CS1210
Computer Science I: Fundamentals

Fall 2021

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TAs
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Lecture 1, Aug. 23, 2021

ANNOUNCEMENTS

- No formal discussion sections tomorrow but your TA will be available both in the scheduled room (301 MLH or W240 AJB) and on Zoom (via the TA's Office Hours Zoom link on the lecture ICON) during the scheduled section times to help with Python installation/execution questions
- First homework will be assigned tomorrow, due Friday, Sep 3, 2pm.
- Office Hour Zoom links for both me and TAs are on the lecture ICON page. Times are posted on the main course information page (outside of ICON)
- Lecture slides will always be posted within a few hours after class.
- Lecture videos will typically be recorded and posted on ICON but sometimes there are recording glitches … so there is no guarantee of lecture video availability.

IMPORTANT THINGS TO DO THIS WEEK

- Read the textbook, Ch 1 and Ch2
- Install Python on your computer, and practice basic expressions
- Make sure you can access Piazza (discussion forum) through the lecture ICON
- Email questions to me (or post questions on ICON). If you email aTA, **always** include (cc) me as well. Do not hesitate to send me email!

THINGS TO BE COVERED TODAY

- Background – welcome to CS1210, and recent developments in computer science
- Goals of this course
- About me
- The syllabus, including details about the work required and grading criteria

Welcome to CS1210!

- This is an exciting time to be a computer scientist! Computing and *computational thinking* is becoming part of all aspects of life:
  - Healthcare, Biology, Pharmacy, Biomedical Engineering
  - Economics, Finance
  - Sociology, Psychology
  - Physics, Astronomy
  - Music, Film
  - Humanities (e.g. Digital Humanities Initiative at UI)

Core Computer Science areas are full of exciting developments and activity

- Machine learning, deep learning, AI
  - Image recognition (e.g. Yelp uses machine learning to classify user-submitted restaurant pictures), facial recognition (lots of articles about various governments using/proposing using facial recognition systems… privacy concerns, etc.)
  - Voice recognition (Alexa, Siri, …)
  - companies want expertise in machine learning to enable "mining" of customer and other data
- Data science (new UI major) and visualization
- Computer graphics, animation, virtual reality (e.g. Oculus Rift, Microsoft Hololens, Google Glass, Magic Leap, …)
- Human-computer interaction (HCI)
- Networks and distributed computing
- Natural language processing
- Computer vision
- Robotics
- Algorithms

Search Engines

- Exemplify amazing computer science contributions
- Advances in algorithms, networking, distributed computing, machine learning all combine to support
  - *millions of simultaneous searches of*
  - *billions of web pages, with*
  - *responses in milliseconds*

  - *"The Friendship that Made Google Huge. Coding together at the same computer, Jeff Dean and Sanjay Ghemawat changed the course of the company—and the Internet."*

Just a few other recent developments

- IBM's Watson defeated the best human Jeopardy players in 2010 – substantial progress in natural language understanding
- In 1997, IBM's Deep Blue became first computer to beat reigning world chess champion.
- In 2016, AlphaGo surprised many experts by becoming first computer program to defeat a top professional Go player (Lee Sedol, ranked #2 in international titles). Movie
- But then, in 2017 AlphaGO Zero and AlphaZero easily defeated AlphaGO as well as the chess and shogi programs.
- Dec, 2018: AlphaZero paper in top journal Science. "One program to rule them all"
- 2019: AlphaStar, grandmaster level for StarCraft II real-time strategy video game
- Microsoft Kinect sensor – add-on for Xbox gaming console. Very impressive technology for $149. Distance and color sensors plus algorithms enabling detailed tracking of 20+ joints of 6 humans at once
- Autonomous vehicles: major advances in AI (deep learning), sensing (don't hit people, animals, stuff!), etc. E.g. Tesla AI & Autopilot
- Blockchain and cryptocurrency: Bitcoin, Dogecoin, Ethereum, and many more. Blockchain – essentially a secure distributed ledger – is expected to be used for many things beyond just currency
- Machine learning/deep learning is everywhere: facial recognition systems, Siri/Alexa/OK Google, traffic prediction, social media personalization, product recommendations, credit card fraud detection, medical diagnoses, machine translation, automatic new article creation, …

This Course

- This course has one primary goal - to provide a core of computer science programming concepts and skills, and enough practice using them, that students will develop confidence in their ability to think computationally and to solve problems via programming.
- Beyond basic programming concepts, the course provides an introduction to object-oriented programming, algorithmic design and analysis, web programming, and graphical user interfaces.
- CS is much more than programming but this is a skills oriented programming course rather than a broad overview of CS. It teaches programming principles necessary for more advanced work in the Computer Science. CS1020 and CS1110 provide broader introductions to the overall field of Computer Science.

Me

- This is my 30th year at UI. PhD from Cornell University, 1989. Lived many places before that - 13 in 17 years, all over US and also in Europe.
- Teaching: data structures, computer graphics, virtual reality, algorithms. Most recently have regularly taught iOS/iPhone/iPad App Development class (incl joint class with Vietnam), and CS 2100: Introduction to Informatics.
  - Two semesters teaching in Hanoi
- Research: previously, the Hank VR research group. Now, the Computational Epidemiology group. E.g. "Gamifying Accelerometer Use Increases Physical Activity Levels of Sedentary Office Workers", "More than Just a Game? A Randomized Controlled Trial of Pokèmon Go on Physical Activity Habits" , "Using Computer Vision and Depth Sensing to Measure Healthcare Worker-Patient Contacts and Personal Protective Equipment Adherence Within Hospital Rooms "
- Outside of work: when not hanging out at home, I'm somewhere in the world riding an ElliptiGO


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KÍNH GỌNG HÀNG THÙNG
SECOND HAND

ICON/the syllabus/course website

- ICON: used for four things
  - Providing links to Zoom lectures and lecture recordings
  - Submitting homework
  - Posting all scores/grades
  - Posting/reading questions about assignments/lectures (Piazza link in ICON)
- Syllabus and all course announcements, homework assignments, and lectures notes will be posted on external course website: http://homepage.cs.uiowa.edu/~cremer/courses/cs1210/

The rest of today's lecture discusses the information on the course website.

- Many people find this course difficult. I believe that if you work at it steadily, not just last-minute, you can do well without suffering.
- The course can be very rewarding – from (for some of you) no programming skill to real confidence and ability to make computer do cool stuff for you.
- Attend class, do your own work, read, think carefully (super valuable *before* sitting at a keyboard and typing), work hard on the homeworks. If you do the homeworks well, the exams will take care of themselves.

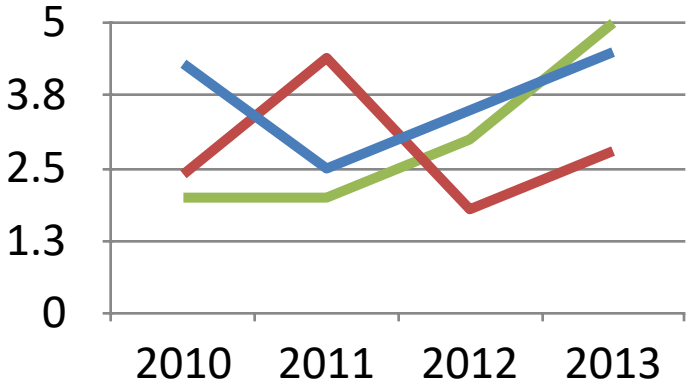
Before next time:

- Read/do: Chapter 1 of the text. It is short and easy.
- Do: Install Python on your machine. Evaluate some Python code in the interpreter. Ask for help during discussion sections tomorrow

Next time: beginning Python, some interesting problems

To think about: *examples of computational complexity*

- Euler vs Hamiltonian circuits and TSP. *Graphs* in computer science: different notion than the graphical plots taught in high school



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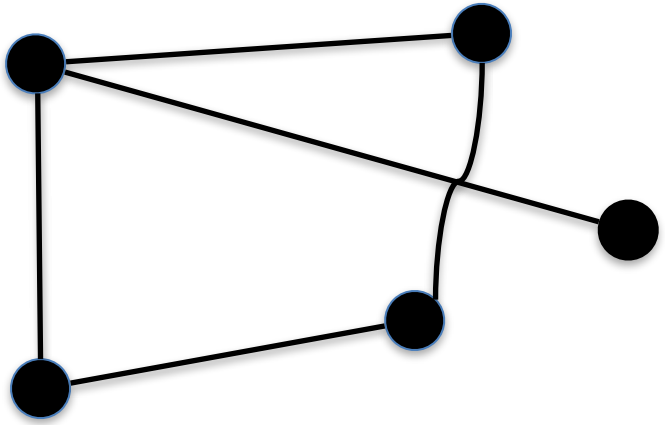

- Can you find a path that traverses every edge (connection) exactly once?
- Can you find a path that visits every node (vertex) exactly once?
- If the edges are assigned "weights" (representing distance/cost to traverse), can you find path of minimum cost that visits every node exactly once?
- If the edges are assigned weights, can you find minimum cost path between two particular nodes?

Are these similarly computationally hard or easy?