

Introduction To CPSC 231 And To Computer Science

James Tam

James Tam

Administrative (James Tam: L20)

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 - Appointment: phone or call
 - Drop by for urgent requests (but no guarantee that I will be in!)



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A Bit About CPSC 231

- It is a course geared primarily towards CPSC majors
- It is not assumed that you have prior knowledge of Computer Science
- It can be a lot of work



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How To Succeed In This Course

- Practice things yourself.
 - Write programs.
 - Trace lots of code



Leonardo da Vinci



Bruce Lee



J.R.R. Tolkien



Amadeus Mozart

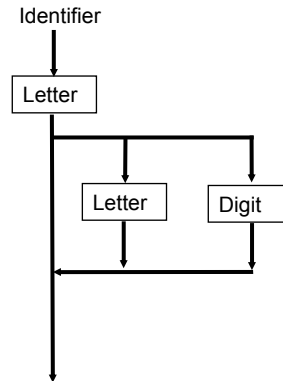
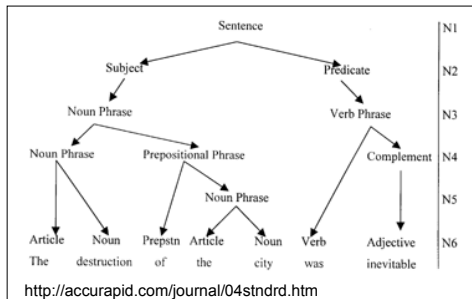


Wayne Gretzky

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This Course Teaches Programming Principles

- The required structure for a computer program
- Principles of writing good programs
- You will then need to apply these principles throughout the term



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Feedback



How You Will Be Evaluated

- Assignments (*Total value 30%*)
 - Assignment 1: Introduction to the Computer Science environment (*Worth 1%*)
 - Assignment 2: Non-decimal number systems, representations and logic (*Worth 3%*)
 - Assignment 3: Modifying and creating simple programs (*Worth 1%*)
 - Assignment 4: Decisions, loops (*Worth 3%*)
 - Assignment 5: Problem decomposition, 1D arrays (*Worth 4%*)
 - Assignment 6: 2D arrays (*Worth 6%*)
 - Assignment 7: Lists - Version 1 implemented using an array of records (*Worth 6%*)
 - Assignment 8: Lists – Version 2 implemented using a linked list (*Worth 6%*)

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How You Will Be Evaluated (2)

- Exams (*Total value 70%*)
 - Midterm exam (30%): In class during normal lecture time
 - Final exam (40%): TBA (scheduled by the Registrar's Office)

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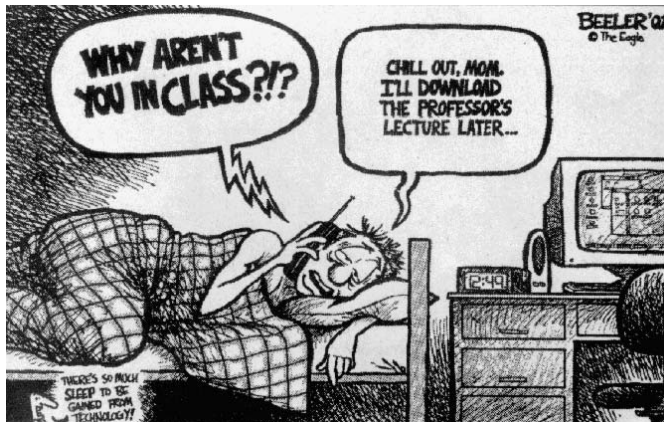
Course Resources

- Course website: <http://pages.cpsc.ucalgary.ca/~tamj/231>
- Recommended course textbooks:
 - (Pascal programming)
 - 1.Pascal Programming & Problem Solving, 4th Edition, Leestma/Nyhoff (Prentice Hall)
 - (Unix)
 - 1.A Practical Guide to Solaris, Sobell (Addison-Wesley)
 - 2.(A good alternative) Harley Hahn's Student Guide to Unix, Hahn (McGraw-Hill)

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How To Use The Course Resources

- They are provided to support and supplement the class.
- Neither the course notes nor the text books are meant as a substitute for regular attendance to lecture and lab



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Introduction To Computer Science

- What is Computer Science?



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Introduction To Computer Science

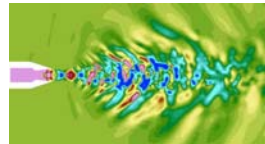
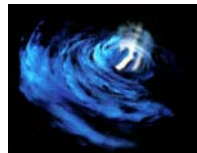
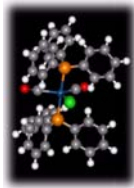
- What is Computer Science?



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Introduction To Computer Science

- Computer Science is about problem solving



Some of the sources for the pictures include: Star Trek: Deep space 9 © Paramount & the international space station James Tam

Some Areas Of Study

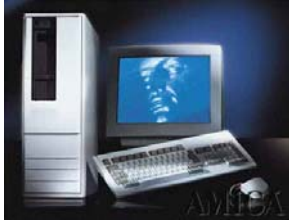
- Human-Computer Interaction
- Computer Graphics
- Information Visualization
- Databases
- Computer Theory
- Simulations
- Artificial Intelligence
- Computer Vision
- Software Engineering
- Games programming

This list provides only a brief introduction to the different areas of Computer Science and is far from comprehensive:
For a more complete list: <http://www.cpssc.ucalgary.ca/Research/>

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Human-Computer Interaction

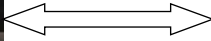
- Considers how people work with and use computers



Technological perspective



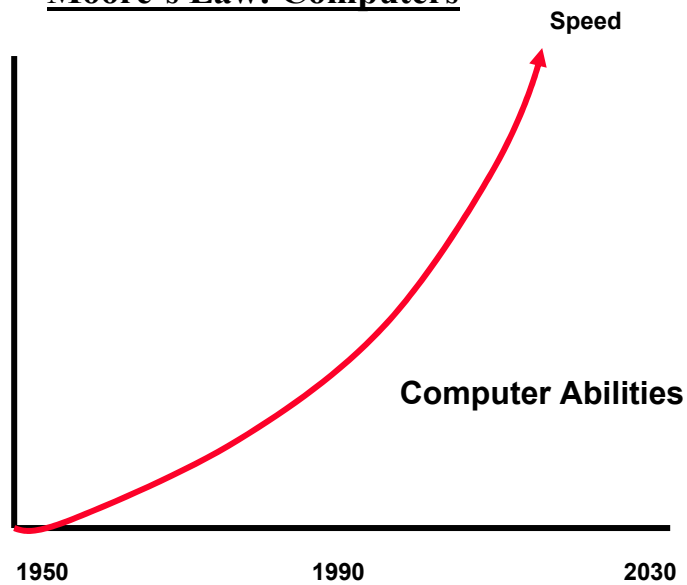
People perspective



For more information: <http://grouplab.cpsc.ucalgary.ca/>

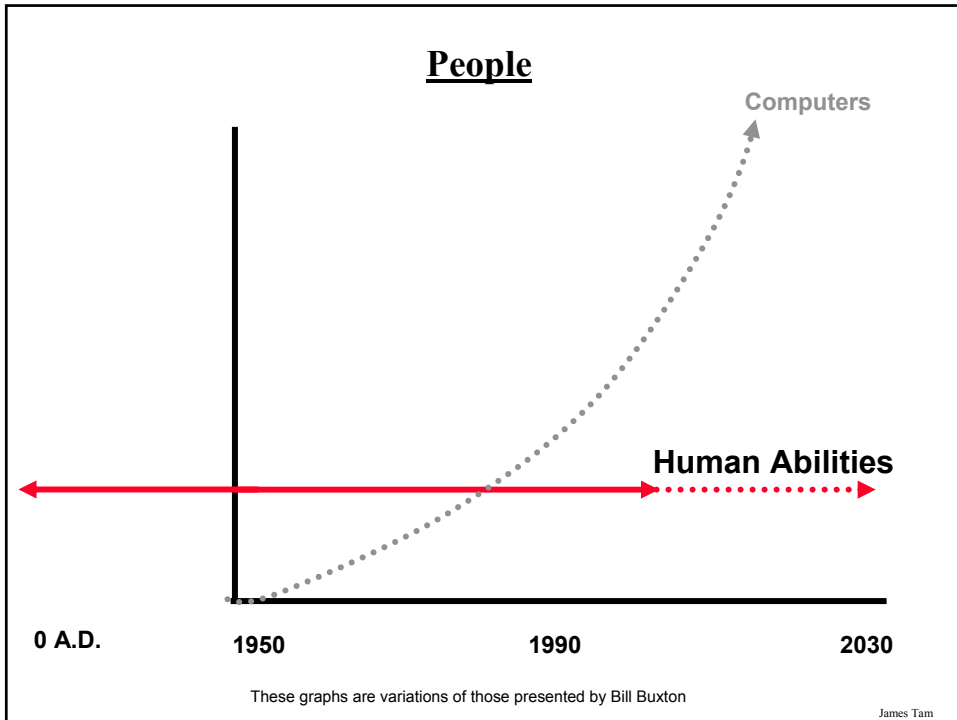
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Moore's Law: Computers



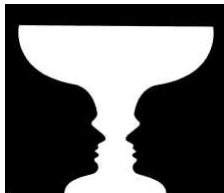
These graphs are variations of those presented by Bill Buxton

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Human Perspective: Issues

- How people process information
- Memory, perception, motor skills, attention etc.
- Language, communication and interaction

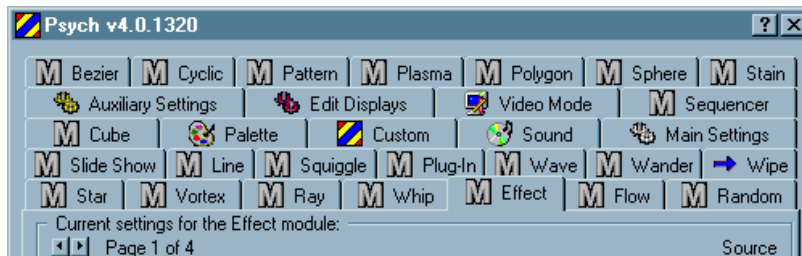


Human-Computer Interaction: Not Just Common Sense Information



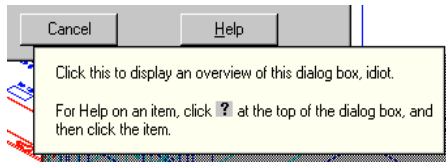
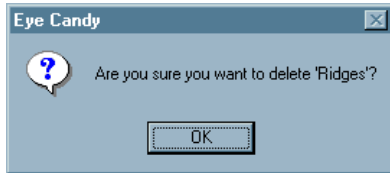
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Human-Computer Interaction: Not Just Common Sense Information (2)



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Human-Computer Interaction: Not Just Common Sense: Information (3)



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Computer Graphics

- Concerned with everything to do with producing images on the computer.



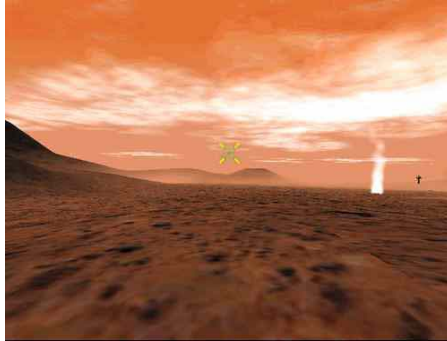
Scene from MechWarrior 4: Vengeance © Microsoft

Computer Graphics: Issues

- How to make the images look “real”?



From <http://klamath.stanford.edu/~aaa/>

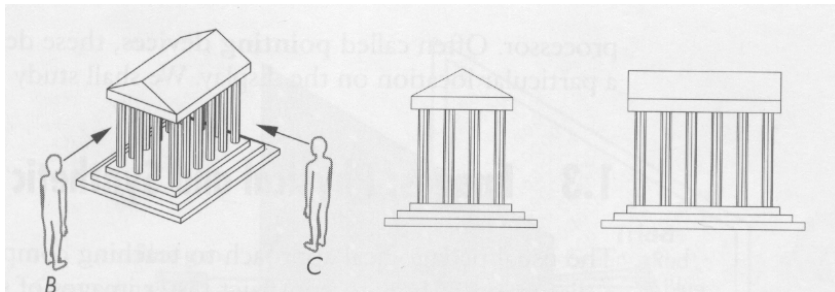


From ACM SIGGRAPH: Vol.32 No.2 May 1998

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Computer Graphics: Highly Mathematical

- Highly mathematical



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Computer Graphics: Still A Long Way To Go

- “Even though modeling and rendering in computer graphics have been improved tremendously in the past 35 years, we are still not at the point where we can model automatically, a tiger swimming in the river in all it’s glorious details.”¹



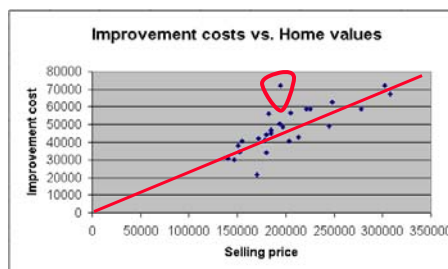
¹ From "The Tiger Experience" by Alain Fournier at the University of British Columbia

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Information Visualization

- Finding ways of representing information in a way that amplifies cognition.

	A	B
1	Market value (\$)	Improvement cost (\$)
2	140000	31120
3	147000	29980
4	151000	38120
5	152000	34360
6	155000	40710
7	170000	21620
8	172000	42100
9	178000	41070
10	180000	34210
11	180000	44090
12	182000	55960
13	185000	45170
14	185000	46820
15	193400	50200
16	194500	71860
17	197000	48460
18	203000	40720
19	205000	56600
20	213000	42780
21	221000	58770
22	225000	58960
23	245000	48910
24	248000	62620
25	278000	58580
26	302500	72200
27	308000	67320

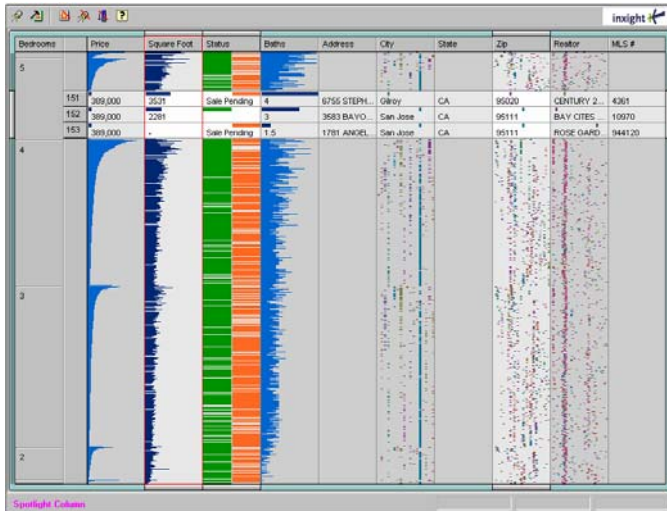


For more information: <http://innovis.cpsc.ualgary.ca/>

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Information Visualization: Issues

- What is the “best” way of representing the information?



The image shows a screenshot of a Table Lens visualization. The table has columns for Bedrooms, Price, Square Foot, Status, Baths, Address, City, State, Zip, Realtor, and MLS #. The rows are grouped by Bedrooms (2, 3, 4, 5). The visualization uses vertical bars of different colors (blue, green, orange) to represent the data in each column. A 'Spotlight Column' is highlighted in pink at the bottom left.

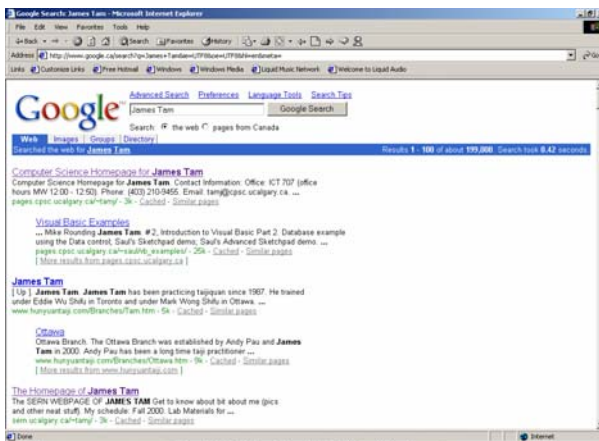
Bedrooms	Price	Square Foot	Status	Baths	Address	City	State	Zip	Realtor	MLS #
5	151 369,000	2521	Sale Pending	4	6755 STEPH.	Orroy	CA	95020	CENTURY 2.	4301
	152 369,000	2281	Sale Pending	3	3683 BAYO.	San Jose	CA	95111	BAY CITES	10070
	153 369,000	.	Sale Pending	1.5	1781 ANKEL	San Jose	CA	95111	ROSE GARD	944120
4										
3										
2										

The Table Lens: Ramana R. and Stuart K. Card Xerox Palo Alto Research Center

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Databases

- Concerned with the efficient storage, retrieval and distribution of information
- It can be a difficult challenge!



For more information: <http://www.adsa.cpsc.ucalgary.ca/>

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Databases (2)

- Concerned with the efficient storage, retrieval and distribution of information
- It can be a difficult challenge!

Results 1 - 100 of about **199,000**. Search took **0.42** seconds.

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Computer Theory

- Deals with the mathematical aspects of computers
- e.g., Distributed Computing, Computer Security

THINK computational chemistry

1.03g (2704) LIFE SCIENCES

Current Molecule: E8FO#1-10-B-11-2473-100

Current Protein Target

Cyclin Dep. Kinase 2

Legend:

- Carbon
- Hydrogen
- Oxygen
- Nitrogen
- Sulfur
- Hetero Atom(s)

32939 conformers

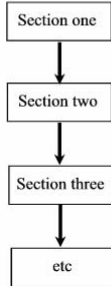
UNITED DEVICES intel Microsoft .net

THINK © United Devices Inc. is part of a distributed Cancer research project.
For more information go to <http://www.ud.com>

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Computer Theory: Distributed Computing

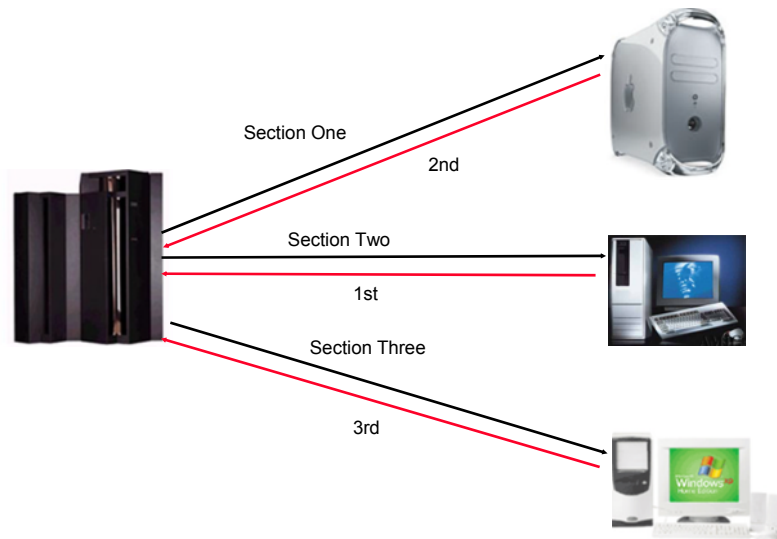
- Issue: Ensuring proper order



For more information: <http://pages.cpsc.ucalgary.ca/~higham/Research/research.php>

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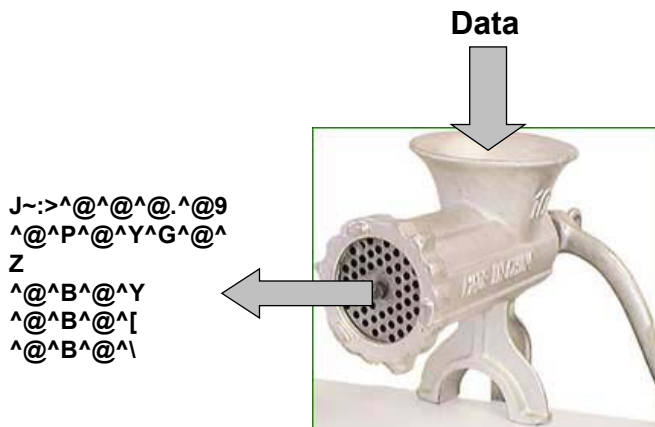
Computer Theory: Distributed Computing (2)



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Computer Theory: Computer Security

- Cryptography (encoding data) has become increasingly important since the advent of the Internet

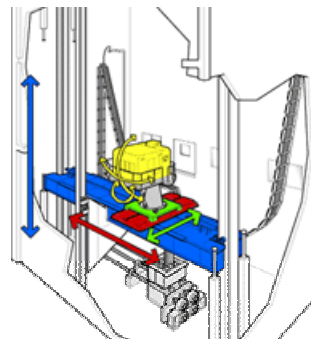


For more information: <http://cisac.math.ucalgary.ca/>

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Simulations

- Recreating behaviour by an analogous model or situation to gain information more conveniently or to train personnel.



Images from <http://www.simlabs.arc.nasa.gov/vs>.

For more information: <http://warp.cpsc.ucalgary.ca/>

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Simulations (2)

- Why simulate?
 - Complex systems
 - Dangerous experiments
 - Controlled conditions
 - Cost savings

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Simulations: Some Issues

- What information should be included in the simulation?
- How confident are we in the results of the simulation?
- Speed of the simulation.

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Artificial Intelligence

- What makes a person smart?
- How do we build a smart machine?
 - How do we make a machine think like a person?
 - How do we make a machine behave like a person?

For more information: <http://pages.cpsc.ucalgary.ca/~jacob/AI/>

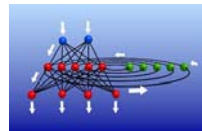
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Artificial Intelligence (2)

- Approaches:
 - 1) Top-down



- 2) Bottom-up

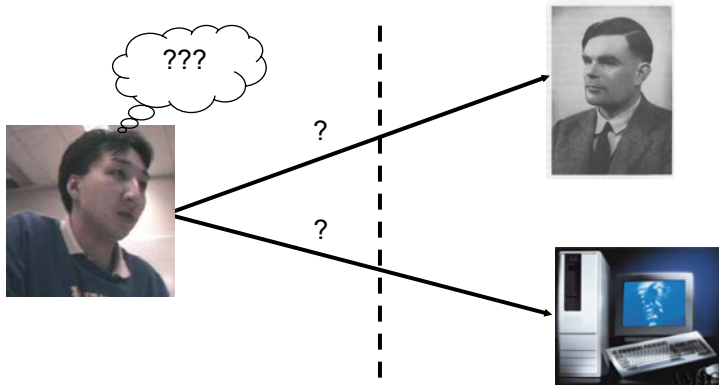


Images of the M1A and the neural network from the Pacific Northwest National Laboratory

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Artificial Intelligence (3)

- How do we know we have a "smart machine"?
- Turing test



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Artificial Intelligence (4)

- Much work still needs to be done



Photo from www.startrek.com © Paramount

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Computer Vision

- Determining what type of object is being viewed based on it's visual appearance
 - e.g. Six?



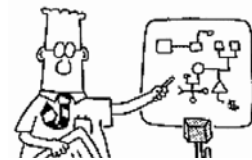
- Issues: What are the consequences of the computer misrecognizing something?

For more information: <http://pages.cpsc.ucalgary.ca/~parker/>

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Software Engineering

- 63% of large software projects go over cost
 - Insufficient user-developer communication and understanding
 - Software:
 - Is not easily used
 - Is never tested until it is too late
 - : : :



Dilbert © United Features Syndicate

- Avoid "hacking-out" software
 - "How does the program work? I don't know!!!!?"
- Involves developing systematic ways of producing good software on time and within budget

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Games Programming

- Pulls together many areas of Computer Science
- The U of C was the first Canadian university to offer this area of study.

**Blatant
advertisement!!!**



WarCraft III © Blizzard Entertainment