CS61A Discussion 12:
FINAL

TA: **Jerry Chen**
Email: **jerry.c@berkeley.edu**
TA Website: **jerryjrchen.com/cs61a**

Attendance

Fill out the sign-in sheet!

Agenda

1. Week in Review

2. Out of Scope, including:

    1. Personal setup

    2. Parallelism, Distributed Systems (in scope from lecture)

    3. Various other topics

Week In Review

Scheme Proj

Lab 12 (Spark) - **Due Friday**

Hw9 is extra credit

Ants Composition - Resubmit by **Friday**
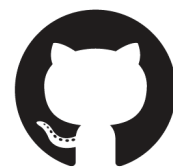
Out of Scope

Just some cool things (mostly unrelated to 61A) that you may find interesting

1. My personal setup

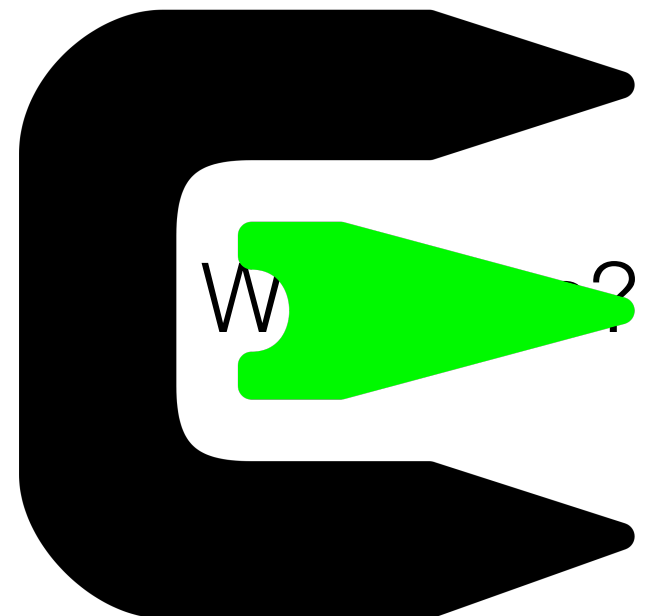2. (Kinda in scope) Parallelism, distributed systems

3. The World of CS
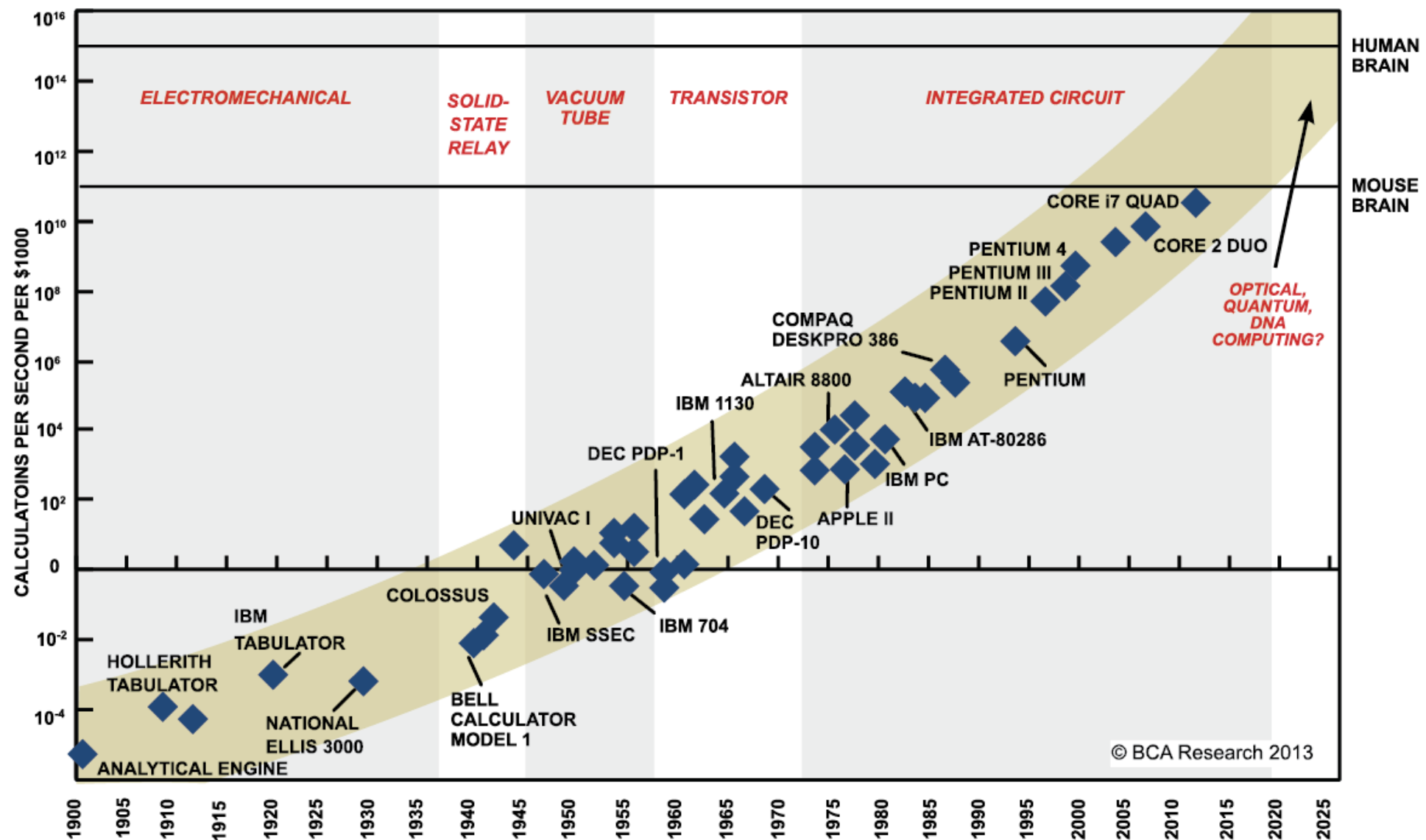
Personal Setup

Misc. CS Topics

There's going to be a LOT of content coming up, don't worry about understanding it all!

But, **be sure to (interrupt me and) ask questions if you're interested.**

A Very Big Idea

Moore's Law

A Very Big Idea

But, all good things must come to an end

Intel retires "tick-tock" development model, extending the life of each process
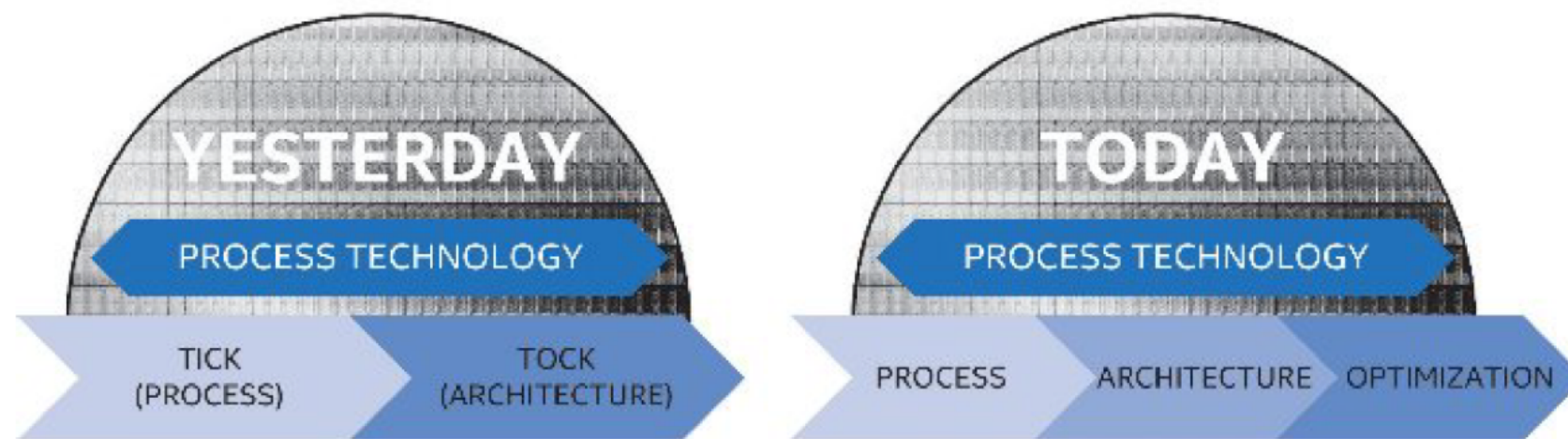
The new pattern is "Process, Architecture, Optimization."

by **Peter Bright** - Mar 23, 2016 9:19am PDT

f Share   **y** Tweet   ✉ Email   146
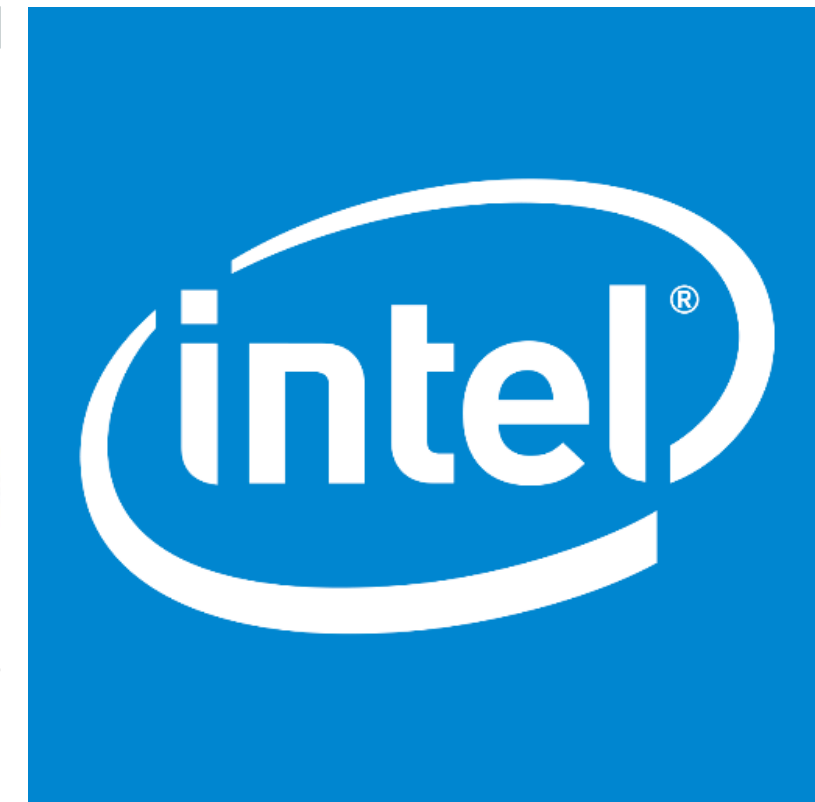

🔍 Enlarge / The third phase after tock finally has a name.

It looks like the Kaby Lake processor isn't a one-off. Intel's latest 10-K filing (spotted at Motley Fool) discloses that the two-phase "tick-tock" development model that the company has been using since 2007 is being replaced with a three-phase model: Process, Architecture, Optimization.

A Very Big Idea

Ok, can't cheaply speed up a CPU by cramming in "more circuit"
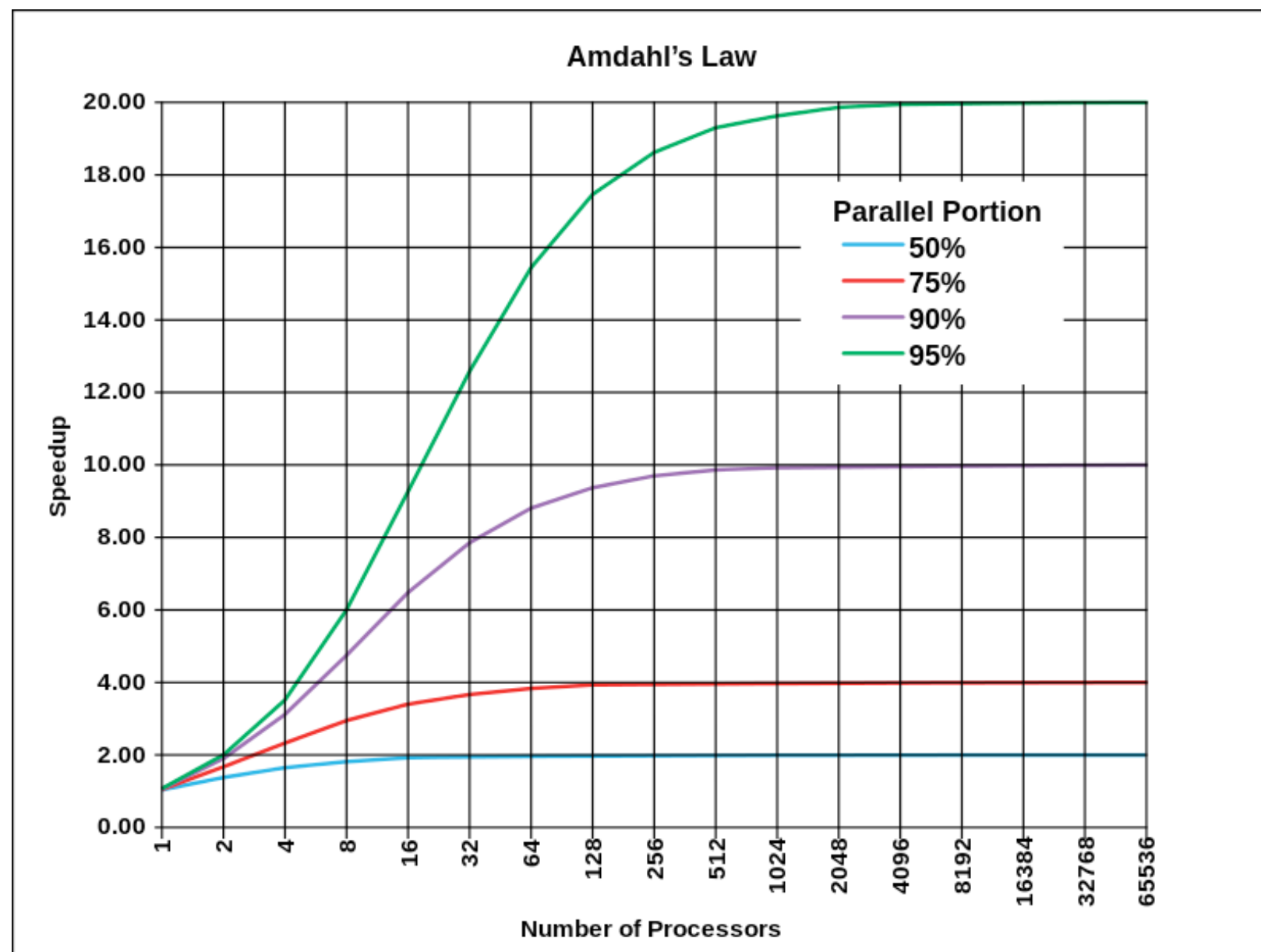
Alternatives

- **Parallel computing** — get more CPUs!

  Take large problem -> many small ones, execute simultaneously

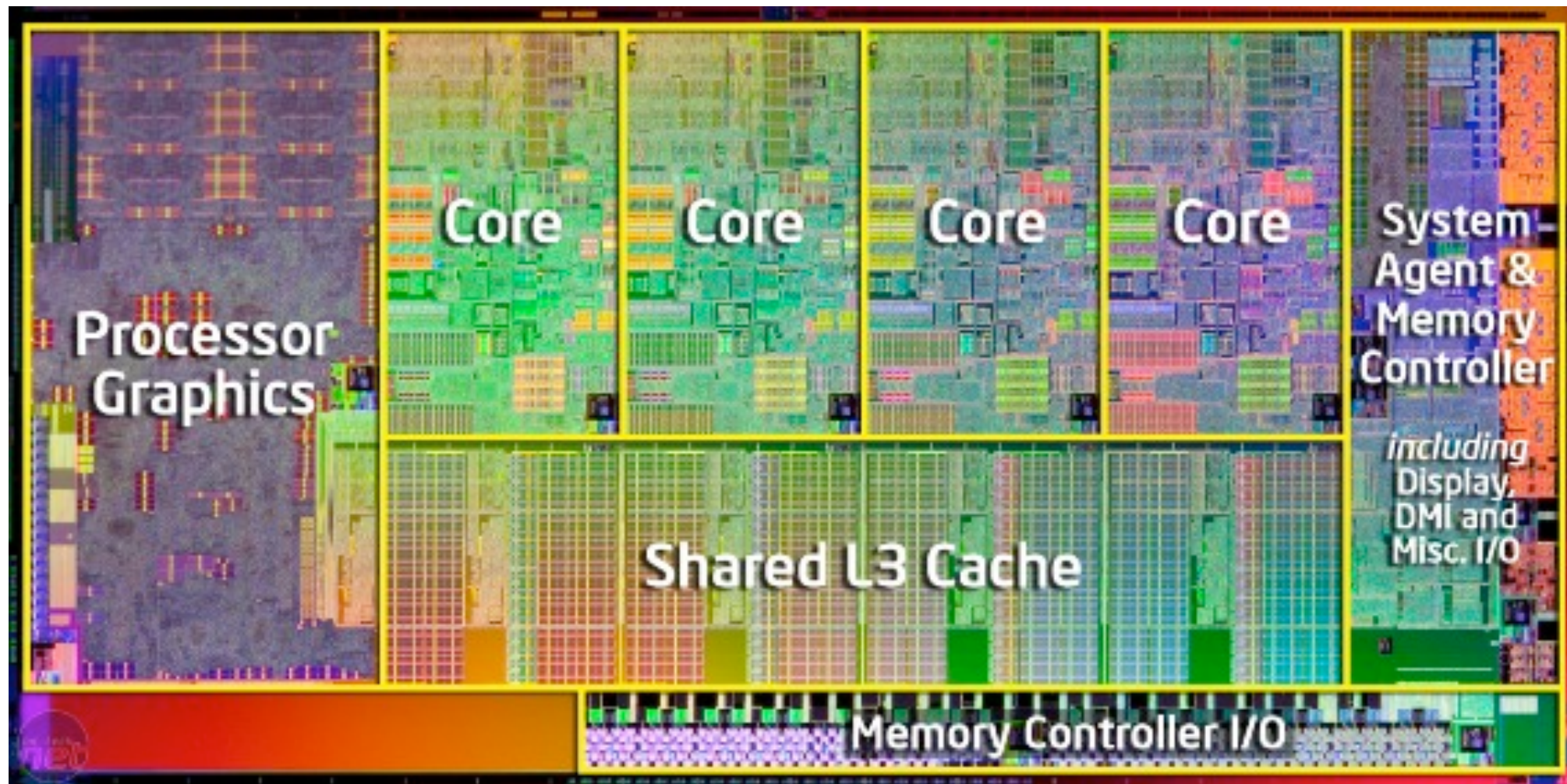- **Distributed systems** — lots of computers linked together to perform computation

Parallelism

First, some bad news:

https://en.wikipedia.org/wiki/Amdahl's_law

Parallelism

Still, many computers are now multiprocessor (including phones!)
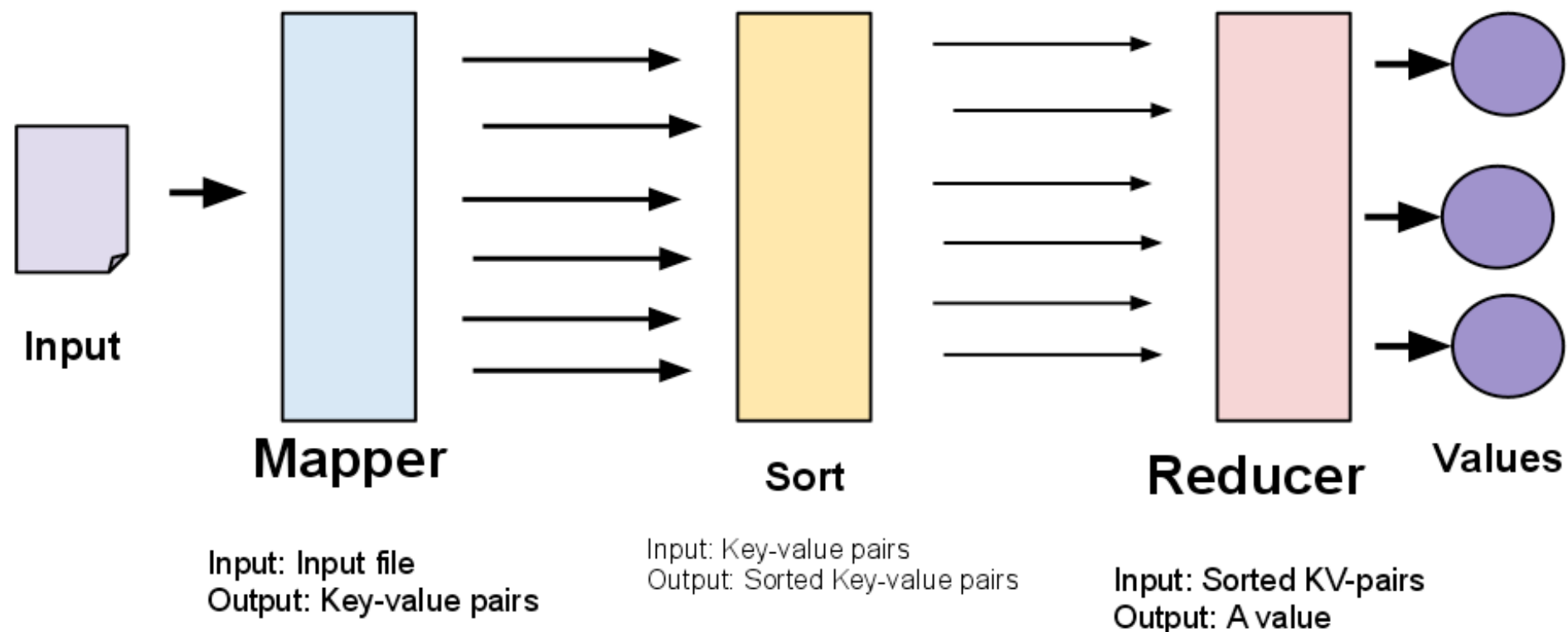
Parallelism

Some new problems:

- **Race conditions**

  - Ex: Two bank withdrawals at the same time

- **Deadlock**

  - Ex: A waits for B, B waits for A

MapReduce

Programming model for working with a **large dataset**

- Easy to **split work** onto many computers (parallel)

Input

Mapper
Input: Input file
Output: Key-value pairs

Sort
Input: Key-value pairs
Output: Sorted Key-value pairs

Reducer
Input: Sorted KV-pairs
Output: A value

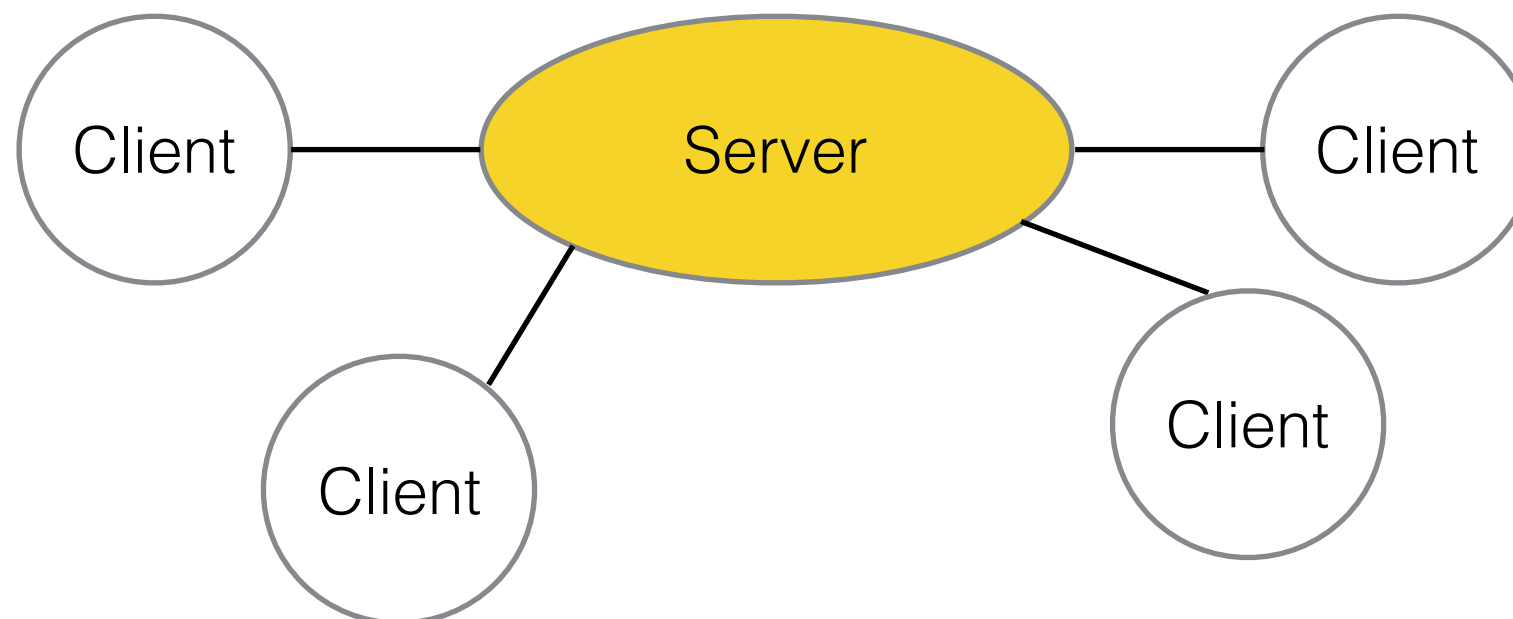Values

The "Cloud"

The Abstraction

The "Cloud"

The Reality

- A network of servers (computer clusters)

- Use **protocols** to communicate over networks (IP, TCP, etc)

- Can be difficult to ensure **consistency, availability, etc.**

Distributed Systems
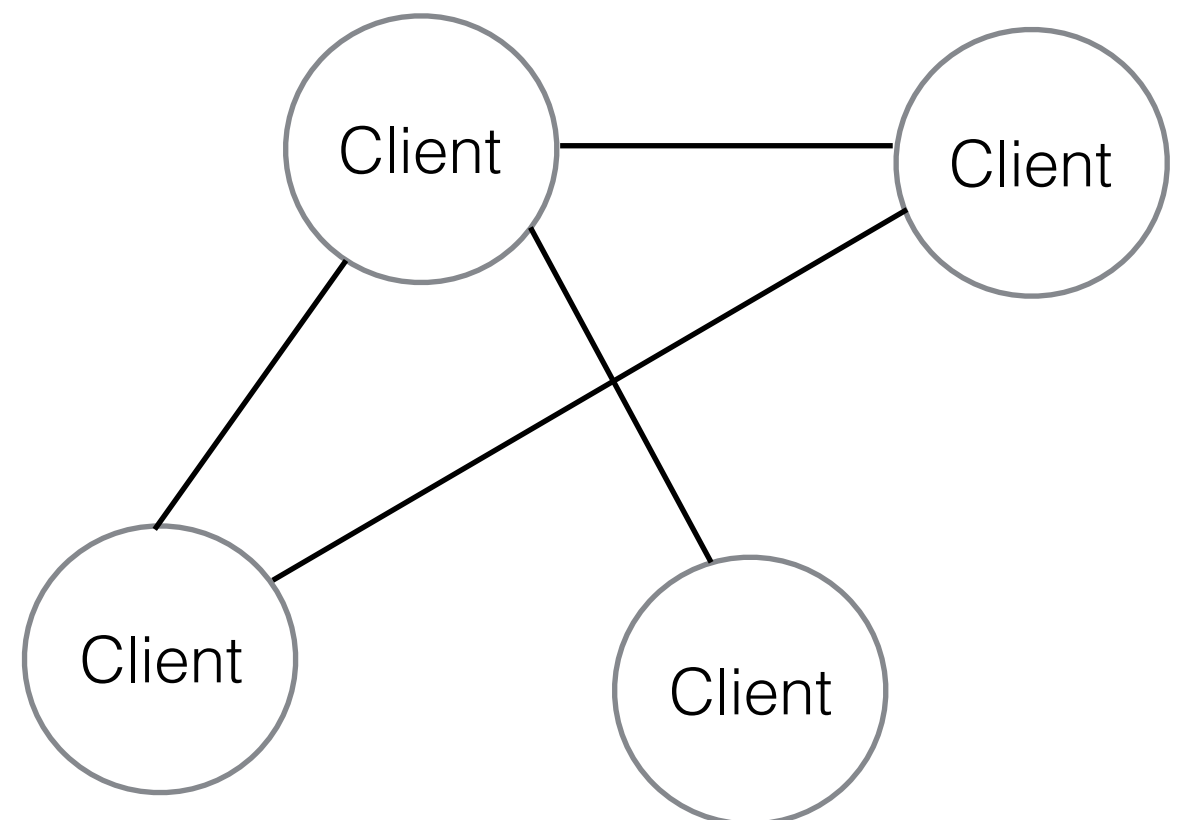
Client-Server Model (Centralized)

- What happens if the **server goes down**?

- What if there are **too many** clients?
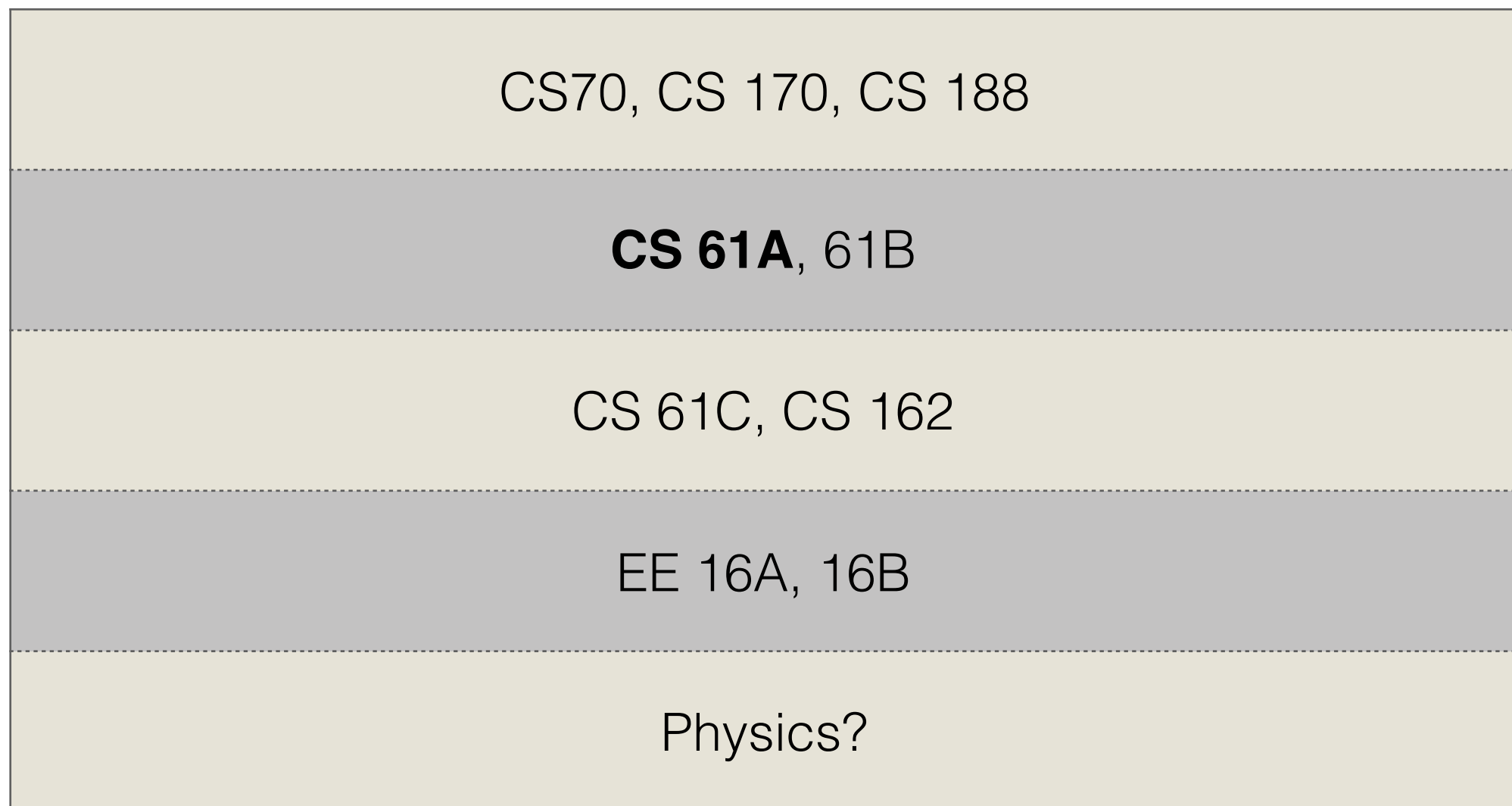
Distributed Systems

Peer-to-Peer Model

+ Scalability (in theory)

+ More reliable and secure (in theory)
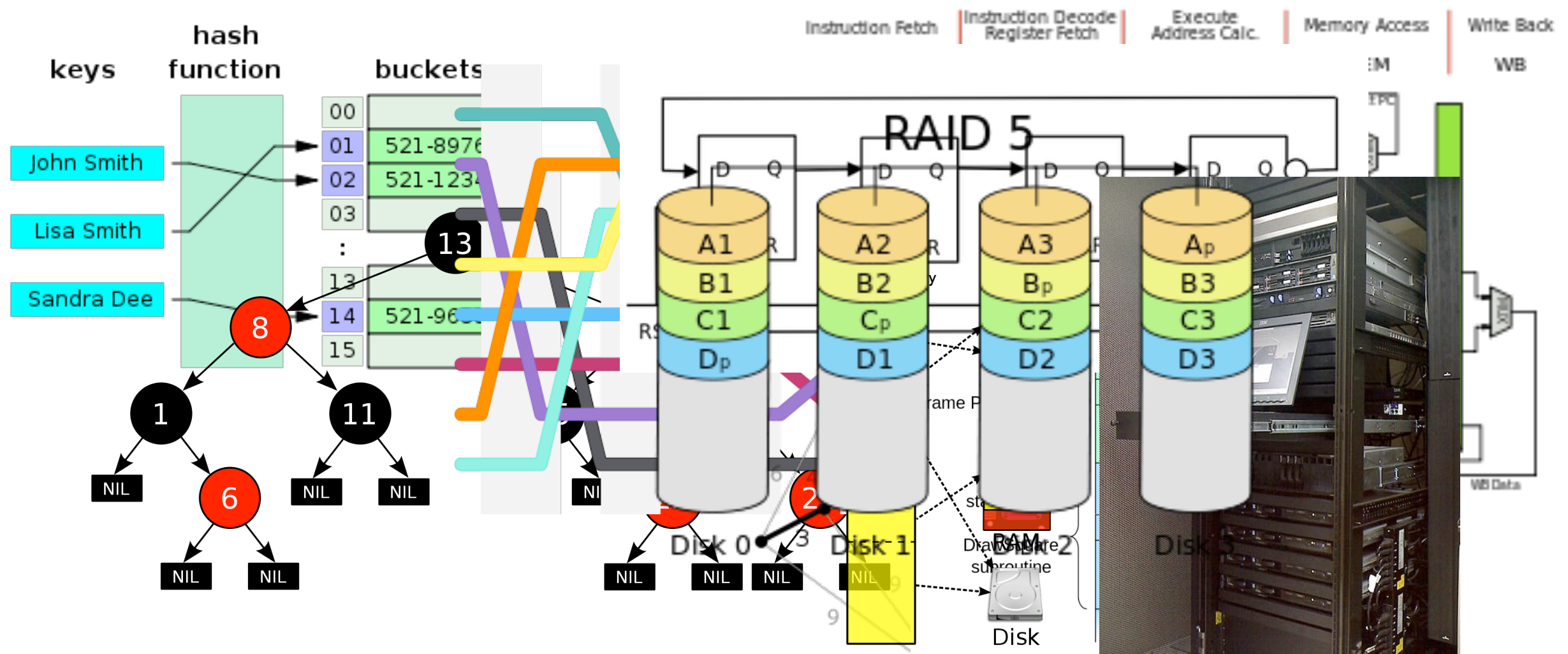
+ Reliable data backups (in theory)

CS at Berkeley

61A lies in the "upper middle" part of the low-high level hierarchy:

CS70, CS 170, CS 188
CS 61A, 61B
CS 61C, CS 162
EE 16A, 16B
Physics?

61B & 61C

"Data Structures" and "Great Ideas in Computer Architecture" are **HUGE** courses in terms of topics (think 61A huge)

Images from Wikipedia

Artificial Intelligence

Disclaimer: I have not taken this class (yet)! (CS 188)

Artificial Intelligence

Google: **AlphaGo** victory paves way for an AI-first world
Inquirer - Apr 22, 2016
GOOGLE HAS SAID that the firm's **AlphaGo** victory paves the way for an "AI-first world" as it shows the potential of artificial intelligence to bring ...

Beyond smartphones: Google CEO says AI is the next big thing
TechRadar - Apr 21, 2016

Explore in depth (26 more articles)

How Google's **AlphaGo** Beat a Go World Champion
The Atlantic - Mar 28, 2016
On March 19, 2016, the strongest Go player in the world, Lee Sedol, sits down for a game against Google DeepMind's artificial-intelligence ...

Beating Go and the road ahead for AI: Interview with Deep Mind's **...**
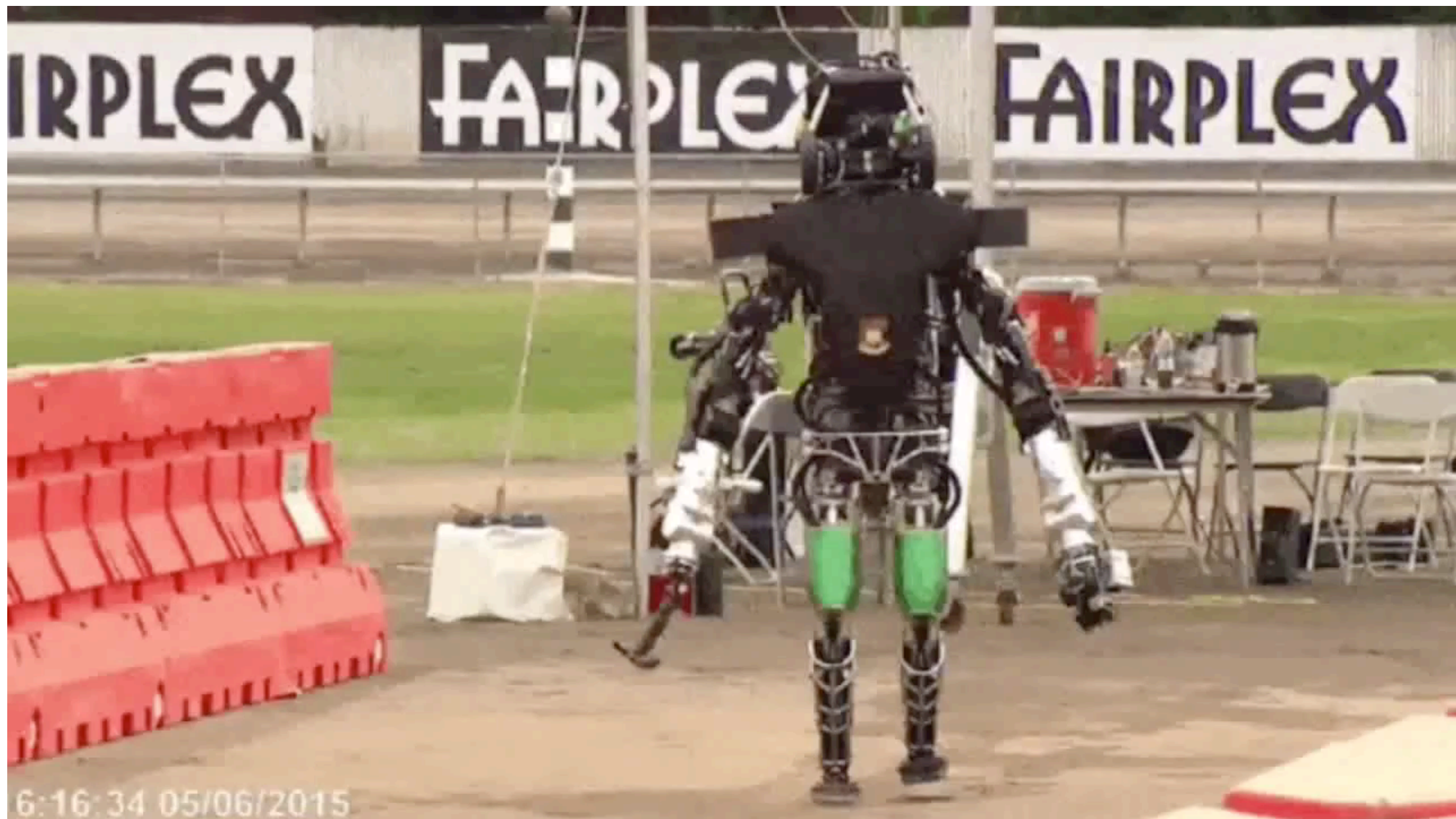Digit - Mar 28, 2016

Explore in depth (6 more articles)

Singer: Google's **AlphaGo** and the perils of artificial intelli…
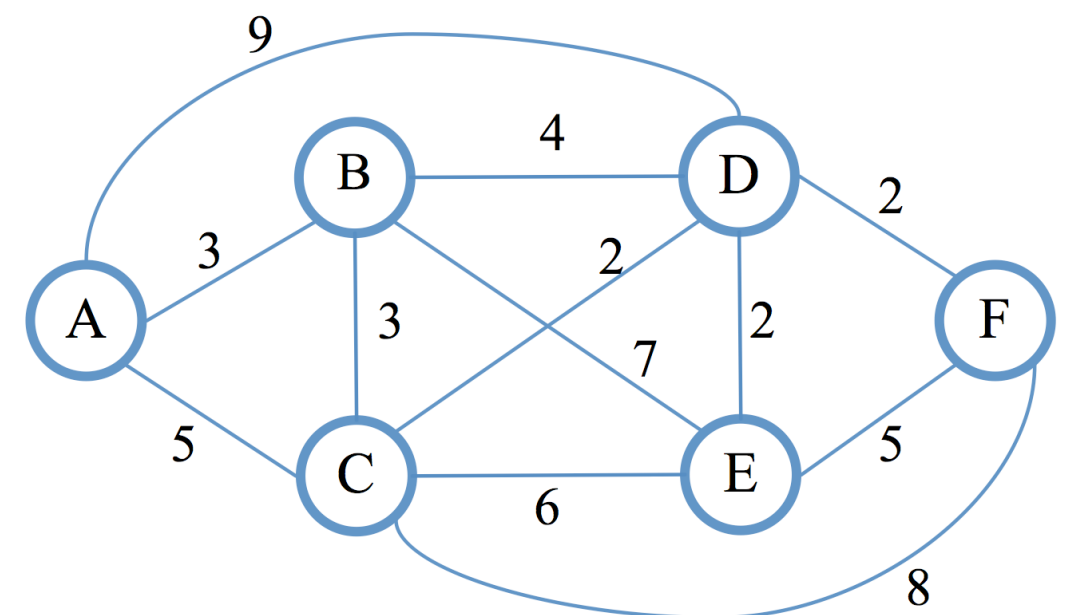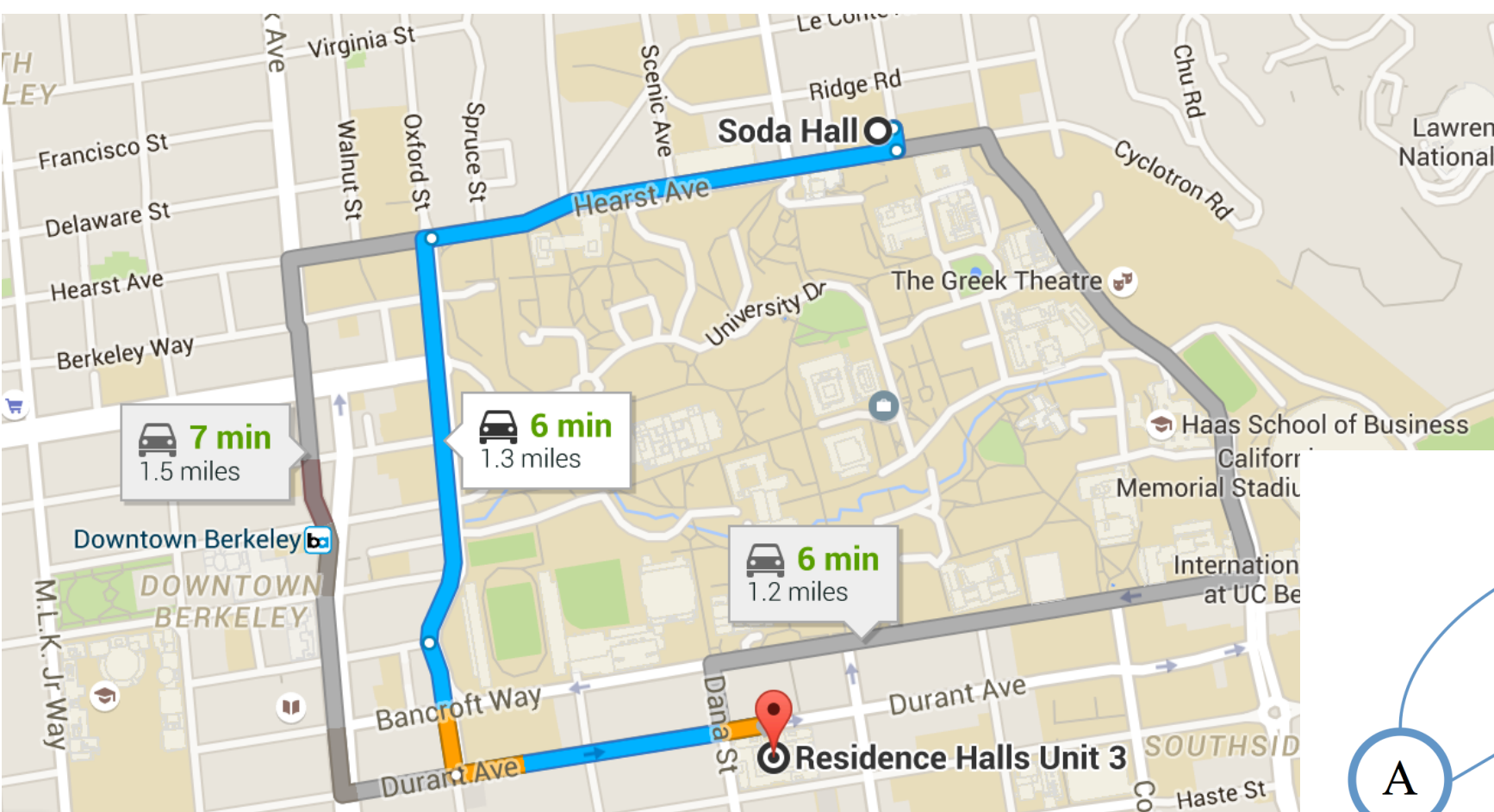The Denver Post - Apr 16, 2016
South Korean professional Go player Lee Sedol places the first stone against Google's artificial intelligence program, **AlphaGo**, during the ...
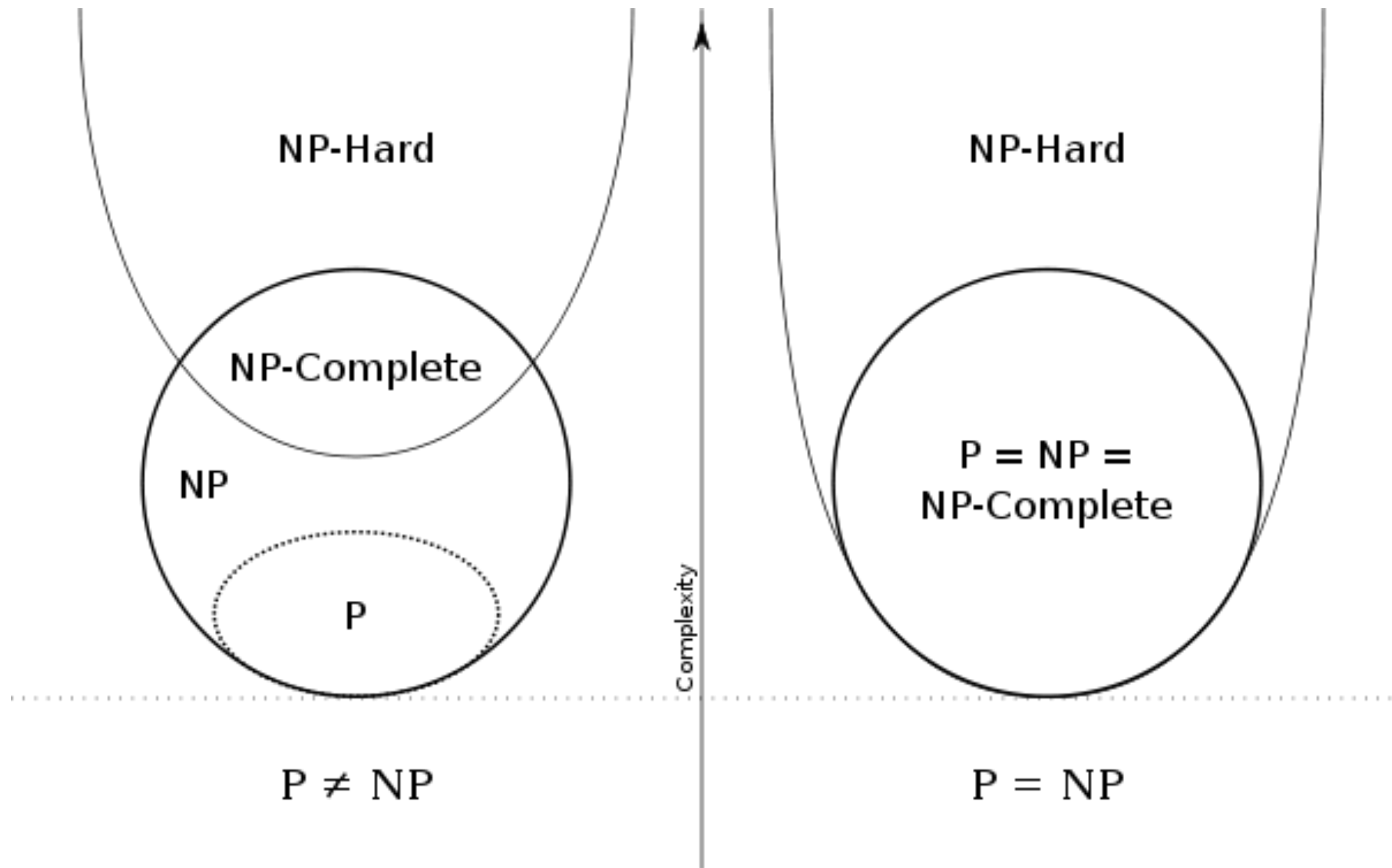
The Globe and Mail

Artificial Intelligence

A Compilation of Robots Falling Down at the DARPA Robotics Challenge
IEEE Spectrum

Algorithms

Algorithms

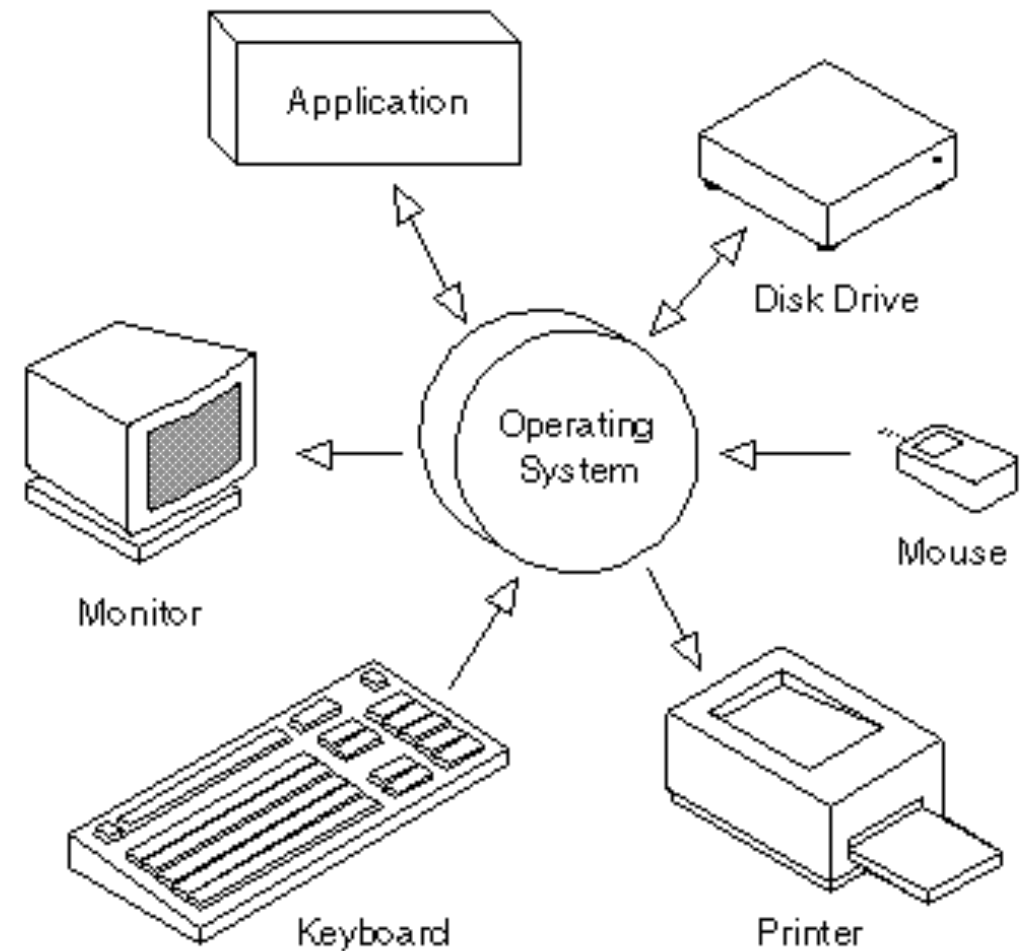https://en.wikipedia.org/wiki/NP-completeness

Operating Systems

http://www.technologydatagroup.com/
img/pageimg/os.jpg

http://www.webopedia.com/
FIG/OPER-SYS.gif

Operating Systems


```
A problem has been detected and windows has been shut down to prevent damage
to your computer.

The problem seems to be caused by the following file: SPCMDCON.SYS

PAGE_FAULT_IN_NONPAGED_AREA

If this is the first time you've seen this Stop error screen,
restart your computer. If this screen appears again, follow
these steps:

Check to make sure any new hardware or software is properly installed.
If this is a new installation, ask your hardware or software manufacturer
for any windows updates you might need.

If problems continue, disable or remove any newly installed hardware
or software. Disable BIOS memory options such as caching or shadowing.
If you need to use Safe Mode to remove or disable components, restart
your computer, press F8 to select Advanced Startup Options, and then
select Safe Mode.

Technical information:

*** STOP: 0x00000050 (0xFD3094C2,0x00000001,0xFBFE7617,0x00000000)

*** SPCMDCON.SYS - Address FBFE7617 base at FBFE5000, DateStamp 3d6dd67c
```

https://upload.wikimedia.org/wikipedia/
commons/a/a8/Windows_XP_BSOD.png

http://g01.a.alicdn.com/kf/
HTB1OrFyIXXXXXcBXFXXq6xXFXXXh/Authentic-
Guaranteed-Free-Shipping-Kingmax-
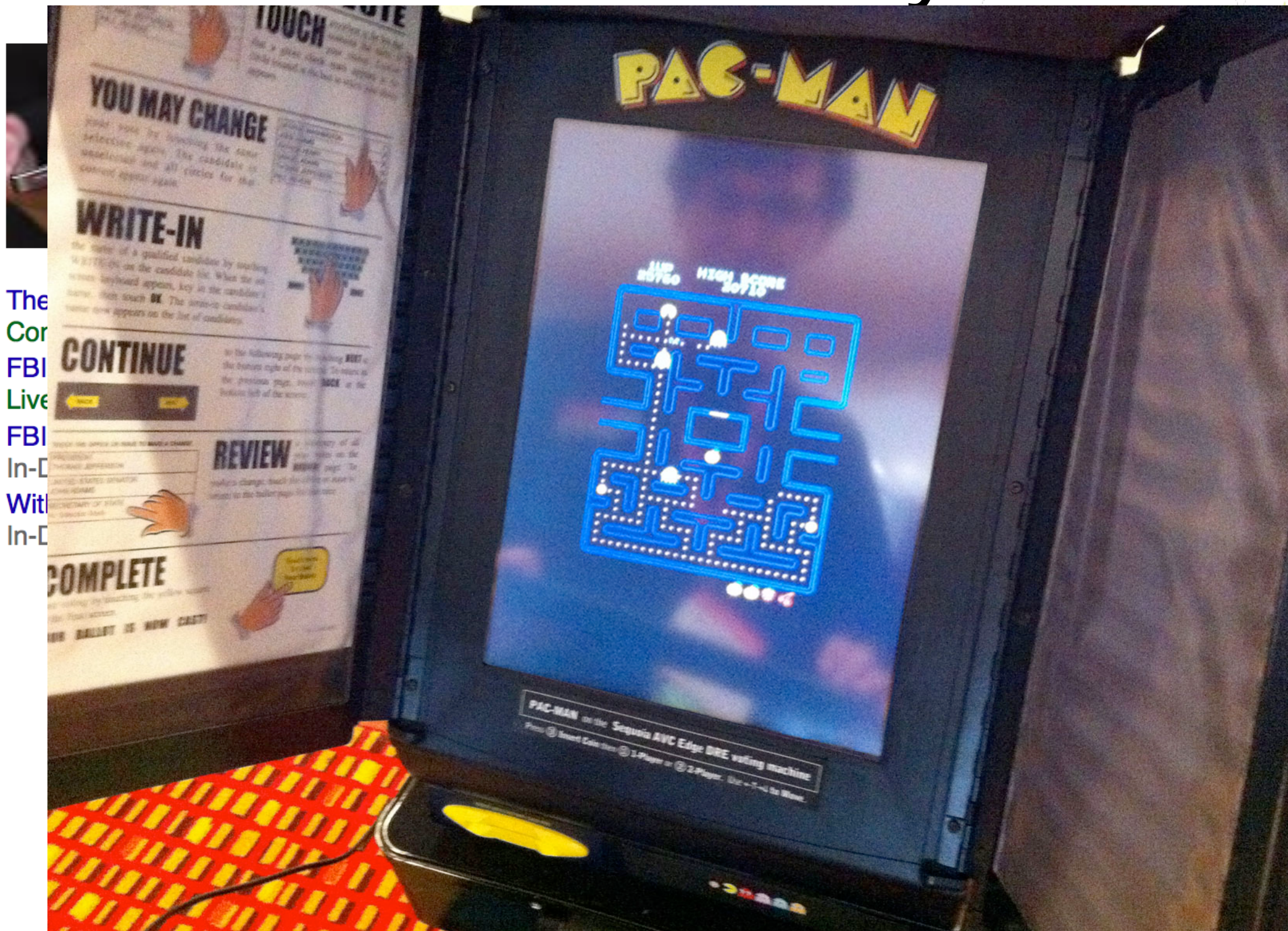DDR3-2GB-1600MHz-Desktop-font-b-Computer-b-
font-font-b.jpg

https://
upload.wikimedia.org/
wikipedia/commons/f/
f8/Laptop-hard-drive-
exposed.jpg

Security

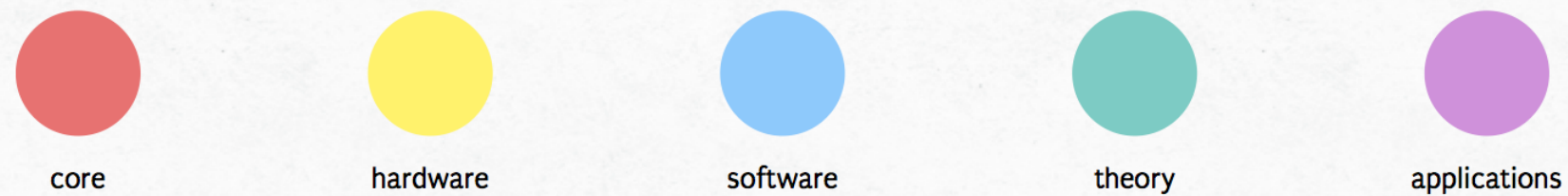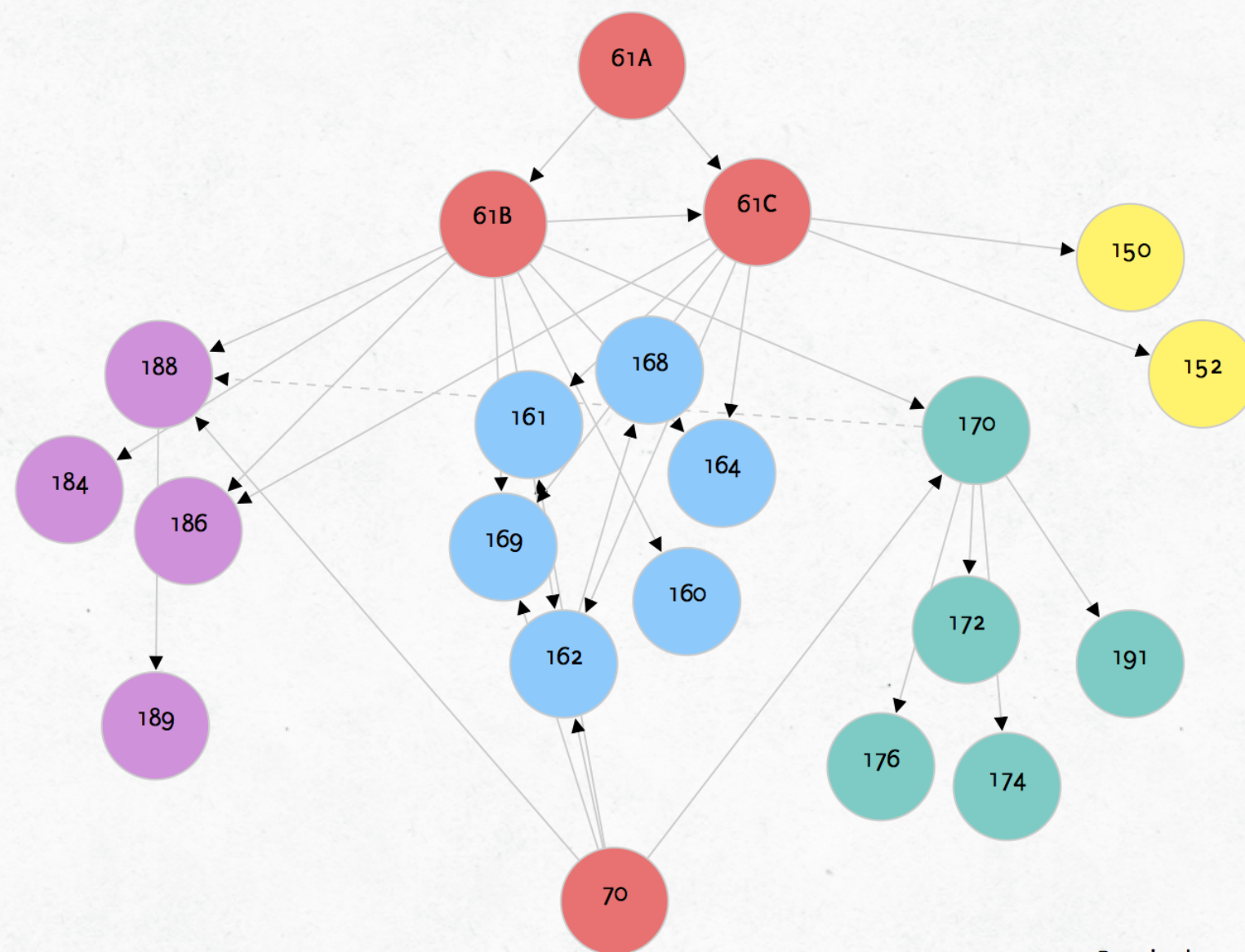Berkeley's very own Defense Against the Dark Arts!

Security

https://jhalderm.com/pacman/avc-screen.jpg

Security

Super Mario World: Arbitrary Code Injection At AGDQ 2014, Performed Live

HKN's CS Course Map

https://hkn.eecs.berkeley.edu/courseguides

The End

Liked 61A? Stick around!

| Student | → | Lab Assistant | | Mentoring |
| Tutor | → | TA | |
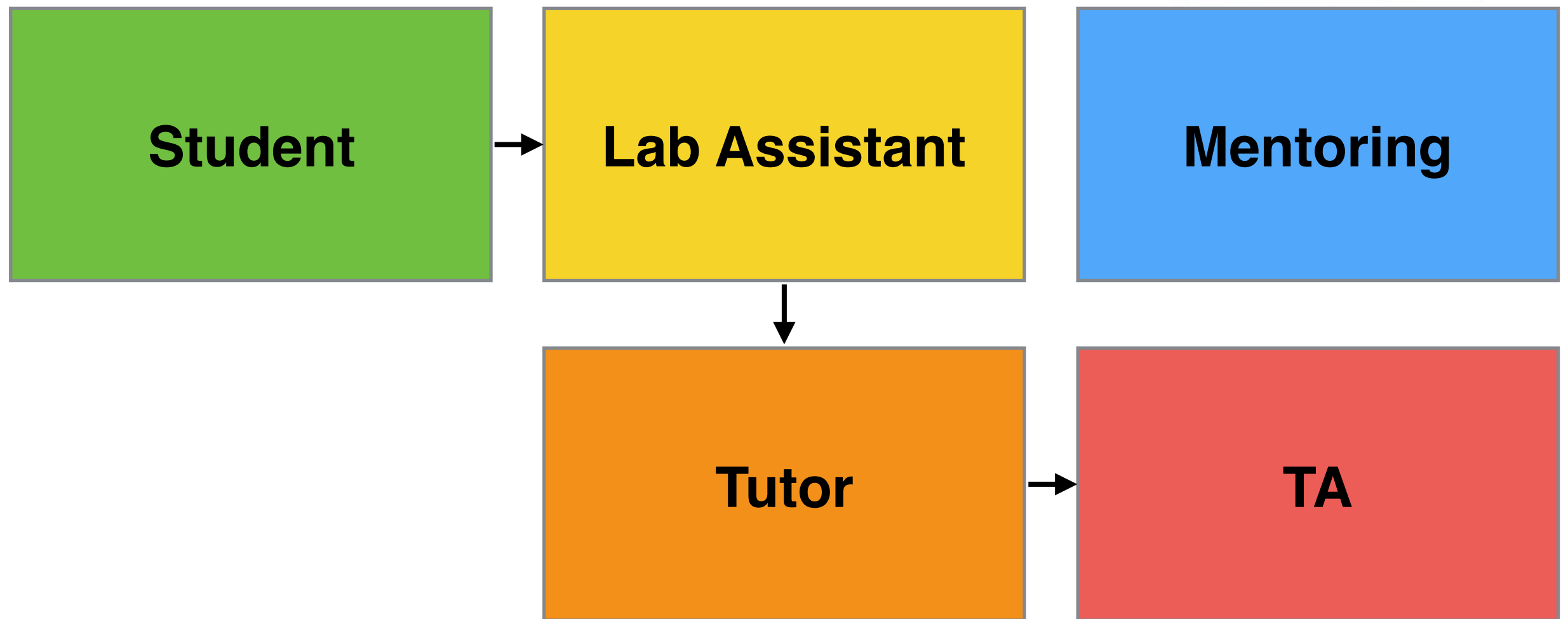
Final Thoughts

Thanks for a wonderful semester!

Please **go to lecture this Friday** and **fill out the surveys!** (in-class & online, 1 EC for each)

I sincerely hope you enjoyed your time in 61A.

As always, feel free to reach out to me with any questions.