

Announcements

We are thinking about having TAs hold a review session during regular lecture time during RRR week.

- Let us know what you think at <https://tinyurl.com/61bRRRpoll>

For project phase 2, there are two common ways to save:

- One is to use “Serializable”, which we do not describe in the spec, but we provide as an example in SaveDemo.java.
- The other is to simply save the input string somewhere, and when you load, you first call interactWithInputString and then hand control over to interactWithKeyboard.

Both are reasonable approaches, though I personally prefer #2.

Announcements

Be very careful about using non-final static variables in project 2.

- I would not have them at all, except MAAAAYBE a static random.
- It is very easy to have extremely subtle bugs.
- Basic idea: All of your methods have access to the data that you store in a static variable, and if any of those methods at any point does something wrong, you might not see the error until much later.

Note if you use `Serializable`, static variables are not saved.



the students' answer, where students collectively construct a single answer

UPDATE: If this is your error make sure that your functions aren't static. Just like they said if you use static things everything breaks.

CS61B

Lecture 37: Software Engineering III

- Candy Crush and Friends
- The Ledger of Harms
- Your Life

Overview

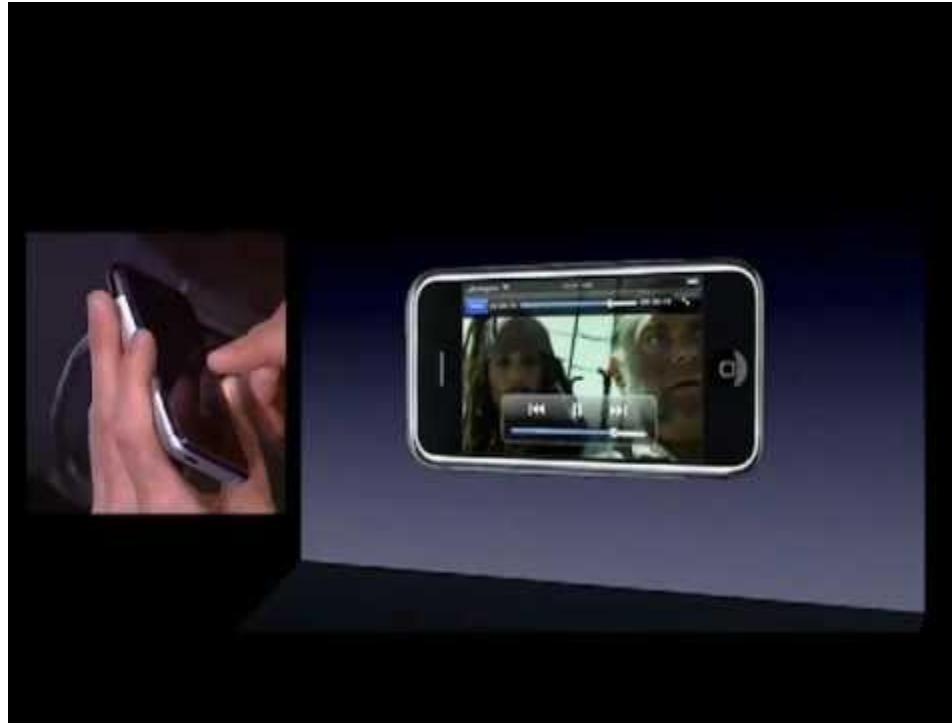
Software has completely reshaped society in my lifetime.



1994
Today Show

Today, we'll discuss your role in the future we're creating.

2007



Candy Crush

The mobile game Candy Crush tracks the number of days you have played in a row.

- Every consecutive day gets you a reward.
 - Progress indicator.
 - Up to 2 hours worth of a special item for that day that makes the game more fun.

If you miss a day, the counter resets.

Why does this feature exist in Candy Crush?

- Charge you for slip days. Buy back into the streak?
- Keep you playing the game. More

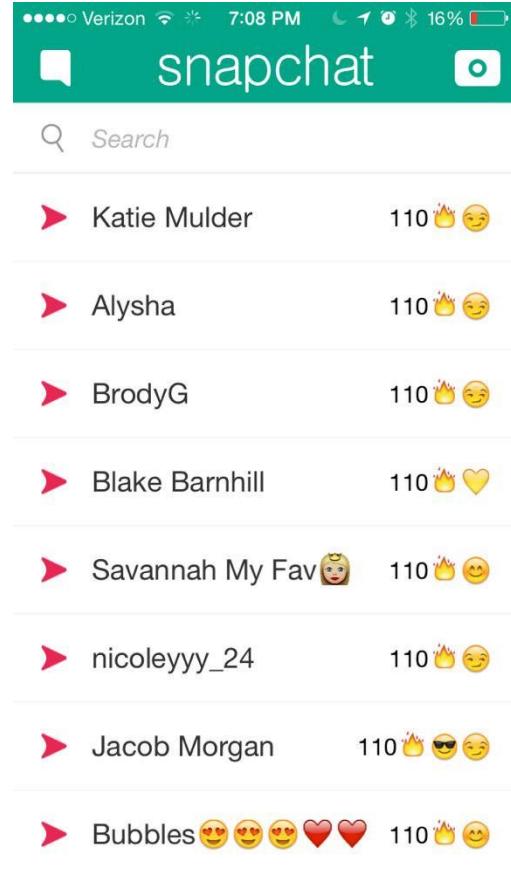


Snapchat

Similarly, for every day that you and a friend communicate on snapchat, your snap streak is extended by one day.

Why does this feature exist in Snapchat?

- Facebook currency is “number of likes.”
- On snapchat, currency is “length of your longest streak”.
- They want to maximize engagement.



Snapstreaks and Candy Crush Streak

What positive impact do these features have on the world?

- Easily accessible source of daily meaning.
- Keeps kids off the streets. No juul pods in the sewers or whatever.
- Evidence of being alive (proof of life).
- It's a source of revenue for the people who build the tools.
- Provides a cultural common denominator, homogenizes us.
- Use as an alibi in case of a crime.
- Encourage determination and hard work (maybe).
- Low risk way of practicing the maintenance of a long term commitment.
- Maintains contact with people you might lose track of.

What negative impact do these features have on the world?



Snapstreaks and Candy Crush Streak

What negative impact do these features have on the world?

- They enslave you by tapping into your obsessive tendencies.
- Waste of time, you are less productive / bad use of time.
- Fosters addictive personalities.
 - Shortens your attention span.
- Your significant might break up with you for being lame.
- Distracts us from more important tasks like not running over people.
- Makes our interactions more superficial, not as rich as face to face contact.
- It's too easy of a type of happiness, harder to enjoy things that are fun, but take more work.
- Might open up the app because you feel like you have to, rather than it is fun.

Snapstreaks and Candy Crush Bonuses

Are these features net positives for the world?

More Generally

Are Candy Crush/

and Snapchat net positives for the world?

Bad and you use it:

- The network effect keeps you there.
- Don't want to give up my streaks.
- Fastest way to get to someone.

Khan Academy

I'm assuming you're familiar with Khan Academy: <https://www.khanacademy.org/>.

- ... but just in case you're not, let's check it out.



For every student,
every classroom.
Real results.

We're a nonprofit with the mission to provide a free, world-class education for anyone, anywhere.

Learners

Teachers

Districts

Parents

Khan Academy

What positive impacts does Khan Academy have on the world?

- Access to math information you may have learned in the past and forgot.
- Free information for everyone.
- Gives people educational opportunity they might not have otherwise.
- It allows you to complete math 53 to your satisfaction.
- Gamifies education -- a student in 61B personally got drawn in.

What negative impacts does Khan Academy have on the world?

- Some teachers use it to automate themselves, and maybe they would do better if they were doing the teaching.
- Not free information for everyone, just for people with easy internet access of sufficient bandwidth to watch videos, etc.
- Makes learning more passive.



Khan Academy

What negative impacts does Khan Academy have on the world?

- Some teachers use it to automate themselves, and maybe they would do better if they were doing the teaching.
- Not free information for everyone, just for people with easy internet access of sufficient bandwidth to watch videos, etc.
- Makes learning more passive.
- Dilutes the value of my fancy schmancy degrees since apparently mere peasant can just learn mathematic. ??
- May make you overestimate your ability.
 - “I learned more studying for my first 61A midterm than I had programming for years before”
- May homogenize teaching itself.

Khan Academy

Is Khan Academy a net positive?



Workplace Preference

What are some reasons people might prefer working at King (developer of Candy Crush) over Khan Academy?

- They pay more.
- More passionate about the usbject - games mmight be fun to build than educational tools.
- Marquee branding for your career is a big deal.
- More secure career.
- Skillsets are different.
- It feels too close to home for fresh engineers perhaps -- would rather go do something else.
- Different cultures.

Revenues

King and Snapchat generate enormous amounts of revenue.

- Note: Even with all this revenue, Snapchat is still not profitable (yet?).

	Revenues	Profits	# Employees	Revenue / Employee
King (2017)	2 billion	Unreported*	2,000	~\$1,000,000
Snapchat (2018)	1.2 billion	-1.2 billion	2,884	~\$416,000
Khan Academy	0.037 billion (includes gifts)	N/A	147 (including a dog)	N/A

* King is owned by Blizzard-Activision and yearly report doesn't give profit for King as a unit.

Sources: [Link](#), [Link](#), [Link](#), [Link](#), [Link](#)

The Ledger of Harms



Concerns Expressed by Tech Leaders

- “I think we have created tools that are ripping apart the social fabric of how society works.” - [Chamath Palihapitiya](#) (early executive at Facebook)
- “God only knows what it[Facebook]’s doing to our children’s brains.” - [Sean Parker](#) (the Napster guy)
- “The technologies we were most excited about 10 years ago are now implicated in just about every catastrophe of the day.” - [Farhad Manjoo](#) (technology journalist)
- “*These are our lives.* These are our precious, finite, mortal little lives. The idea that we are spending them distracted, not accomplishing the thing that we’re trying to do, is just painful. It’s crazy.” - [Justin Rosenstein](#), creator of the Like button and founder of Asana
- ““Facebook appeals to your lizard brain — primarily fear and anger,” he said. “And with smartphones, they’ve got you for every waking moment.”” - [Roger McNamee](#) (early investor in many tech companies, interesting guy)

My Thoughts

Technology companies do inflict significant negative externalities upon society.

- Most of them are still a net positive, e.g. I personally use and enjoy Facebook.

My personal sense is that these are largely unintended consequences by well intentioned people.

- Yes, there are some bad actors, but I don't think they are common.
- Workers and executives at these companies do care.
 - ... but money does skew people's perspective in strange ways.

The Center for Humane Technology and the Ledger of Harms

The [Center for Humane Technology](#) was founded by current and former tech workers to raise awareness and try to combat harmful side effects of internet tech platforms.

In 2018, they created a [Ledger of Harms](#) “collect those negative impacts of social media and mobile tech that do not show up on the balance sheets of companies, but on the balance sheet of society.”

- It is “aimed at guiding rank-and-file engineers who are concerned about what they are being asked to build.” [[Link](#)]

Ledger of Harms

Their concerns:

- Attention: Loss of ability to focus without distraction.
- Mental Health: Loneliness, depression, stress, loss of sleep, increased risk of suicide.
- Relationships: Less empathy, more confusion and misinterpretation.
- Democracy: Propaganda, lies, an unreliable and noisy place to talk.
- Children: New challenges learning and socializing.

For each category, they provide research and citations for potential harms.

Attention

- “The presence of a smartphone, even when off, can reduce cognitive capacity by taxing the attentional resources that reside at the core of both working memory capacity and fluid intelligence.”
- “72% of teens and 48% of parents feel the need to immediately respond to texts, social-networking messages, and other notifications.”
- “Almost 90% of 290 undergraduates reported feeling "phantom vibrations," which were experienced an average of once every two weeks.”

Mental Health

- “A systematic review and meta-analysis (of 20 studies) showed strong, consistent evidence of an association between bedtime access to or use of devices and reduced sleep quantity and quality, as well as increased daytime sleepiness.”
- “Electronic device use is weakly correlated with teen depression and suicide, and social media use is weakly correlated with depressive symptoms, especially for girls.”
- “Doctors have coined the phrase “Snapchat dysmorphia” to describe what’s happening to people who feel they can’t live up to their modified social media photos, and seek plastic surgery to match their own faces to the photos.”

Relationships

- “Even the mere presence of smartphone can disrupt the connection between two people, having negative effects on closeness, connection, and conversation quality.”
- “People overestimate their ability to correctly interpret sarcasm, humor, or sincerity over text communication, and this means people tend to believe they can communicate over e-mail more effectively than they actually can.”

Democracy

- “18.5% of total tweets from the top 50k active users on Twitter came from bots, when sampled during three weeks of the 2016 presidential election.”
- “Search results can shift the voting preferences of undecided voters by 20% or more, with virtually no one aware they are being manipulated.”
- “9/10 false news websites from the month before the 2016 election were still in the top 10 across Twitter almost two years later — demonstrating that the general public is still at high risk of learning false information from Twitter.”
- “People are more likely to start believing a story if they hear it a lot, especially from multiple sources. Misinformation actors place and promote misinformation stories on multiple social media channels, many of which appear to be independent entities when in fact they are not.”

Children

- “78% of teens check their devices at least hourly, and 50% report feeling “addicted” to their phones; meanwhile, 69% of parents check their devices at least hourly, and 27% of parents feel “addicted”. ”
- “67% of over 2,200 teachers say the number of students who are distracted by digital technologies in the classroom is growing; 76% of teachers say that their students’ ability to focus on educational tasks decreased in the 3 to 5 years before 2015.”
- “Children who are cyberbullied are 3x more likely to engage in suicidal ideation than non-bullied children, while those who experience “traditional” bullying are 2x more likely to engage in suicidal ideation.”

Your Life



The Power of Software

Unlike other engineering disciplines, software is effectively unconstrained by the laws of physics.

- Programming is an act of almost pure creativity!

The greatest limitation we face in building systems is being able to understand what we're building!

The Limiting Reagent

You are a rare commodity.

Revenue per employee rankings:

1	Apple	\$1.982 million
2	Alphabet Class A Shares	\$1.609 million
3	Facebook	\$1.569 million
4	Microsoft	\$904 300
5	Amazon	\$411 500

Sources: [Link](#), [Link](#)

Net income per employee rankings:

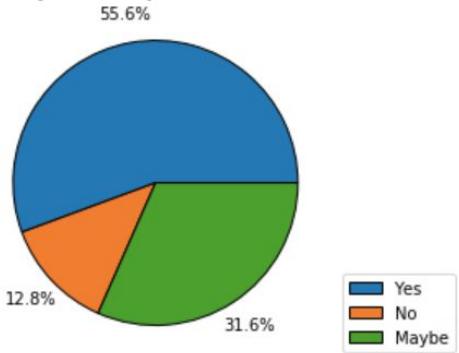
1	Facebook	\$621 400
2	Apple	\$450 200
3	Alphabet Class A Shares	\$361 400
4	Microsoft	\$256 000
5	Amazon	\$178 000

The skills you are building will be in high demand from companies, non-profits, government agencies, educational institutions, and more.

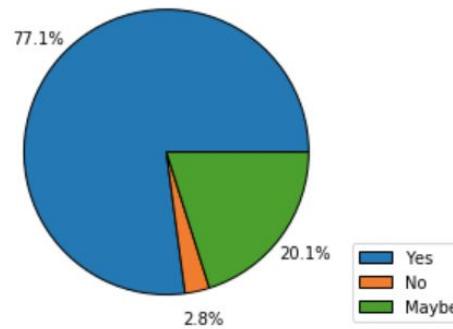
- The choice of how to spend your career is yours.

Some 61B Data

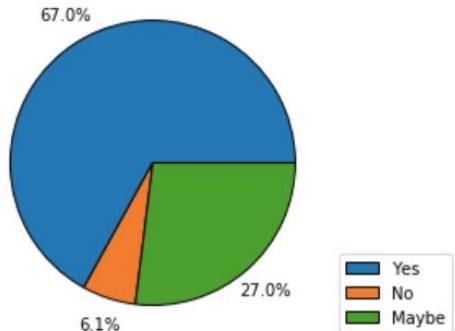
Would you take a job from Facebook?



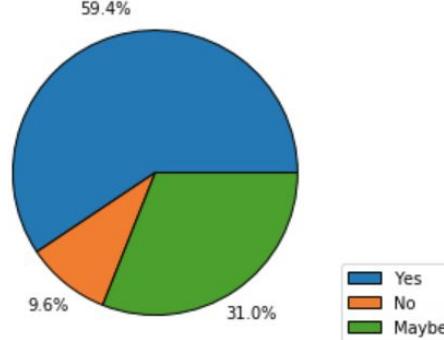
Would you take a job from Google?



Would you take a job from Apple?



Would you take a job from Amazon?



Steering the Course

Quite a lot of you will likely end up working at some sort of technology company at some point in your life.

There's nothing (IMO) wrong with working at profit driven tech companies.

- Please do realize that even as a rank and file employee, you have the power to effect change, particularly if you are paid in stock (because then you are a partial owner).

Let's see some examples.

Example 1: Google and the Censored Chinese Search Engine

From 2006 to 2010, Google operated a censored version of Google in China.

- Withdrew in 2010 in response to cyber attacks by the Chinese government on users of Google's services: "These attacks and the surveillance they have uncovered--combined with the attempts over the past year to further limit free speech on the web--have led us to conclude that we should review the feasibility of our business operations in China. We have decided we are no longer willing to continue censoring our results on Google.cn."

In Oct 2018, leaked documents published in [The Intercept](#) revealed a secret project by Google to re-enter the Chinese market.

- This new search engine would be censored, and also allow government officials to hypothetically track Chinese residents making undesired queries.

Example 1: Google and the Censored Chinese Search Engine

Some employee responses:

- After the leaks, access within the company to documents related to the project were curtailed: “Everyone’s access to documents got turned off, and is being turned on [on a] document-by-document basis,” said one source. “There’s been total radio silence from leadership, which is making a lot of people upset and scared. … Our internal meme site and Google Plus are full of talk, and people are a.n.g.r.y.” [[Link](#)]
- Over 1400 employees signed a letter demanding more transparency, and at least five employees resigned in protest [[Link](#)].

Example 1: Google and the Censored Chinese Search Engine

Jack Poulson (a senior scientist who resigned): ([Link](#))

- “There are serious worldwide repercussions to this... what are Google’s ethical red lines? We already wrote some down, but now we seem to be crossing those.”
- Poulson said that he “very much agree[s] with the case Sergey made in 2010. That’s the company I joined, the one that was making that statement.” If the anti-censorship stance is shifting, he said, then he could no longer “be complicit as a shareholder and citizen of the company.”

Ultimately, in response to employee outcry, the project was cancelled [[Link](#)].

Example 2: Amazon and Climate Change [[Link](#)]

A few weeks ago, 6,772+ employees at Amazon publicly signed [a letter](#) demanding better responses to climate change by Amazon.

- Specifically, they want the company to adopt a shareholder resolution ([link](#)) to study how the company will adapt to and reduce its contribution to climate change.
- “Amazon is not a mere victim of climate change—its operations contribute significantly to the problem... Coal still powers Amazon data centers. Diesel, gasoline, and jet fuel still power package delivery.”
- “Amazon has the resources and scale to spark the world’s imagination and redefine what is possible and necessary to address the climate crisis.”

“Like other shareholders, they can file a resolution urging a particular corporate change that investors vote on at a company’s annual meeting.”

Time

You get some number of decades on the planet.

Each week is 168 hours.

Anecdotally, most of you will have much more free time after college.

- ~40 hours of work.
- ~56 hours of sleep.
- ~72 hours for everything else.

Spend your time wisely, in both your career and personal life.