertaining to professional work.
- 2.4 Accept and provide appropriate professional review.
- 2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

ACM Code of Ethics: PROFESSIONAL RESPONSIBILITIES

- 2.6 Honor contracts, agreements, and assigned responsibilities.
- 2.7 Improve public understanding of computing and its consequences.
- 2.8 Access computing and communication resources only when authorized to do so.

ACM Code of Ethics: ORGANIZATIONAL LEADERSHIP IMPERATIVES

- 3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities.
- 3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life.
- 3.3 Acknowledge and support proper and authorized uses of an organization's computing and communication resources.

ACM Code of Ethics: LEADERSHIP IMPERATIVES

- 3.4 Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements; later the system must be validated to meet requirements.
- 3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system.
- 3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems.

ACM Code of Ethics: COMPLIANCE WITH THE CODE

- 4.1 Uphold and promote the principles of this Code.
- 4.2 Treat violations of this code as inconsistent with membership in the ACM.

CIPS

- CIPS (Canadian Information Processing Society), headquartered in Mississauga, Ontario, is the professional association for Information Technology (IT) practitioners in Canada.
- Founded in 1958, CIPS is a non-profit organization that represents more than 6000 IT professionals (in 25 sections across the country) on important issues affecting the IT industry and profession.
- U of R is the longest continually accredited CS program in CIPS

CIPS code of ethics (Main Headings)

- 1. Protect Public Interest and Integrity
- 2. Demonstrate Competence and Quality of Service
- 3. Maintain Confidential Information and Privacy
- 4. Avoid Conflicts of Interest
- 5. Uphold Responsibility to the IT Profession

Other Professional Codes

- The Hippocratic Oath
  - Hippocrates, 4th c. BC
- The Obligation of the Engineer
  - Unique to Canada
  - Rudyard Kipling, 1922
- Accounting
- Journalism
- Education

Relevant Excerpts from the (Modernized) Hippocratic oath

- I will remember that there is art to medicine as well as science, and that warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drug.
- I will not be ashamed to say "I know not," nor will I fail to call in my colleagues when the skills of another are needed for a patient's recovery.

Relevant excerpts from the Obligation of the Engineer

- For my assured failures and derelictions I ask pardon beforehand of my betters and my equals in my Calling here assembled, praying that in the hour of my temptations, weakness and weariness, the memory of this my Obligation and of the company before whom it was entered into, may return to me to aid, comfort and restrain.

Scenarios

- Scenario 1:
- Your company is developing a free e-mail service that will include targeted advertising based on the content of the e-mail messages (similar to Google's Gmail). You are part of the team designing the system. What are your ethical responsibilities?

Scenarios

- Scenario 2:
- You are a relatively junior programmer working on modules that collect data from loan application forms and convert them to formats required by the parts of the program that evaluate the applications. You find that some demographic data are missing from some forms, particularly race and age.

Scenarios

- Scenario 3:
- Your company has 25 licenses for a computer program, but you discover that it has been copied onto 80 computers.

Scenarios

- Scenario 4:
- Suppose you are a member of a team working on a computer-controlled crash avoidance system for automobiles. You think the system has a flaw that could endanger people. The project manager does not seem concerned and expects to announce completion of the project soon.

Scenarios

- Scenario 5:
- You work for the IRS, the Social Security Administration, a movie-rental company, or an Internet service provider. Someone asks you to get a copy of records about a particular person. He will pay you $5000.

Scenarios

- Scenario 6:
- You have a small consulting business. Company A wants to build a new collaborative content-sharing Web site. A hires you to evaluate bids from vendors. Your spouse works for Company B and did most of the work in writing the bid that B plans to submit.

Scenarios

- Scenario 7:
- A team of programmers is developing a communications system for firefighters to use when fighting a fire. Firefighters will be able to communicate with each other, with supervisors near the scene, and with other emergency personnel. The programmers will test the system in a field near the company office.

Scenarios

- Scenario 8:
- You are the computer system administrator for a mid-sized company. You can monitor the company network from home, and you frequently work from home. Your niece, a college student, is visiting for a week. She asks to use your company computer to check her e-mail.

More ethical scenarios

- A colleague has gone for lunch and not logged out of his terminal. As you pass by you notice he is writing an email to a competing firm asking for trade secrets

More ethical scenarios

- On the forums you pretend to be a nursing student. People start emailing you for health advice

- On the forums, you begin to realize that someone is only pretending to be a computer scientist, and is giving out bad advice

More ethical scenarios

- A professor at your university proposes a new course teaching hacking techniques and virus design principles. As the Dean you can decide whether the course should run or not.

More ethical scenarios

- A government agency approaches your company and offers to fund a large-scale military project. You feel the project is unlikely to succeed, but the theoretical work may benefit humanity in other ways.

More ethical scenarios

- You are working on a multi-team project. Your team is performing well and your task will be complete, but you become aware that another team's work is faulty and will provide your module with faulty data

More ethical scenarios

- A colleague is making a presentation which includes charts and graphs. You discover that the graphs have been manipulated and the result is that they appear more positive. The numbers have not been changed

More ethical scenarios

- You are the manager of a company with a strict appropriate-use policy. Through secret monitoring, you discover that an employee is doing personal genealogical searches on company equipment, but only on lunch, break time, and after normal work hours.

More ethical scenarios

- You and a friend are hired as student tech support at the university. You discover that your friend has used his access to set up a website to share illegal software and pornography.

More ethical scenarios

- You are developing code for your software company. You notice that many of the chunks of code you write would be useful in your personal side projects. The NDA you signed states that all code you write is the property of the company.