Quantum Computing

CS 333

About Me

- Shelby Kimmel (call me Professor Kimmel, Professor)
- **My research:** quantum algorithms and complexity
- **Academic Background:** Williams undergrad, MIT grad school, University of Maryland postdoc
- **Non-academic Background:** internships at Raytheon, Fulbright (English Teaching Assistant) South Korea

Find a partner or two, and brainstorm as many responses as you can to the following question:

- What do you know about quantum computing?

This Class:

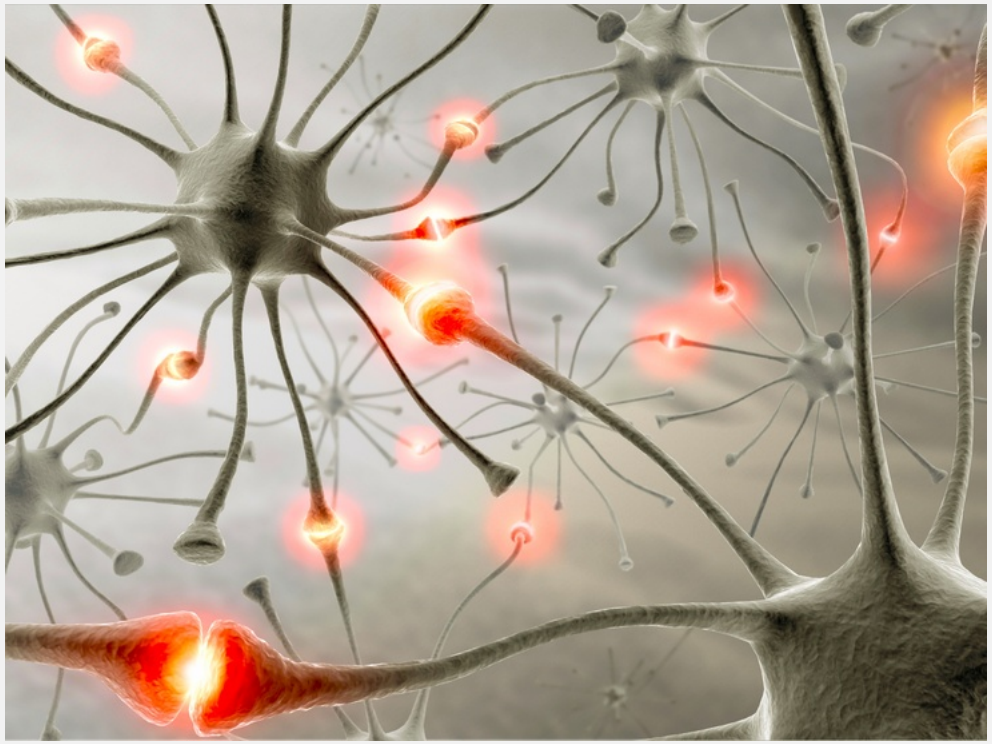
We will learn how quantum mechanics can give advantages in computer science applications from communication, cryptography, and algorithms.

Learning Goals

- Apply linear algebra and other mathematical tools to describe, analyze, and solve problems related to quantum information and computation protocols.
- Build intuition about quantum mechanics and its properties that lead to advantages over standard computation.
- Appreciate the limits of quantum computation.

Learning from biological perspective

- Learning is the process of developing new connections between neurons in your brain.



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- Trying to do a task for the first time can sometimes feel unpleasant…but this is when the most learning happens

Take-aways

- Embrace that feeling of difficulty when you are learning something new.
  - Don’t give up
  - This is NOT a sign of inability/failure.

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- Give you brain time to form new connections
  - Don't cramming for tests
  - Don't do the problem set the night before it is due.

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  - Don’t read over your notes
  - Practice as many problems as possible

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- You might not be able to change your mindset immediately, but keep practicing this new approach, and it will become easier, and make you a better learner.

Active Learning

- In class, I will often ask you to solve problems and answer questions. (This helps you to build new connections in your brain.)
- Because you are learning, I don't expect you to answer correctly. Won't be graded on response (other than for participation)
- Opportunity for you to get feedback on whether you understand.
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Syllabus – with a partner:

- Each person reads one page, then explains key points to partner.
- What are 3 questions you have about the syllabus?

Syllabus – with a partner:

Questions similar to quiz questions:

- What is the purpose of the problem set reflection?
- How should you use the Discussion section of Canvas?
- If you have difficulty with a problem set problem, which of the following options are acceptable?
  - go to office hours
  - e-mail me
  - discuss with a classmate
  - look online for solutions
  - do the best you can, write on your problem set what you tried, look at my solution when doing the self-grade, write about why you had difficulty in your reflection, and then try to solve the problem or similar problems from scratch

Website tour!

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Announcements

- Fill out questionnaire
- PreQuiz due Wednesday at midnight
- Quiz Monday on syllabus
- First problem set due next Wednesday
- Not registered – come talk to me.