

# How to thrive in grad school

## Session 1: Basics

Y. Samuel Wang

Fall 2021

# Introductions

Welcome to Cornell Statistics and Data Science!

- What does a “perfect day” look like for you?
- Favorite place on campus or in Ithaca

# Course goals

In this “class” I hope to ...

- Highlight what is important and worth investing your time to learn/develop
- Make space for questions
- Provide reference material

We will not ...

- Talk about actual statistical research topics
- Give step-by-step recipes for how to succeed

# Roadmap and expectations

We will cover

- Session 1: Basics
- Session 2: LaTeX
- Session 3: Computing
- Session 4: How to learn from previous research
- Session 5: Starting your own research
- Session 6: Communicating your research to others
- Session 7: Possible career paths

# Purpose of grad school

What do you hope to get out of graduate school?

# Purpose of grad school

What do you hope to get out of graduate school?

- Learn technical skills
  - Math + statistical theory
  - Computation
  - Data analysis
- Learn how to do research
  - Ask interesting questions
  - Persevere through uncertainty
  - Develop novel solutions
- Learn how to teach
  - Clearly present complex topics
  - Transfer knowledge to others

# Grad school roadmap

Courses generally are the main focus first and second year

- **Fall 1:**
  - STSCI 7170 Linear Models
  - MATH 6710 Probability
- **Spring 1:**
  - MATH 6720 Probability II or STSCI 6750 Probability II for Statisticians
  - STSCI 6730 Theory of Statistics
- **Spring 1 or 2**
  - STSCI 7180 Generalized Linear Models
  - STSCI 6520 Statistical Computing
- **Fall 2:** MATH 6740 Asymptotic Statistics
- **Fall 2 or 3:** BTRY 7950 Statistical Consulting
- **Spring 2 or 3:** BTRY 7951 Advanced Statistical Consulting
- 4-5 additional electives

# Other milestones

- Potential written exam after first year (depending on grades)
- A Exam
  - After coursework and before 7th semester
  - Able to start writing a dissertation
- B Exam
  - At least 2 semesters after A exam
  - Dissertation defense
- Expect to graduate within 5 years



# Research in the mathematical sciences

From [Singular Mind of Terry Tao \(NYT\)](#):

*The true work of the mathematician is not experienced until the later parts of graduate school, when the student is challenged to create knowledge in the form of a novel proof. It is common to fill page after page with an attempt, the seasons turning, only to arrive precisely where you began, empty-handed — or to realize that a subtle flaw of logic doomed the whole enterprise from its outset. The steady state of mathematical research is to be completely stuck. It is a process that Charles Fefferman of Princeton, himself a onetime math prodigy turned Fields medalist, likens to “playing chess with the devil.” The rules of the devil’s game are special, though: The devil is vastly superior at chess, but, Fefferman explained, you may take back as many moves as you like, and the devil may not. You play a first game, and, of course, “he crushes you.” So you take back moves and try something different, and he crushes you again, “in much the same way.” If you are sufficiently wily, you will eventually discover a move that forces the devil to shift strategy; you still lose, but — aha! — you have your first clue.*

# Research timeline

- Research is the process of “creating new knowledge”
  - Theory, methods, applications
  - Define a problem of interest
  - Propose solutions
- Classes are not the end, but a means to doing research
  - Grades don't matter
  - Learn relevant material
  - Explore new topics, get to know professors
- Start “as early as possible”
  - Ask professors about reading
  - Explore different topics
  - Attend seminars
- Research will change throughout your career
  - Start with smaller, well defined projects
  - Topics and interests develop/change

# Dissertation

- Collection of work “as proof of expertise”
- Typically three different projects (+ intro and conclusion)
- Sometimes three projects in same area or three completely disjoint topics
- Anywhere from 60-200 pgs
- Generally not the “final version” and will be also submitted to journals
- Browse [recent dissertations](#)
  - [Xin Bing \(2021\)](#)
  - [Amy Willis \(2017\)](#)
  - [Ben Risk \(2015\)](#)
  - [Irina Gaynanova \(2015\)](#)

# Expectations and norms

- Show up to things
  - Stats department is a community
  - Seminars and exams
  - Being around the office
- Be proactive
  - Grad school is school, but also a job
  - Others will depend on your work
  - Reach out and communicate with others
- Difficulty does not necessarily mean something is going wrong
  - Transition from undergrad to grad school takes time
  - Everyone is here because they are capable
  - Success is not a “scarce resource”
  - Ask for help!

# Thriving in grad school

Getting a PhD is difficult, but it doesn't need to be miserable

- Potential topics: time management, mental health, networking

# Thriving in grad school

Getting a PhD is difficult, but it doesn't need to be miserable

- Potential topics: time management, mental health, networking
- Your accomplishments are NOT what make you a worthy human being.
  - [Francis Su Joint Math Meetings \(2013\)](#)
  - Try hard things when success is uncertain
  - Accept honest feedback on our work
  - Celebrate the success of others

# Questions

- What topics would you like to cover?
- Are there resources you've found helpful so far that you'd like to share?

# Homework

- Setup an account on overleaf: <https://www.overleaf.com/register>
- Read Francis Su's [Haimo Teaching Award Lecture](#) from the 2013 Joint Math Meetings
- Browse [recent dissertations](#)
  - [Xin Bing \(2021\)](#)
  - [Amy Willis \(2017\)](#)
  - [Ben Risk \(2015\)](#)
  - [Irina Gaynanova \(2015\)](#)