```
fun append (xs,ys) =
    if xs=[]
    then ys
    else (hd xs)::append(tl xs,ys)

fun map (f,xs) =
    case xs of
        [] => []
      | x::xs' => (f x)::(map(f,xs'))

val a = map (increment, [4,8,12,16])
val b = map (hd, [[8,6],[7,5],[3,0,9]])
```

Programming Languages

Dan Grossman

2013

Welcome to the Class!

Welcome!

We have 10 weeks to learn *the fundamental concepts* of programming languages

With hard work, patience, and an open mind, this course makes you a much better programmer

- Even in languages we won't use
- Learn the core ideas around which *every* language is built, despite countless surface-level differences and variations
- *Poor* course summary: "Uses ML, Racket, and Ruby"

This bit:

- Course mechanics, structure, etc.
- Nothing much specific to programming languages

Concise to-do list

1. Get familiar with all the materials on the webpage
   - Whether or not this is your first Coursera course

2. Complete beginning-of-course surveys
   - Coursera-wide demographic survey (see email)
   - Course-specific questions (on course website)

3. Get set up using Emacs and SML
   - Installation/configuration/use instructions on web page
     - And videos if you need
   - Essential; non-intellectual
     - No reason to delay!

Course materials

- Video lectures
- Reading notes
  - Same material as lectures, but more precise and complete
  - So: optional but recommended
- Lecture code
  - To avoid having to re-copy from .mp4/.pptx/.pdf
- Homework assignments
  - Graded against test cases *and* peer graded (1-5 scale)
- Two exams
  - Cover topics harder to re-enforce with “just programming” because this is not just a programming course

Homework

- Seven total
- To be done individually
- Doing the homework involves:
  1. Understanding the concepts being addressed
  2. Writing code demonstrating understanding of the concepts
  3. Testing your code to ensure you understand and have correct programs
  4. "Playing around" with variations, incorrect answers, etc.

  Only (2) is graded, but focusing on (2) makes homework harder
- Challenge problems: Low points/difficulty ratio

Note my writing style

- Homeworks tend to be worded very precisely and concisely
  - I am a computer scientist and I write like one (a good thing!)
  - Technical issues deserve precise technical writing
  - Conciseness values your time as a reader
  - You should try to be precise too
- *Skimming or not understanding why a word or phrase was chosen can make the homework harder*
- By all means ask others if a problem is confusing
  - Being confused is normal and understandable
  - And I may have made a mistake
  - Once you're unconfused, you might agree the problem wording didn't cause the confusion

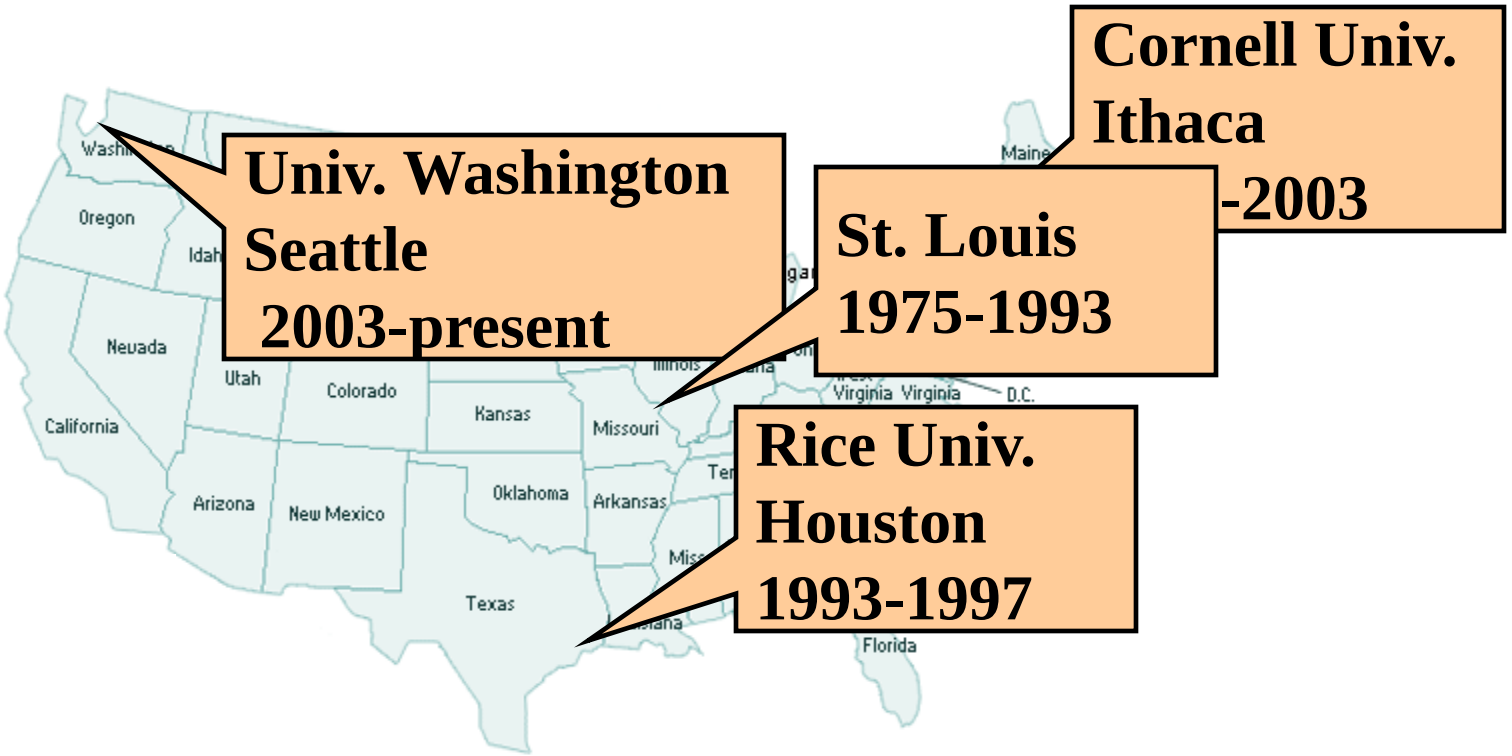
More?

- May occasionally need to look up language details elsewhere
- Some material labeled “optional”
- A small group of TAs behind the scenes
  - And perhaps occasionally with optional FAQ videos
- Great adventure for all of us
  - Hope to support an active, energetic community
  - More fun together even if I cannot meet all of you
  - Would love to set a record for completion rate, even though this is a real and not-easy university-level course

[You can stop watching this video now]

I thought some of you might be curious about who I am since you will be spending so many hours listening to me…

Where I am from



My research: "from Greek to graphs"

Use the *fundamental elegance* of PL…

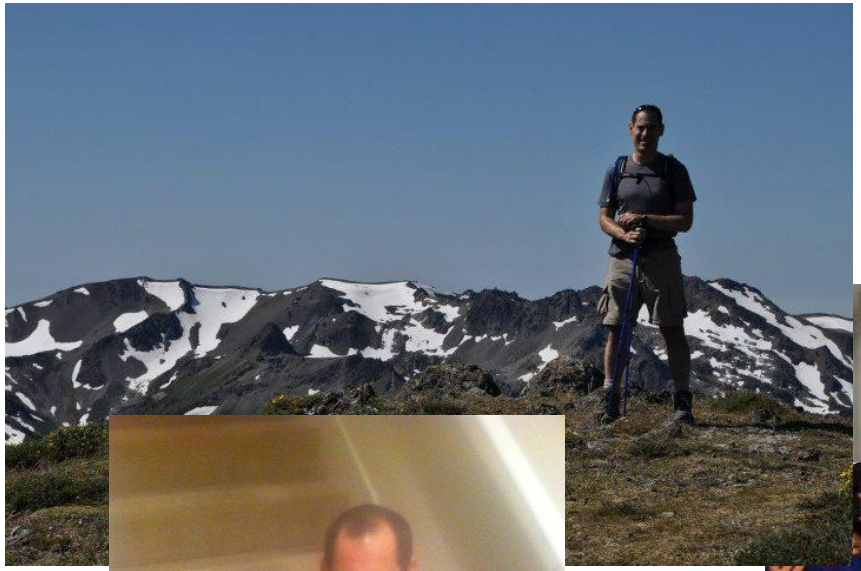
- Functional languages, type systems, logic, proofs, …
- Formal semantics is very, very beautiful – and very useful

… to improve *modern technology trends*

- Multicore [largest focus in last few years]
- Power limitations
- Web-programming [client-side]
- Data explosion
- …

A powerful and fulfilling strategy: Collaborate with others, bringing precision, formalism, and language structure

When not sitting still…



Where I have been

Countries:

Vatican City, Monaco, St. Lucia, Luxembourg, Bahamas, Israel, Switzerland, Estonia, Ireland, Italy, Norway, Germany, Japan, Sweden, Spain, France, Mexico, India, China, United States, Canada, Russia

U.S. States:

All except Alaska, Delaware, Hawaii

[I’m also curious about you, so fill out the surveys!]