



# The Beauty and Joy of Computing

## Lecture #1 Welcome; Abstraction



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Sr Lecturer SOE  
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**BJC: YOU'LL LOVE IT!**

Watch the student testimonials about the course, what it means to them, and how it has changed their lives. Inspiring!



[inst.eecs.berkeley.edu/~cs10/](http://inst.eecs.berkeley.edu/~cs10/)



# BJC in one slide

- **Big Ideas of Programming**
  - Abstraction
  - Algorithms (2)
  - Recursion (2)
  - Functions-as-data,  $\lambda$  (2)
  - *Programming Paradigms*
  - *Concurrency*
  - *Distributed Computing*
- **Beauty and Joy**
  - "CS Unplugged" activities
  - All lab work in pairs
  - Two 3-week projects in pairs
    - Of their own choice!! (data + prog)
  - One writeup
    - Of students' own choice!!
- **Big Ideas of Computing**
  - HowStuffWorks
    - 3D Graphics + Video Games
    - Internet
  - Research Summaries
    - AI
    - HCI
  - The Power of Data (big, small, etc)
  - Apps that Changed the World
  - Social Implications of Computing
  - Saving the World with Computing
  - Cloud Computing
  - Limits of Computing
  - Future of Computing





# Format & Textbooks

- Format (7 hrs/wk \* 14 wks)

Mon	Tue	Wed	Thu	Fri
Lecture	Lab	Lecture	Lab	Discussion
	Lab		Lab	

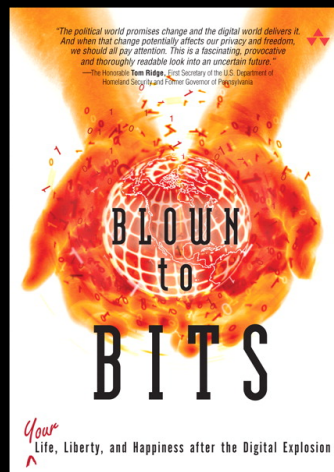
- Selected Reading

- Taken from great book ("Blown to Bits" by Abelson, Ledeen & Lewis) + articles + videos
- Current events EVERY LECTURE (e.g., IBM's Watson vs Jeopardy)

- All resources FREE

- Even clickers!

- Pair Programming!



HAL ABELSON • KEN LEDEEN • HARRY LEWIS





# Week at a glance (cue calendar)

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# Let's check enrollments (in real time)

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- We have NEVER turned anyone away ... if more students sign up, we'll open up more sections!
- We don't intend to turn anyone away now





# Peer Instruction

- Increase real-time learning in lecture, test understanding of concepts vs. details
- As complete a “segment” ask multiple choice question
  - 1-2 minutes to decide yourself
  - 2 minutes in pairs/triples to reach consensus. Teach others!
  - 2 minute discussion of answers, questions, clarifications





# Piazza for {ask, answer}ing questions

**PIAZZA** CS 10 Questions · Statistics **35** Search or ask a question... Add Question/Note Dan Garcia Piazza Help

Popular tags: #instructor-question #admin #logistics #welcome

**QUESTION FEED** FILTERS

**This week**

**When are TA / professor office hours?** Sun  
When can I meet up with a GSI or professor to get help with the course material? #admin  
#instructor-question #admin

**Last week**

**So, I'm here... now how exactly does Pia:** Mon  
(No question details)  
#logistics #welcome

**question.** 3 Views, 1 Follows Actions

**When are TA / professor office hours?**  
When can I meet up with a GSI or professor to get help with the course material? #admin  
Last updated by Luke Segars 2 days ago

**Good Question!**

**instructors' response.** Actions

We haven't established our office hours yet, but we'll make that information available as soon as possible. Check back here for an update by the second week of classes.  
Last updated by Luke Segars 2 days ago

**Good Answer!** **Ask a Followup** »

**Start off a Students' Response**

**followup discussions.**

**Still Confused? Ask New Followup**

**AVERAGE RESPONSE TIME** SPECIAL MENTIONS **USERS ONLINE THIS WEEK**

**N/A** Luke Segars answered **When are TA / ...** in 1.1 hr. 2 days ago **3**  
Online Now: 1

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# Pro-student Grading Policies

- **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 3 “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 0. Project is late by 1 day. A uses 1, B is 1 day late
  - Late is 1/3 off/day





# Abstraction

- **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”



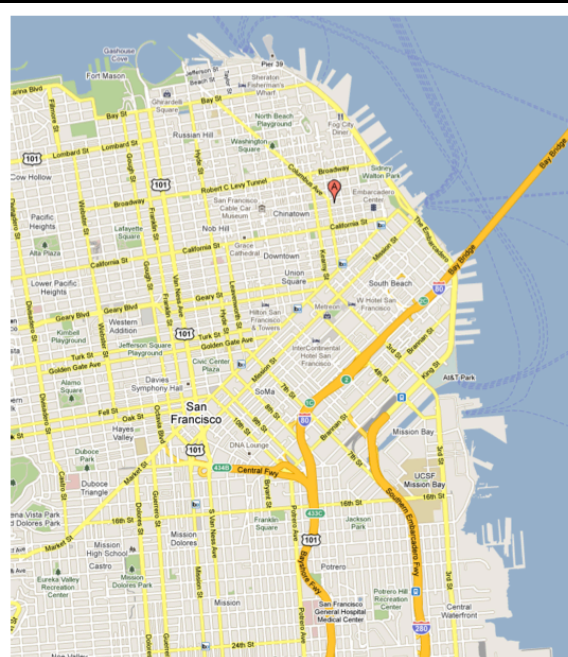
Henri Matisse “Naked Blue IV”

Garcia + Friedland





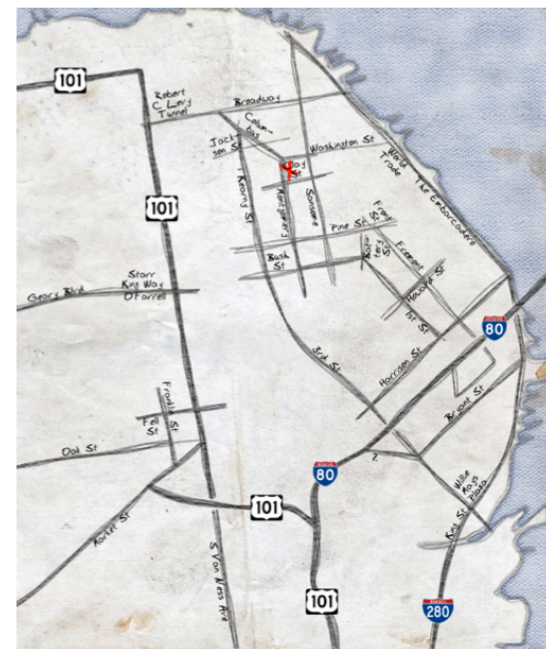
# Detail Removal



General Purpose Online Map



Selected Roads



Our Result

**Automatic Generation of Detail Maps**  
Maneesh Agrawala (UCB EECS), among others





# Detail Removal (in BJC)

- You'll want to write a project to **simulate a real-world situation**, or play a game, or ...
- 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.





# Generalization Example

- You have a farm with many animal kinds.
- Different food for each
- You have directions that say
  - To feed dog, put dog food in dog dish
  - To feed chicken, put chicken food in chicken dish
  - To feed rabbit, put rabbit food in rabbit dish
  - Etc...
- How could you do better?
  - To feed <animal>, put <animal> food in <animal> dish



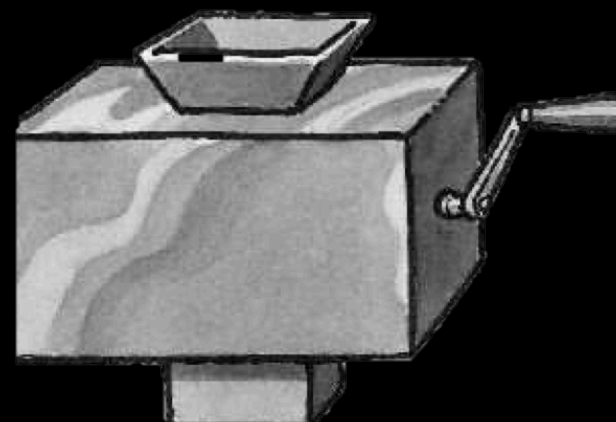


# Generalization (in BJC)

- You are going to learn to write functions, like in math class:

$$y = \sin(x)$$

- You should think about **what inputs make sense to use so you don't have to duplicate code**



"Function machine" from *Simply Scheme* (Harvey)





# 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!

*We only need to worry about the interface, or specification, or contract NOT how (or by whom) it's built*

## Above the abstraction line

**Abstraction Barrier (Interface)**  
(the interface, or specification, or contract)

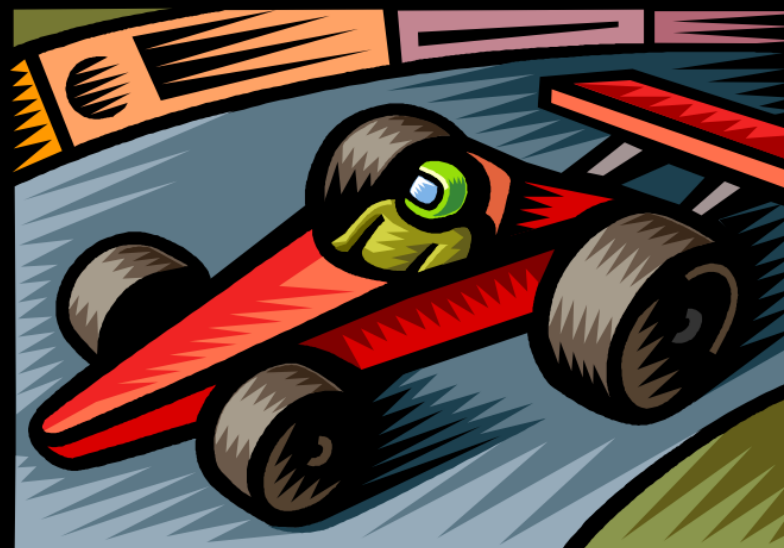
## Below the abstraction line

*This is where / how / when / by whom it is actually built, which is done according to the interface, specification, or contract.*



# Summary

- Abstraction is one of the big ideas of computing and computational thinking
- Think about driving. How many of you know how a car works? How many can drive a car? Abstraction!



Someone who drove in 1930 could still drive a car today because they've kept the same Abstraction!  
*(right pedal faster, left pedal slow)*

