Goals today

- Introduce you to
  - the field
  - the course
  - the team
- Answer your questions

Big Ideas:
- Abstraction
- Data Type

Data Science

Nearly every field of discovery is transitioning from "data poor" to "data rich".

Greatest Artifact of Human Civilization ...

A Connected World
Data 8 – Foundations of Data Science

• Computational Thinking + Inferential Thinking in the context of working with real world data
• Introduce you to several computational concepts in a simple data-centered setting
  – Authoring computational documents
  – Tables
  – Within Python3 and “SciPy”

CS88 – Computational Structures in Data Science

• Deeper understanding of the computing concepts introduced in c8
  – Hands-on experience = Foundational Concept
  – How would you create what you use in c8 ?
• Extend your understanding of the structure of computation
  – What is involved in interpreting the code you write ?
  – Deeper CS Concepts: Recursion, Objects, Classes, Higher-order Functions, Declarative programming, ...
  – Managing complexity in creating larger software systems through composition
• Create complete (and fun) applications
• In a data-centric approach

Pathways

c8
c8 cs88
c8 cs88 cs47a cs61b

*** CS major

c8 cs61a

c8 cs61a

How does CS88 relate to CS61A?

Course Structure

• 1 Lecture + 1 Lab/Discussion on Monday (!!!)
• Lecture introduces concepts (quickly)
• Lab provides concrete detail hands-on
• Homework (10) cements your understanding
  – Out Monday, Due Sunday
• Projects (3) put your understanding to work in building complete applications
  – Maps
  – Hangman
  – Open Projects!
• Readings: http://composingprograms.com
  – Same as cs61a

CS88 Team - uGSIs

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- Adjunct Assistant Professor, EECS UC Berkeley
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Projects you might want to check out:

- [http://mmcommons.org](http://mmcommons.org)
  - Work with 100M images, 1M videos in your own Amazon instance.

- [http://www.teachingprivacy.org](http://www.teachingprivacy.org)
  - Creating teaching materials informing about data over sharing.

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Course Culture

- Learning
- Community
- Respect
- Collaboration
- Peer Instruction

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Piazza for {ask, answering} questions

- EPA
  - Rewards good behavior
  - Effort
    - E.g., Office hours, doing every single lab, hw, reading Piazza pages
  - Participation
    - E.g., Raising hand in lec or discussion, asking questions on Piazza
  - Altruism
    - E.g., helping other students in lab, answering questions on Piazza

- You have 2 “Slip Days”
  - You use them to extend due date, 1 slip day for 1 day extension
  - You can use them one at a time or all at once or in any combination
  - They follow you around when you pair up (you are counted individually)
  - E.g., A has 2, B has 6. Project is late by 1 day, A uses 1, B is 1 day late

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Pro-student Grading Policies

- Detail removal
  - “The act or process of leaving out of consideration one or more properties of a complex object so as to attend to others.”

- Generalization
  - “The process of formulating general concepts by abstracting common properties of instances”

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Abstraction

Henri Matissey

"Naked/Blue/IV" /
Experiment

Where are you from?

Possible Answers:
- China
- California
- The Bay Area
- San Mateo
- 1947 Center Street, Berkeley, CA
  - 37.8693° N, 122.2696° W

All correct but different levels of abstraction!

Abstraction gone wrong!

Abstraction in CS: Data Type

• What’s this?

The Power of Abstraction, Everywhere!

• Examples:
  - Functions (e.g., sin x)
  - Hiring contractors
  - Application Programming Interfaces (APIs)
  - Technology (e.g., cars)

• Amazing things are built when these layer
  - And the abstraction layers are getting deeper by the day!

Detail Removal (in Data Science)

- You’ll want to look at only the interesting data, leave out the details, zoom in/out…
- Abstraction is the idea that you focus on the essence, the cleanest way to map the messy real world to one you can build
- Experts are often brought in to know what to remove and what to keep!

The London Underground 1928 Map & the 1933 map by Harry Beck.
Data Types and Operations

- Set of elements
  - with some internal representation
    - E.g. Integers, Floats, Booleans, Strings, ...
- Set of operations on elements of the type
  - e.g. +, *, /, %, //, **
  - ==, <, >, <=, >=
- Properties
  - Commutative, Associative, ..., Closure (???)
- Expressions are valid well-defined sets of operations on elements that produce a value of a type

Questions

- What's the difference between ‘==’ and ‘=’?

Lab and HW this week

- Lab will get you to where you have a program development environment
  - Even on your computer
- HW will give practice and explain subtleties of types, operators, and expressions
  - In a program development environment