Welcome to 15-744: Graduate Networks

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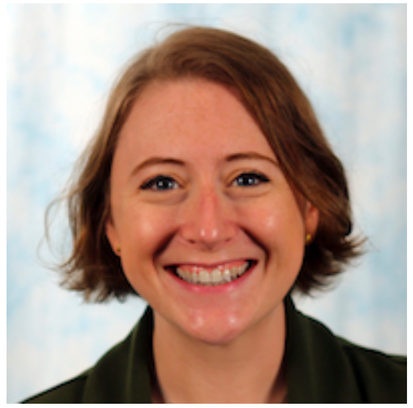
Getting to Know Each Other

Hello!

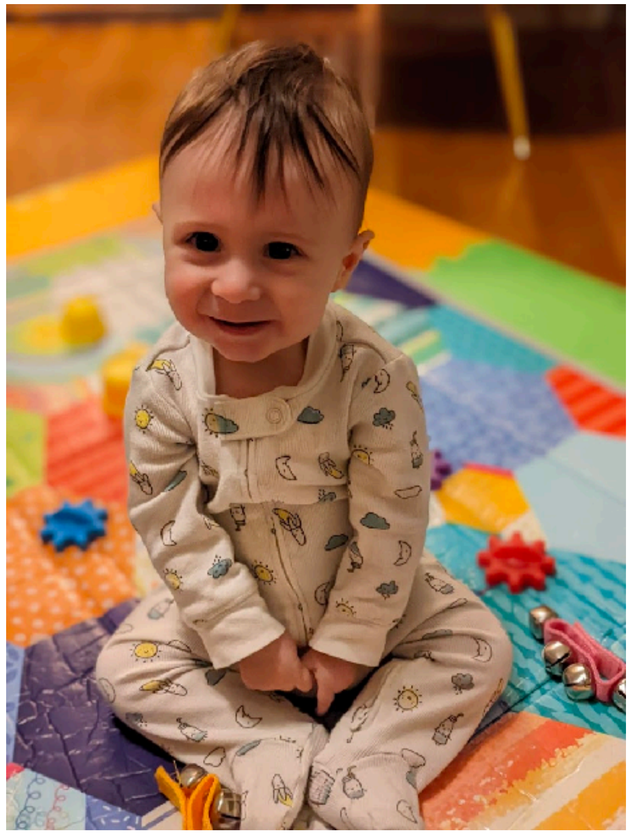


- My name is Justine.
- I’m an assistant professor in CSD.
- I *really* like the Internet.

Things I am known for in the Internet world

- APLOMB, a paper that proposed that we take middleboxes and manage them like cloud services. [SIGCOMM 2012]
- An analysis of Google's BBR congestion control algorithm that showed that it was unfair to competing Internet services [IMC 2019]
- An intrusion detection system built using an FPGA that allows it to process 100Gbps. We think it is the fastest open-source IDS in the world. [OSDI 2020]
- If you're not a networking student, all of that was gibberish.
  - But it won't be by the end of the semester!!!

Outside of the Internet World



- This is Carlos.
- He is the coolest dude of all time.*

* even cooler than his father, Prof. Ruben Martins, who does Formal Methods here at CMU

This is a small class!

- I'd like to get to know all of you, and especially what you're interested in in research.
- We'll try to get to know each other today via zoom, but hopefully we have more opportunities to see each other in person after this darn Omicron wave dies down.
- **Please please please participate in this class.**

Please introduce yourself, your area of interest in CS, and do a show and tell of something cool in the room with you right now.

If you don’t have something cool to share, I’m sorry, you’re going to have to get us hyped about a paperclip on your desk or something.

Thinking about Big Ideas

What we're doing in this class

- Two goals:
  - This is a systems star course. I'd like you to learn some big ideas from computer networks.
  - This is a doctoral research course. I'd like you to learn to think about what makes a research idea good, and, importantly, **how to convince a reader that your research idea is good.**

Topics We Will Read About

- Internet Architecture
- Routing
- Congestion Control
- Datacenters
- Content Distribution
- Programmable Dataplanes
- Software Defined Networks
- Router Hardware
- Video Streaming
- … etc

Breakouts:

1. Tell your group about a research paper you read in any field (preferably CS, but okay if it's, e.g. sociology too!) and the really cool big idea you liked in that paper.
2. Tell your group something the authors told you in the paper that convinced you that the idea was good.

justine pull out the iPad here

Boring Logistics Stuff

Research Papers

- We will read >40 research papers in computer science.
  - All of the papers will have great, game-changing ideas in them.
  - Not all of the papers will do a great job explaining why their idea is good! We will talk a lot about how to write papers that both *have good ideas* but also *convince the reader that the idea is good.*
- You will take turns *presenting these papers to class* and *leading a discussion about the papers.*

Research Papers

- You will also **do some original research** in this class and write your own paper.
- You will submit this paper to *AndrewNets 2022*, a very prestigious conference I invented for this class.
- You are all members of the program committee, and using the skills you learned in this class, you will evaluate the papers and decide if they should be published at *AndrewNets.*

I’m really excited to go through this with you!

- Every week we will meet as a class on Monday and Wednesday to talk about research papers.
- On Fridays, you will have a homework due about what you read that week.
- On Fridays, there is also an *optional* review session going over networking material from 15-441. Not in detail, but just enough to get the gist of what the papers are talking about.

Homework Grading

[Print this out and frame it]

1. Does the response have a thesis?

2. Is the thesis easy to find or is it buried in the text?

3. Does the thesis make sense and adequately answer the question?

4. Is the thesis supported by evidence?

5. Does the text provide a warrant, ie, a connection between the evidence and the thesis statement?

6. Do the statements in the text logically “flow”, e.g., by using signposting, the known-new contract, and transition statements so that the reader does not feel lost?

7. Does the response demonstrate understanding or a connection to the assigned course readings?

Homework Grading Part #2

One common way inexperienced writers fail in getting their papers accepted is in criteria 1-6 of that rubric.

If you do not do those things, it is very hard for a reader to understand what the heck you are talking about.

So, I am going to be a jerk about that criteria in *everything* you write so that you learn those skills.

There are some handouts linked on the course homepage to help you learn those skills.

Boring Logistics

Assessments

The final course grade will be calculated using the following categories:

Assessment	**Percentage of Final Grade**
Paper Q&A (Homeworks)	15%
Presentation in Class	10%
Peer Presentation Feedback *(Due 48 hours after presentation)*	5%
Midterm	15%
Course Project Paper	35%
Mock PC Reviews & Participation	10%

Boring Logistics

Grade	Percentage Interval
A	90-100%
B	80-89.9%
C	70-79.9%
D	65-69.9%
R (F)	< 65%

I reserve the right to adjust these intervals to be more generous, but promise I will not adjust them to be less so.

Exception: If you submit your class project to SIGCOMM, NSDI, IMC, ANRW, SOSR, or CoNeXT before the end of 2022 and it is accepted, you **automatically get an A** in the class (I will retroactively change your grade if you did not get an A).

Boring Logistics

Grading Policies

- **Late-work policy**: I do not accept late work or make-up work, unless you are experiencing an emergency or crisis. In this case I will be happy to work with your advisor, student services, or disability services to develop an ad-hoc make-up plan.
- **Incomplete policy**: My incomplete policy is the same as my policy for late work: incompletes will only be permitted as part of a make-up plan in collaboration with your advisor, student services, or disability services in case of crisis or emergency.
- **Attendance policy**: Attendance is not part of your grade.

Boring Logistics

- **See syllabus:**
  - Academic Integrity Policy
    - Much more collaborative than an undergrad course
  - Accommodations
  - Wellness
  - Children in Class
  - Emergencies

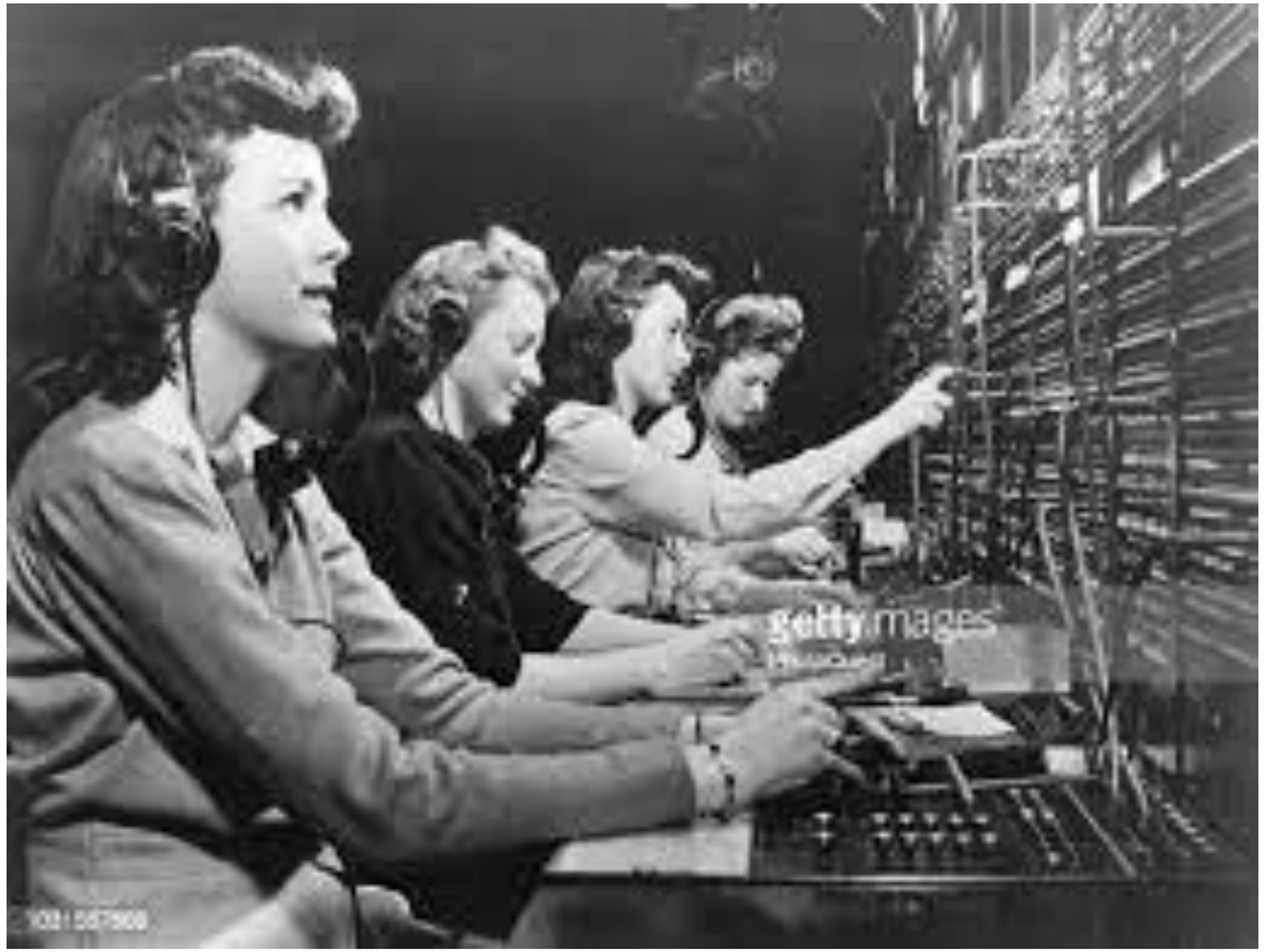
Everything will be recorded.

- And online at www.myheartisinthenetwork.com
- Please log in using your CMU credentials if you are having trouble accessing anything.

Any questions about logistics?

Monday Preview

This is what an early switch looked like



This is what an early switch looked like

Breakouts:

1. The film talks about determining if a line is “busy”. But right now, I am on a zoom call with you all while my husband takes a meeting as well. What is different between today’s network and the telephone network to enable this?
2. Long distance calls were arranged through a series of switchboards like the one we saw here. Hypothesize how a message might get from Pittsburgh to Madrid — how many switchboards do you think it would take, and through what cities? How do you think the operators knew the next city to direct the connection to?
3. Back in the day, we talked about long distance calls being more expensive than local calls. But just this week, I have spoken with people in China and Europe and it didn’t cost any more than talking to you all here in Pittsburgh. What changed?
4. What other differences do you notice between the switchboard world and the networks of today?

Preview for Monday

I will lead a discussion about two classic papers.

P. Baran, “On Distributed Communications Networks,” in *IEEE Transactions on Communications Systems*, vol. 12, no. 1, pp. 1-9, March 1964.

Cerf, V. and Kahn, R. “A Protocol for Packet Network Intercommuni- cation” *IEEE Transactions on Communication*, Vol Comm-22. No. 5. May 1974.

Please read these papers **before** class.

After that, discussions will be led by YOU! Stay tuned for assignments.

Where to find what is up:

www.myheartisinthenetwork.com