Do Grades Matter?

A Discussion About Thinking Bigger While at CMU

Kayvon Fatahalian

December 14, 2016

My CMU undergrad experience

Me, back when I had hops.

Computer science major

Varsity tennis for three years (~20-25 hours/week during season)

Joined Randy Pausch's research group as a sophomore, but quit after 48 hours (hopeless with classes and tennis)

Chose to not play tennis my senior year to try a senior research thesis

Kayvon's <u>bold</u> assertion:
The undergraduate computer science
curriculum at CMU is "challenging".

A bit on our (the faculty's) philosophy

YOU are some of the best CS students in the world.

WE (the faculty) hope your CMU experience pushes you to be excellent on a level far beyond your imagination.

(the definition of being excellent is what I what to talk about today)

How we teach at CMU

- **CMU really, really, really prides itself on the quality of its undergraduate CS courses**
  - Cutting edge topics, really innovative programming labs
  - Distinct undergraduate / graduate courses
  - Department responds to student criticisms/opinions

- **Students learn best by doing (and doing a lot)**
  - Learning comes from immersing yourself in a topic
  - In order to earn an 'A', you have to work hard (hard $\approx$ code a lot, prove a lot)

- **Tough (but fair) requirements for students**
  - We want you to be able to get that A or B, if you put in the effort
  - It's a supportive place

Implications of this approach

1.

GPA at CMU means something

A 4.0 in CS is an impressive achievement
(employers know this)

2.

CMU students know their stuff:

Average CS graduate is extremely well prepared
for the world's best software engineering jobs.
(Again, employers know this: proof by our job fair)

"We have a lot of CMU alumns at Facebook... a lot of them are some of
our best engineers, so when we went to design this trip to go see a few
colleges, Carnegie Mellon was at the top of the list." - Zuckerberg

What I see a lot of…

Amazing CMU CS student → **Works really hard to maximize grades in CS classes**

→ **High GPA looks good on resume**

→ **Good resume handed out at CS job fair**

→ **Resume gets student first-round interview**

→ **Student knows their stuff in interview** (aces fine-grained linked list locking question)

→ **GOOD JOB Woot!**

But let's be honest, this is what really happens...

Amazing CMU CS student

Works DOES NOT SLEEP in order to maximize grades in MANY CS classes
or
A DOUBLE MAJOR
or
A TRIPLE MAJOR

(Most waking hours spent on coursework, tired all the time)

Even more impressive resume handed out at CS job fair

Resume gets student first-round interview

Student knows their stuff in interview
(aces fine-grained linked list locking question)

GOOD JOB
Woot!
("but man, CMU is a brutal place")

Discussion:
Why?

RULE:

To be really good* at something, you have to be really talented (you are), AND you have to work really hard at it.

You have to struggle/agonize over it.
You have to immerse yourself in it.
You have to think about it all the time.

There are very, very few exceptions to this rule.
(And they are really, really lucky people.)

So this is not a talk urging you to work less. (Sorry.)

* Note: good != successful. Success also requires fortunate circumstances and luck.

HYPOTHESIS:

For some of you (but not all): challenging yourself to ace as many classes as possible may not be the most effective way to maximize your efforts at CMU and opportunities afterward.

It may not be the best way to get a competitive job.

It may not be the best way to get the <u>coolest</u> jobs.

It may not be the best way to prepare yourself have the <u>most impact</u> in a future job.

There are other ways to demonstrate and prepare yourself for future excellence.
(these other ways are often <u>more challenging</u> than taking extra classes)

Idea 1: wisely manage yourself in classes in your later years at CMU.

(yes, this is much easier said than done)

Imagine this situation

You are signed up for a normal load of four classes.

One of them is my class, 15-418: Parallel Computer Architecture and Programming. Woot!

You are considering loading up with a fifth class…
say 15-410, or 15-440...

Lots of options!

- **You could do what it takes to get A's in both classes (probably middle-of-the-road work due to lack of time)**

- **What if you gave reasonable effort in my class, resulting in a B (you took my class because you anticipate exposure to the material might be useful in the future, although you don't intend to make a living in parallel programming)? But… this gave you time to do <u>outstanding</u> work on the assignments and final project in another class!**

The "ivory-tower" advice

You should find ways to immerse yourself in the projects and ideas you find most interesting. It is the best way to learn deeply.
(and that will show up in an interview. "Tell me about your project... wait, you implemented what?")

The more practical advice

The really unique opportunities (a.k.a., coolest jobs) in the world tend to come through people that know you, not by submitting resumes.

You better believe colleagues in industry are asking us about the best students all the time. (finding good people is hard, and frustrating, for employers)

The best bosses are looking for people that have done <u>special</u> things.

Idea 2: try undergraduate research

The conventional path I was talking about…

Amazing CMU CS student

Works DOES NOT SLEEP in order to maximize grades in MANY CS classes
or
A DOUBLE MAJOR
or
A TRIPLE MAJOR

(Most waking hours spent on coursework, tired all the time)

Even more impressive resume handed out at CS job fair

Resume gets student first-round interview

Student knows their stuff in interview
(aces linked list reversal question, recalls what a mantissa is)

GOOD JOB
Woot!
("but man, CMU is a brutal place")

An alternative path...

Amazing CMU CS student

Takes fewer classes, but DOESN'T SLEEP because he/she does an amazing project in 15-418. (really interested in parallel programming)

Student: "Hey Kayvon, I liked your class, is there anything I can help with in your research group next semester?"

Kayvon: "Yo! You did the coolest work in 418 in YEARS, you should totally come help with this project in my group."

Student gets awesome experience working side-by-side with CMU Ph.D. students and professors. Learns way more than in class. (BUT STILL PROBABLY DOESN'T SLEEP... SO IT GOES)

Kayvon, to super-awesome friend in industry: "Hey, you've got to hire this kid, they know more about parallel architecture than any undergrad in the country. They've been doing publishable research on it."

WICKED GOOD JOB

Woot!

Kayvon, circa 2002 (junior year at CMU)

My TA in Professor Hodgins' computer animation class (Ph.D. student Kiran Bhat) pulled me aside on the last day of class and told me I should come join the Graphics Lab

Kiran

Why research (or independent study)?

- You will learn way more about a topic than in any class.

- You think your undergrad peers are amazingly smart? Come see our Ph.D. students! (you get to work side-by-side with them and with faculty). Imagine what level you might rise to.

- It's way more fun to be on the cutting edge. Industry might not even know about what you are working on. (imagine how much more valuable you are if you can teach them)

- It widens your mind as to what is possible.

And maybe you might like it and want to go to grad school?

Remember my comment about people…

Without question, the number one way to get into a top grad school is to receive a stellar letter of recommendation from a CMU faculty member. You get that letter from participating in a research team.

DWIC letter: ("did well In class" letter) What you get when you ask for a letter from a faculty member who you didn't do research with, but got an 'A' in their class. This letter is essentially thrown out by a Ph.D. admissions committee.

I'm no exception: got gentle hints from my professors

(Note: this was also true in deciding to be a professor)

Precomputing Interactive Dynamic Deformable Scenes

Doug L. James and Kayvon Fatahalian
Carnegie Mellon University
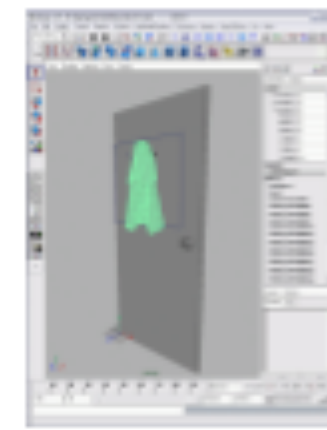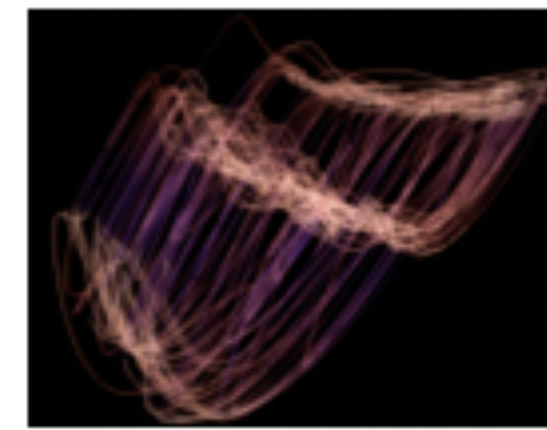
(a) Precomputation (b) Reduced dynamics model (c) Reduced illumination model (d) Real-time simulation
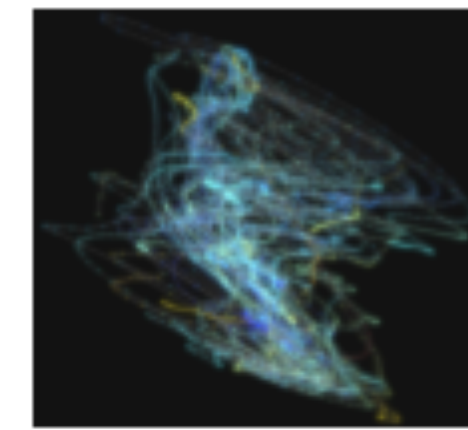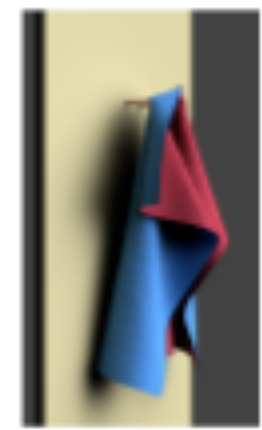
Figure 1: *Overview of our approach:* (a) Given a deformable scene, such as cloth on a user-movable door, we precompute (impulsive)

Subject: Re: ▓▓▓▓ recommendations
From: "Jessica Hodgins" ▓▓▓▓▓▓▓▓▓▓▓▓▓
Date: Fri, November 22, 2002 8:08 am
To: "Doug L. James" ▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓ (more)
Priority: Normal
Options: View Full Header | View Printable Version | Download this as a file

```
I can do it but I REALLY think that you should be applying for
PhD programs, not master's programs.

        Jessica


On Nov 22, 11:08am, Kayvon Fatahalian wrote:
> Subject:  ▓▓▓▓ recommendations
>
> I have applied to the CS masters program at ▓▓▓▓, and am soliciting
> recommendations to accompany my application. could I ask either of
you to
> send a copy of letters you have drafted for me, either for NSF or (in
Doug's
> case for CMU 5th year) over to ▓▓▓ as well.
>
```

Research is just one option…

(Despite what many of us biased faculty tell you, there are many other equally good ones)

Why not start your own project?

Start your own project

Interested in applying technology to a problem that excites you? Give it a shot!

There are plenty of independent study opportunities at CMU.
(and there's funding available)

Like it enough to be your own boss?

Consider starting your own company.
(Project Olympus might give you some money.)

Why go work for Zuckerberg when you can start a company that kicks his ass?
(or he buys for $1B like Instagram)
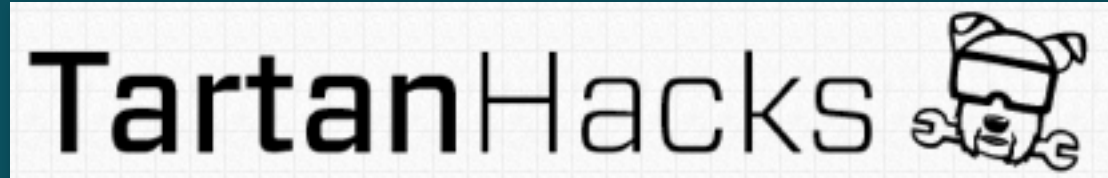
My
Big
Point

There are many ways to be EXCELLENT in CS at CMU

There are many ways to be excellent in CS at CMU

Take more classes

Go beyond what we ask in your favorite classes
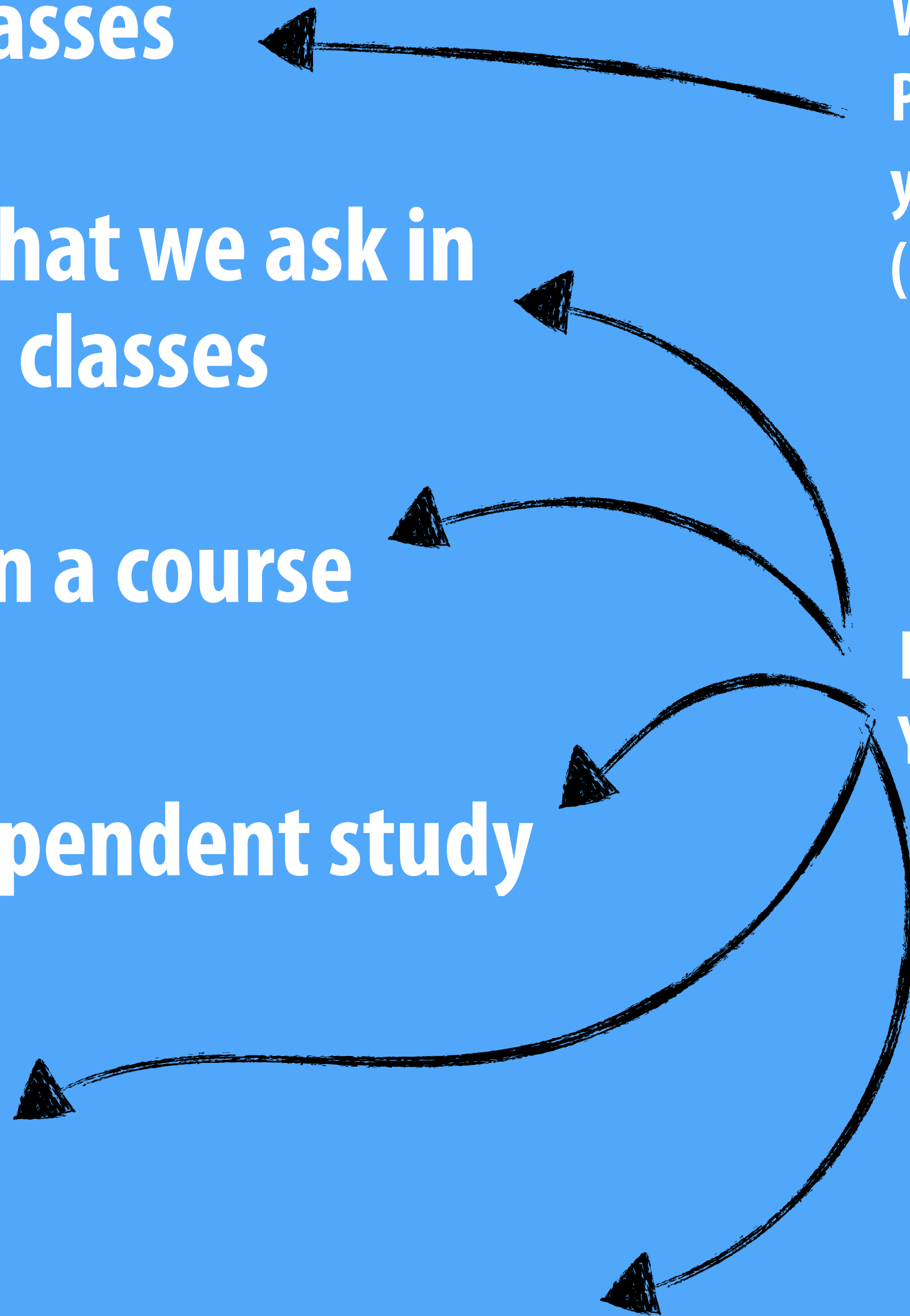
Help redesign a course

Lead an independent study

Do research

Create a startup / non-profit

Well-structured effort:
Professors give you the problems,
you have to solve them
(great problem solvers get A's)

Less-structured effort:
You pick the problems to work on.

But...

Failure.

Taking on harder (and more open ended challenges) means you are more likely to have a hiccup.

The cost of failure?

Go beyond what we ask in class
Create a startup

Do research
Lead an independent study

Yes, there is a higher likelihood of having a setbacks in these activities than in a class.

I encourage you to practice some risk taking while at CMU

Getting over fear of temporary* failure to embrace measured risk is extremely powerful life skill to learn now.

* Let's be honest here: Failure on its own is not a good thing, but if it leads to changes/learning/improvement that ultimately lead to success then it's a positive.

The cost of failure?

You are lucky because you are extremely talented. The cost of "failure" for (many of you) you is <u>actually much less</u> than for others because your backup plan is amazingly good.

Take the shot. If it doesn't work out, you'll try something else and, you'll probably succeed… or just go get that pretty darn good job you would have gotten anyway.

Think bigger, think broader

You are fortunate.

You are smart, talented, and hard-working.

You are in an amazing environment at CMU.
(think about the people and projects going on around you)

How can you maximize that opportunity while you are here?
The mechanisms are in place, if they aren't, we'll help you create them:

Course projects
Research
Independent study
Entrepreneurship

The biggest sign you are in the "real-world" isn't when you are paying your own bills, showing up to work on time, or ensuring your code passes regressions... it is asking your own questions and making your own decisions.

And there's a lot more to decide on at CMU than classes.

Or in other words*…
there are "grades" you can get at CMU
that are much higher than A's.

Discussion

Email from CMU Ph.D. alumnus. I received it 20 minutes before I gave this talk for the first time.

-- Hey Kayvon.

"I bet this talk went well - would love to see a recording or your slides if available. I can tell you that when I interview new grads, I hardly ever look at the quantity of courses taken if from a reputable school like CMU. I look for project courses, and focus on what their role was in those projects."

One ask of you

- **Email me a personal story of your CMU experience**
  - **What intimidated you upon arriving at CMU?**
  - **What creates the culture of taking so many classes?**
  - **What would you most like to change about your CMU experience?**
  - **What was an epiphany you've had about your career?**

- **My goal is to anonymize them and make them available for other students to read**
  - **Because understanding experiences of others is helpful in creating your own ("Oh, I'm not alone!")**