CS61A Lecture 31
Fin

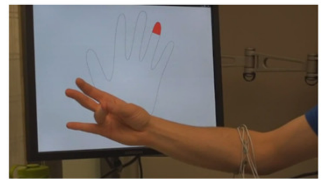
Jom Magrotker
UC Berkeley EECS
August 9, 2012

Computer Science in the News

Microsoft Tech to Control Computers With a Flex of a Finger

MARK HACHMAN · JULY 30TH, 2012

Like 45 people like this. Be the first of your friends.



In the future, Microsoft apparently believes, people may simply twitch their fingers or arms to control a computer, game console or mobile device.

http://www.readwriteweb.com/archives/microsoft-tech-to-control-computers-with-a-flex-of-a-finger.php

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Computer Science in the News

Pop music too loud and all sounds the same - official

Recommend 2,309 people recommend this. Be the first of your friends.

LONDON, July 26 | Thu Jul 26, 2012 9:00am EDT

(Reuters) - Comforting news for anyone over the age of 35, scientists have worked out that modern pop music really is louder and does all sound the same.

Researchers in Spain used a huge archive known as the Million Song Dataset, which breaks down audio and lyrical content into data that can be crunched, to study pop songs from 1955 to 2010.

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http://www.reuters.com/article/2012/07/26/science-music-idUSL6E8IOE3320120726

Today

- Parting Thoughts
  - Where do you go from here?
  - Life Lessons
  - Advice
- Computational Biology
- Artificial Intelligence
- Thanks and Credits

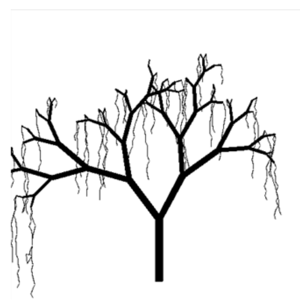
Contest Winners

Congratulations, everyone!
All submissions were amazing!

If you see your art up here, come up and claim your prize.

Drumroll, please!

Contest Winners: Tied for 2ND / 3RD Place Featherweight



Tangled Tree

by David Friedman

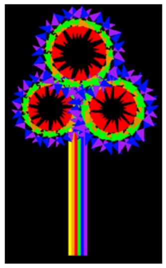
Vines trembling in the breeze
Lulling, calm all at ease
Bones littered beneath.

Contest Winners: Tied for 2nd / 3rd Place Featherweight

Recursive Rainbow Roses

by Stephen Pretto
and Lu Chen

Rainbows and Roses
Colors that leave you smiling
Now please vote for us



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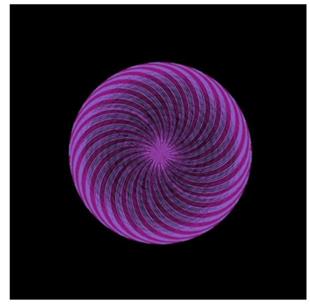
Contest Winners: 1st Place Featherweight

Chagrin

by Neil Thomas
and Rahul Nadkarni

Down the rabbit hole
Into a chesire typhoon
(Re)cursed by Carroll



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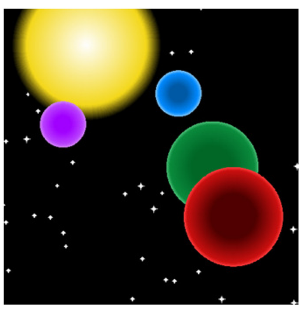
Contest Winners: 3rd Place Heavyweight

Universe Generator

by Tom Selvi
and Iris Wang

I come to Soda
In the day I come out and
Great! It's now night time.



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Contest Winners: 2nd Place Heavyweight

Spring Bloom

by Chien-yi Chang
and Jiajia Jing

Spring cherry blossoms
Surrounds exuberant greeneries
Sounds of nature

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Contest Winners: 1st Place Heavyweight

Ring Around the Logo, a Pocketful of Medals...

by Hannah Chu
and Michael Zhu

Olympic turtles,
Slow and steady wins the race
And maybe contest? :D

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... What Happened?

So, what did we learn?
- A way to understand computation.
- Ways to effectively organize our programs.
- Fundamentals!

Two big points we don't want you to forget:
- Nothing is Magic!
- A lot of being a good programmer and computer scientist has to do with the way you think about what you are doing, or about to do.

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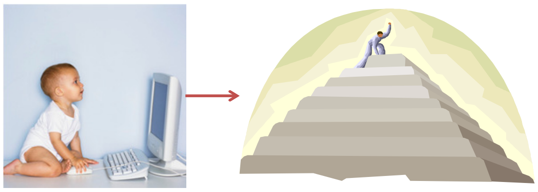
How Far You've Come

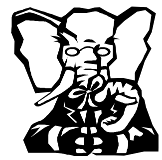
Let's take a moment to think about how far you've come since the beginning of the course.



Don't Forget What You Learned!

All of what you have learned are the foundations of basically everything you will see in computer science!

The language you use does not really matter so long as you understand the fundamentals from this course!

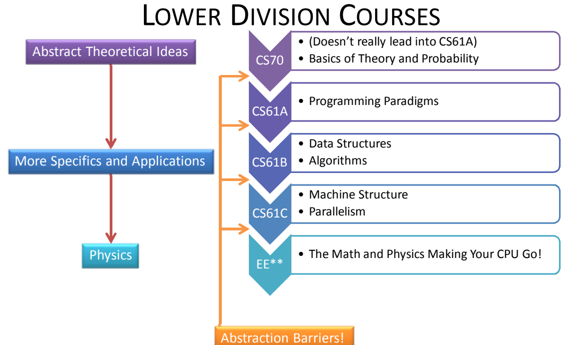


Moving Forward

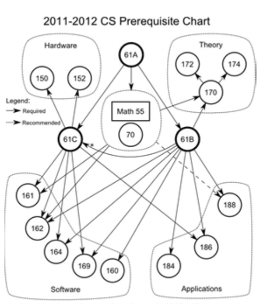
You're (almost) done! Great!

Now what?

Moving Forward: Lower Division Courses



Moving Forward: Upper Division Courses



There isn't *exactly* a "recommended order" or "must-take" set of classes.

We recommend, however, that you take a little of each "area."

Moving Forward: Stay Involved with the Course!

- If you can, please lab assist for future semesters of CS61A.
- Often, readers and TAs are chosen based on how involved they've been with the course, in addition to grades and other factors.
- You can apply to be a reader or TA here: https://willow.coe.berkeley.edu/PHP/gsiapp/menu.php?&dept=eecs

Announcements

- You are now done with all projects and homework assignments! Congratulations! ☺
- Grades Discrepancy
  - You might have noticed we're missing 10 points.
  - We scaled each project up so the total project points is 90.
- Accounts get deactivated on the 15th
  - If you want to keep your files, copy them from the account now!
- You're nearly done. Thank you so much for sticking with us!

Announcements: Final

- Final is **TODAY!**
  - *Where*? 1 Pimentel.
  - *When*? 6PM to 9PM.
  - *How much*? *All* of the material in the course, from June 18 to August 8, will be tested.
- Closed book and closed electronic devices.
- One 8.5" x 11" 'cheat sheet' allowed.
- No group portion.

Computational Biology

Use computer science concepts to help understand biological data or to model biological systems.

http://seis.bris.ac.uk/~enfbm/MCB/dna2.jpg

Computational Biology

There is a *lot* of data in biology.

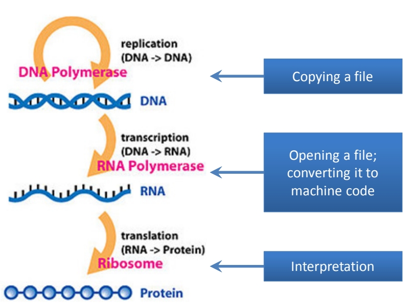
Understanding, and inferring from, this data are interesting problems that computer science can have answers for, or learn answers from.

Example problem:

Compressing the large amount of data available.

Example solution: Burrows-Wheeler transform, used when compressing files using .tar.gz.

Computational Biology



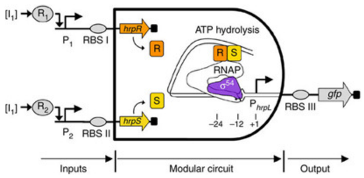
http://en.wikipedia.org/wiki/Central_dogma_of_molecular_biology

Computational Biology

- What patterns can we infer from the data?
- What gene sequences correspond to what function?
- What form will a protein fold into?
- How can we model an organism as an object that interacts with other organisms?
- Can we use these models to make better predictions?

… and oh so much more.

Biological Logic Gates



http://www.nature.com/ncomms/journal/v2/n10/full/ncomms1516.html

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Artificial Intelligence

Attempts to study and design intelligent agents that can sense their environments and make decisions.

- Machine learning
- Robotic manipulation
- Image and voice recognition
- Natural language processing
- Social intelligence

… and, oh so much more.

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Artificial Intelligence

http://www.youtube.com/watch?v=TryOC83PH1g

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Artificial Intelligence

Much of it is based on probabilities: given the data that is available:

- Can a machine determine the probability of an event happening?
- Can a machine determine the probability of an object being of a particular type?
- Can a machine determine what happened "under-the-hood", when only data about what has happened "over-the-hood" is available?

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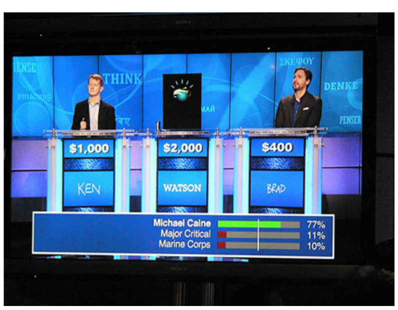
Artificial Intelligence



http://i.cmpnet.com/informationweek/galleries/automated/570/jeopardy12_full.jpg

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Machine Learning: Supervised Learning

Idea: Provide the machine with a *lot* of data and associated human-generated "tags".

The machine should learn what tags most likely correspond to different *features* in the input.

This allows us to construct *classifiers*, which tell us what tags belong to a certain piece of data.

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Machine Learning: Supervised Learning

Usually done in at least two phases:

Training Phase: Take a large fraction of the available data – the *training set* – and let the machine learn using this data.

Testing Phase: Test how often the machine is correct, by asking it to predict the tags on the rest of the available data – the *test set*. Improve the machine accordingly.

Iterative improvement!

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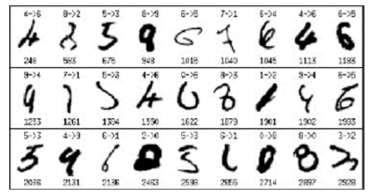
Machine Learning: Supervised Learning

Postal service dgit recognition:

93% accurate.



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Machine Learning: Supervised Learning

Features

Aspects of the data that the machine looks for when computing its probabilities.

For digits: Curvature, amount of whitespace in image, rotation, edges, ...

For birds: Beak, color, general shape, ...

For faces: Eyes, nose, mouth, relative positions, …

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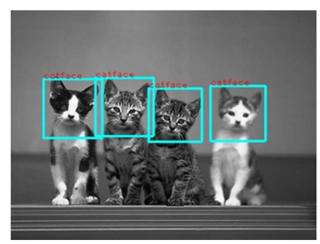
Machine Learning: Supervised Learning



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Machine Learning

Unsupervised Learning

No data is provided:

Machine has to learn what it needs to find, and has to detect patterns in data.

Reinforcement Learning

There are now consequences to decisions: machine learns what to do and what *not* to do.

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Natural Language Processing

Can a computer understand human language?

Early attempts involved giving the rules of a language to a computer; the current trend, however, is to give the computer the data.

The computer learns the rules by itself.

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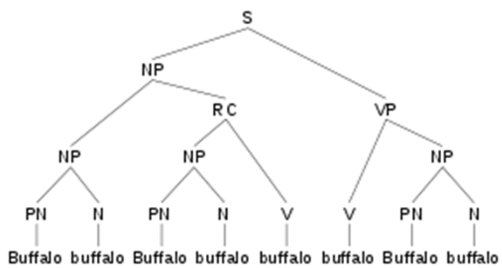
Natural Language Processing



http://upload.wikimedia.org/wikipedia/commons/thumb/2/2c/Buffalo_sentence_1_parse_tree.svg/300px-Buffalo_sentence_1_parse_tree.svg.png

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Computational Humor and Storytelling

From the 1977 program *TALE-SPIN*:

"Once upon a time, George Ant lived near a patch of ground. There was a nest in an ash tree. Wilma Bird lived in the nest. There was some water in a river. Wilma knew that the water was in the river. George knew that the water was in the river. One day, Wilma was very thirsty. Wilma wanted to get near some water. Wilma flew from her nest across a meadow through a valley to the river. Wilma drank the water. Wilma was not thirsty any more.

George was very thirsty. George wanted to get near some water. George walked from his patch of ground across the meadow through the valley to a river bank. George fell into the water. George wanted to get near the valley. George couldn't get near the valley. George wanted to get near the meadow. George couldn't get near the meadow. Wilma wanted George to get near the meadow. Wilma wanted to get near George. Wilma grabbed George with her claw. Wilma took George from the river through the valley to the meadow. George was devoted to Wilma. George owed everything to Wilma. Wilma let go of George. George fell to the meadow. The end."

http://www.j-paine.org/dobbs/lisp_joke_generator.html

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Computational Humor and Storytelling

Knock, knock.

Who's there?

Ammonia.

Ammonia who?

Ammonia trying to be funny.

http://www.slideserve.com/duy/opening-computational-door-on-knock-knock-jokes

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Computer Science is Huge

There are ***so many*** subfields in computer science; many of these are interdisciplinary with other sciences and social sciences.

Experiment and find which one suits you!

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Our Biggest Secret

"**Computer science** is not about computers, nor is it really a science."

– *Prof. Brian Harvey*

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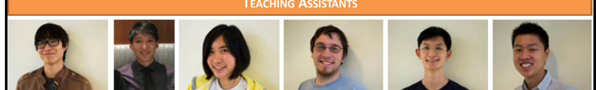
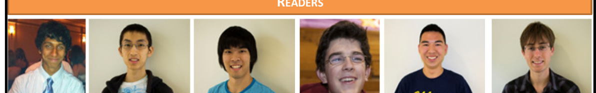
Thank You!

Teaching Assistants



Eric Kim | Steven Tang | Joy Jeng | Stephen Martinis | Albert Wu | Allen Nguyen

Readers



Sagar Karandikar | Jack Long | Mark Miyashita | Michael Ball | Robert Huang | Keegan Mann

Lab Assistants

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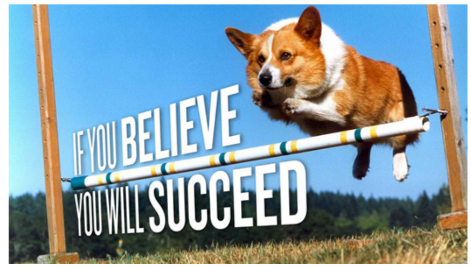
From the Both of Us…

Thank you for being a huge part of a great summer!

You – yes, *you* – are CS61Awesome.

Conclusion

You're CS61Awesome!



Good luck on the final tonight!