



Welcome to  
CS 152

# Data Structures with Java

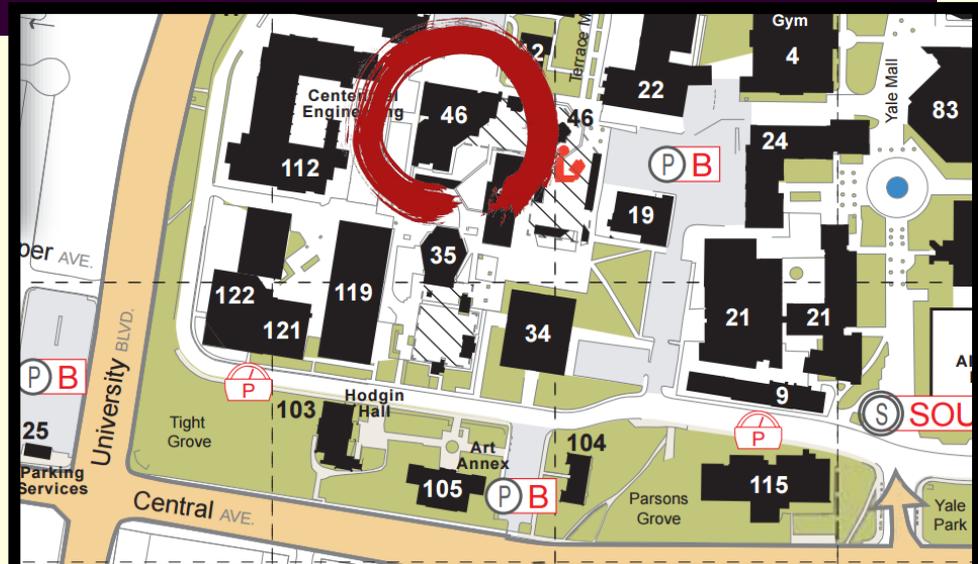


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Web: <http://cs.unm.edu/~joel/>

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Room 233



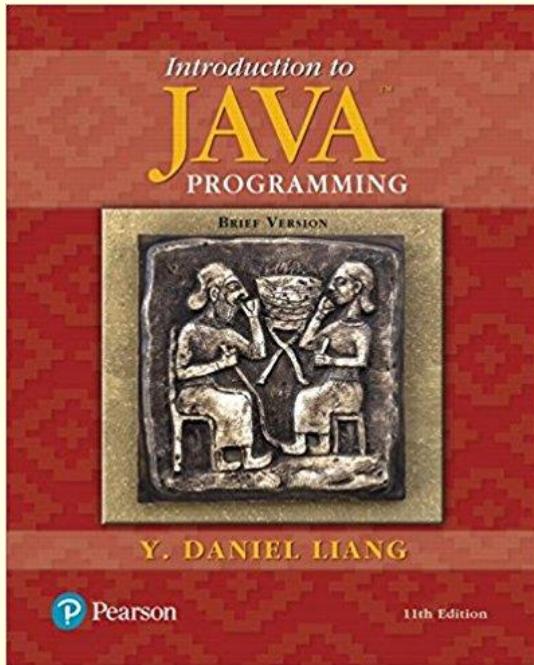
# Computer Science Course Sequence

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- 1 CS-105: Intro programming JavaScript and HTML5,
  - 2 CS-152: Intro programming Java. More rigorous than 105.
  - 3 CS-251: Intermediate programming Java.
  - 4 CS-261: Mathematical Foundations of Computer Science.
  - 4 CS-241: Data Organization using C.
- CS 357: Declarative Programming.
- CS-351: Design of Large Programs.
- CS-361: Algorithms I.

# Textbook & Reading Assignment

*Introduction to Java Programming, Brief Version (11th Edition)*  
By Daniel Liang



Due Friday: Aug 25

Chapter 1:

Chapter 2:

**Lab 1** (due Wednesday Aug 30 at Midnight):  
ComputeChange (modification of textbook Listing 2.10).

★ **Blackboard Learn:** <https://learn.unm.edu/>

The screenshot shows the Blackboard Learn interface. At the top, the browser title is "Blackboard Learn - Mozilla Firefox". The page header includes "The University of New Mexico" and navigation links for "UNM A-Z", "StudentInfo", "FastInfo", "myUNM", and "Directory". The main content area features the UNM logo and the word "Learn". On the left, there is a "Login" section with the text "Please log in using your UNM NetID." and a "USERNAME:" label above an input field. To the right of the login section is a "System Announcements" section with the text "UNM Learn maintenance window: 4:30am - 5:30am daily" and a link "Login for more information.". Further right is a search bar with the text "Include the your quest your answ a Question tab.". A green box on the right side of the screenshot contains a list of features:

- Turn-in Assignments
- Grades
- Discussions

★ **Class Website:** [www.cs.unm.edu/~joel/cs152](http://www.cs.unm.edu/~joel/cs152)

- Syllabus
- Lecture Notes
- Videos
- Source Code

# http://cs.unm.edu/

The screenshot shows the website for the University of New Mexico's Computer Science department. The browser address bar displays 'www.cs.unm.edu'. The navigation bar includes 'The University of New Mexico', 'UNM A-Z', 'StudentInfo', 'FastInfo', 'myUNM', 'Directory', and a search bar. The main header features the UNM logo and 'Computer Science' text, with links for 'Support', 'News', 'Find People', 'Contact Us', and 'Location'. A secondary search bar is labeled 'Search CS'. A red navigation bar contains four main categories: 'ABOUT COMPUTER SCIENCE', 'PROGRAMS & DEGREES', 'RESEARCH', and 'STUDENTS'. A dropdown menu is open under 'ABOUT COMPUTER SCIENCE', listing items like 'Computer Facilities', 'Department Scholarships', 'History of the Department', 'Peer Tutoring Program', 'Research Areas', 'Faculty Directory', and 'Employment Opportunities'. A green box highlights two items: 'Mailing Lists: csundergrad, cssports, Colloquia, ...' and 'How to get CS account & 24x7 Building Access'. A green arrow points from this box to the 'Peer Tutoring Program' in the dropdown. Another green arrow points from the 'Peer Tutoring Program' to the 'Peer Tutoring Program' in the dropdown. A third green arrow points from the 'Peer Tutoring Program' in the dropdown to the 'Peer Tutoring Program' in the dropdown. A fourth green arrow points from the 'Peer Tutoring Program' in the dropdown to the 'Peer Tutoring Program' in the dropdown. A fifth green arrow points from the 'Peer Tutoring Program' in the dropdown to the 'Peer Tutoring Program' in the dropdown. A sixth green arrow points from the 'Peer Tutoring Program' in the dropdown to the 'Peer Tutoring Program' in the dropdown. A seventh green arrow points from the 'Peer Tutoring Program' in the dropdown to the 'Peer Tutoring Program' in the dropdown. A portrait of a woman is visible on the right side of the page. Below the navigation bar are four columns: 'Ph.D. Student Highlights' featuring Ben Edwards, 'Admissions & Financial Aid', 'Faculty & Staff', and 'Useful Links'. The 'Useful Links' column includes 'Computer Facilities', 'Webmail', 'Map & Directions', 'Schedule a Visit', 'Contact an Advisor', and 'News & Colloquium Archive', with a green arrow pointing to the last item.

www.cs.unm.edu

The University of New Mexico UNM A-Z StudentInfo FastInfo myUNM Directory Search UNM...

UNM | Computer Science Support | News | Find People | Contact Us | Location

Search CS Search

**ABOUT COMPUTER SCIENCE** PROGRAMS & DEGREES RESEARCH STUDENTS

- Computer Facilities
- Department Scholarships
- History of the Department
- Peer Tutoring Program**
- Research Areas
- Faculty Directory
- Employment Opportunities

- Mailing Lists: csundergrad, cssports, Colloquia, ...
- How to get CS account & 24x7 Building Access

**Ph.D. Student Highlights**

**Ben Edwards**

How can we make the Internet a safer place? PhD student Benjamin Edwards uses tools from Complex Systems

**Admissions & Financial Aid**

- Undergraduate Admissions
- Graduate Admissions
- International Graduate Admissions
- Financial Aid
- Student Employment Opportunities

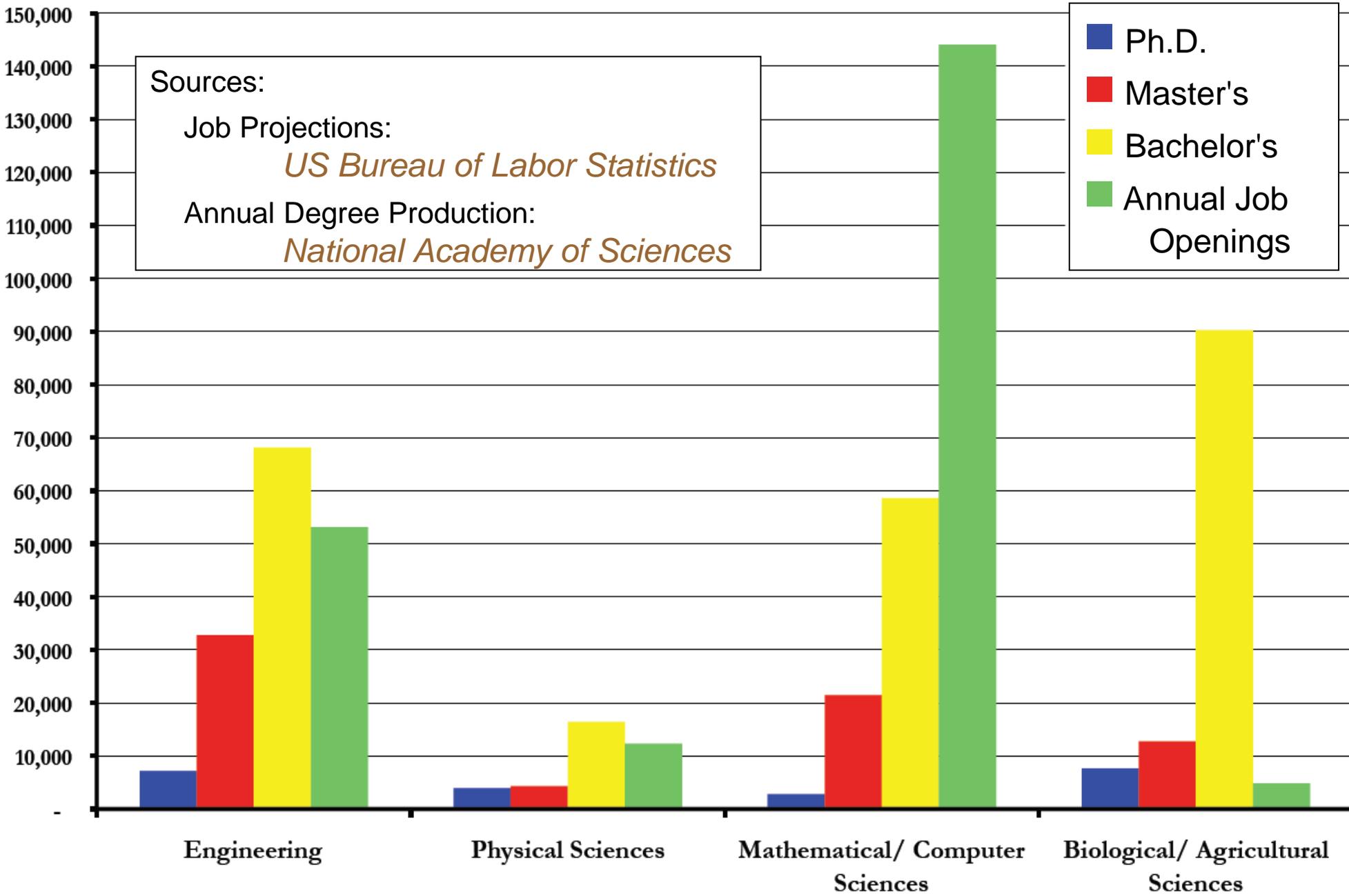
**Faculty & Staff**

- Faculty Directory
- Staff Directory
- Graduate Directory
- By Research Area
- Employment

**Useful Links**

- Computer Facilities
- Webmail
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- Schedule a Visit
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- News & Colloquium Archive

# Annual Degree Production (2006) and Annual Projected Job Openings in S&E Fields (2008-2018)



# U.S. Bureau of Labor Statistics

(<http://data.bls.gov/projections/occupationProj>)



## Computer Programming:

- Median Pay, 2012: \$74,280 / year
- Entry-Level Education: Bachelor's degree
- Number of Jobs, 2012: 1.2 million

*"Despite the economic slowdown of the early 2000s, Computer programmers are likely to remain in high demand in the U.S. for the next decade."*

*[in 2010] "Women hold only 21% of the baccalaureate or higher information technology jobs, yet this field has the largest number of woman who report being "highly satisfied" in their career."*



- We will use i-clicker for quizzes in lecture only.
- We will use i-clicker every lecture.
- For **CS-152**, Register your i-clicker using Blackboard Learn.
- One i-clicker can be registered and shared by more than one person (as long as no two of them are in an i-clicker class at the same time).



## Quiz Question #1:

Do you have your i-clicker?

- a) Yes – I am ready to go.
- b) I bought one from the bookstore, but forgot it.
- c) My dog ate it.
- d) No – I did not get one yet.
- e) What is an i-clicker anyway?

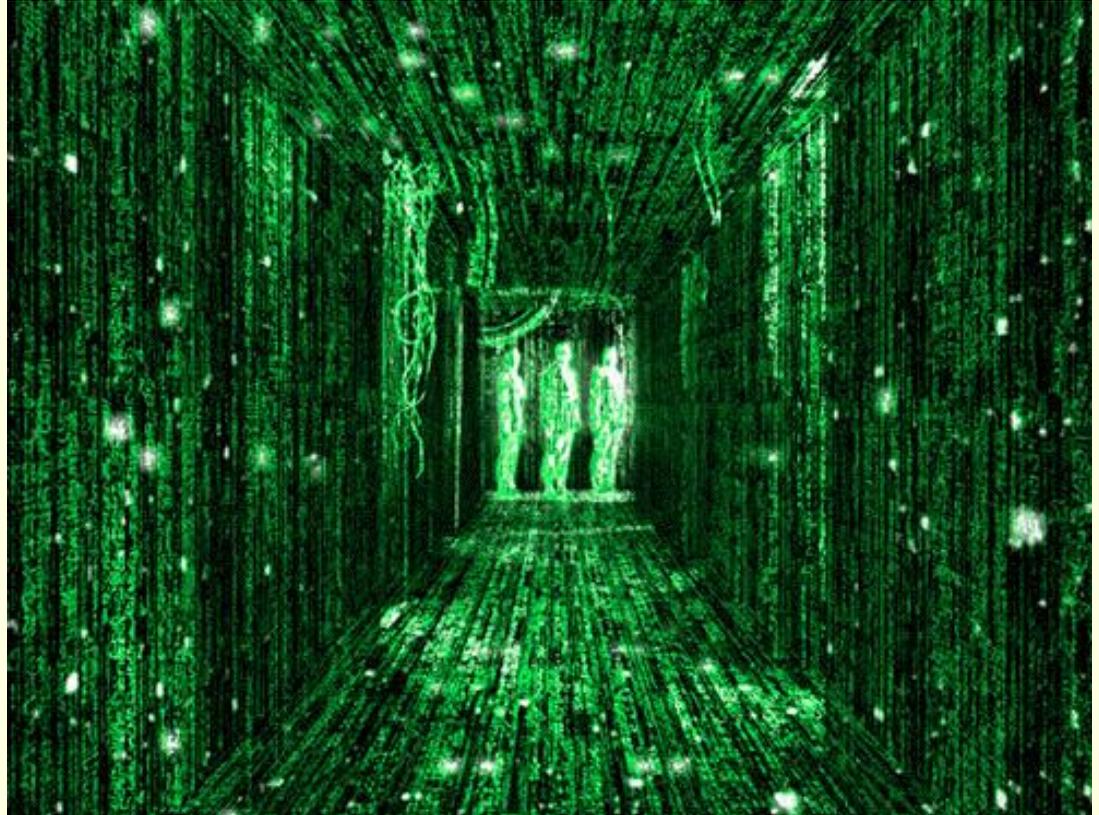
# Forgotten i-clicker?

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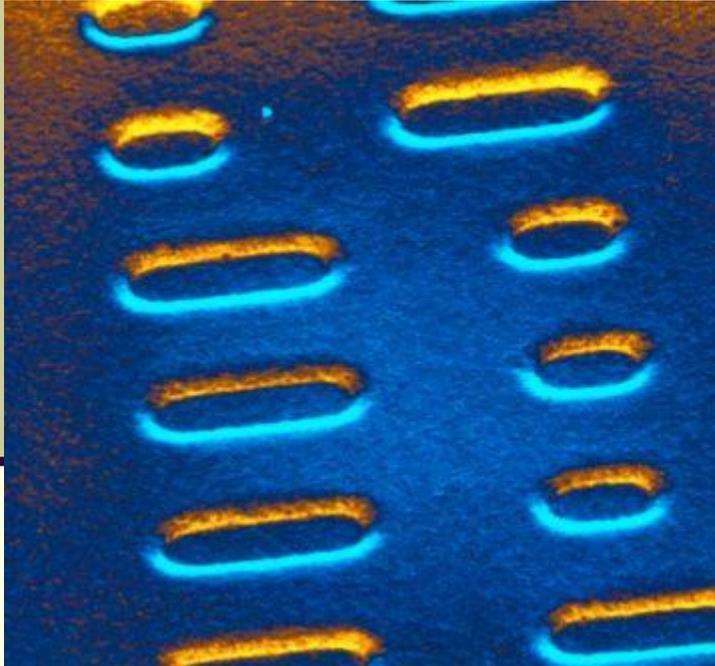
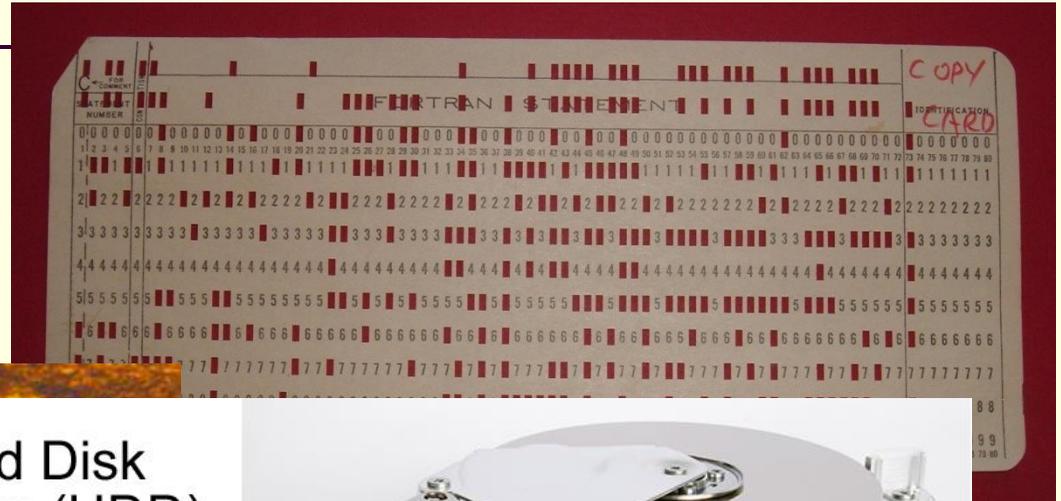
- If you forget your i-clicker, you may borrow one of my loner i-clickers.
- Each loner i-clicker has an animal picture.
- If you borrow an i-clicker, then to get credit, you must ***e-mail me on the same day:***
  - **Subject:** CS-152 borrowed i-clicker
  - **Body:** Name, Date, and Animal.
- Loner i-clickers are not intended to replace buying an i-clicker or a lost i-clicker.

# In the Computer it is All Just Numbers

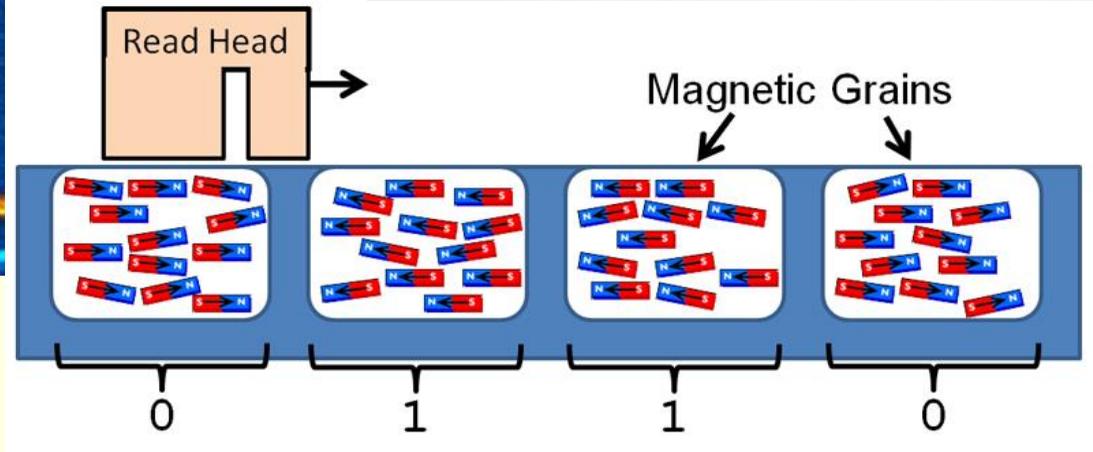
- Bach's Sonata No. 5 in F minor
- Owl City's Fireflies
- The motion picture: Shrek Forever After
- Hamlet, Prince of Denmark.
- World of Warcraft



# A computer file is just a list of 1s & 0s



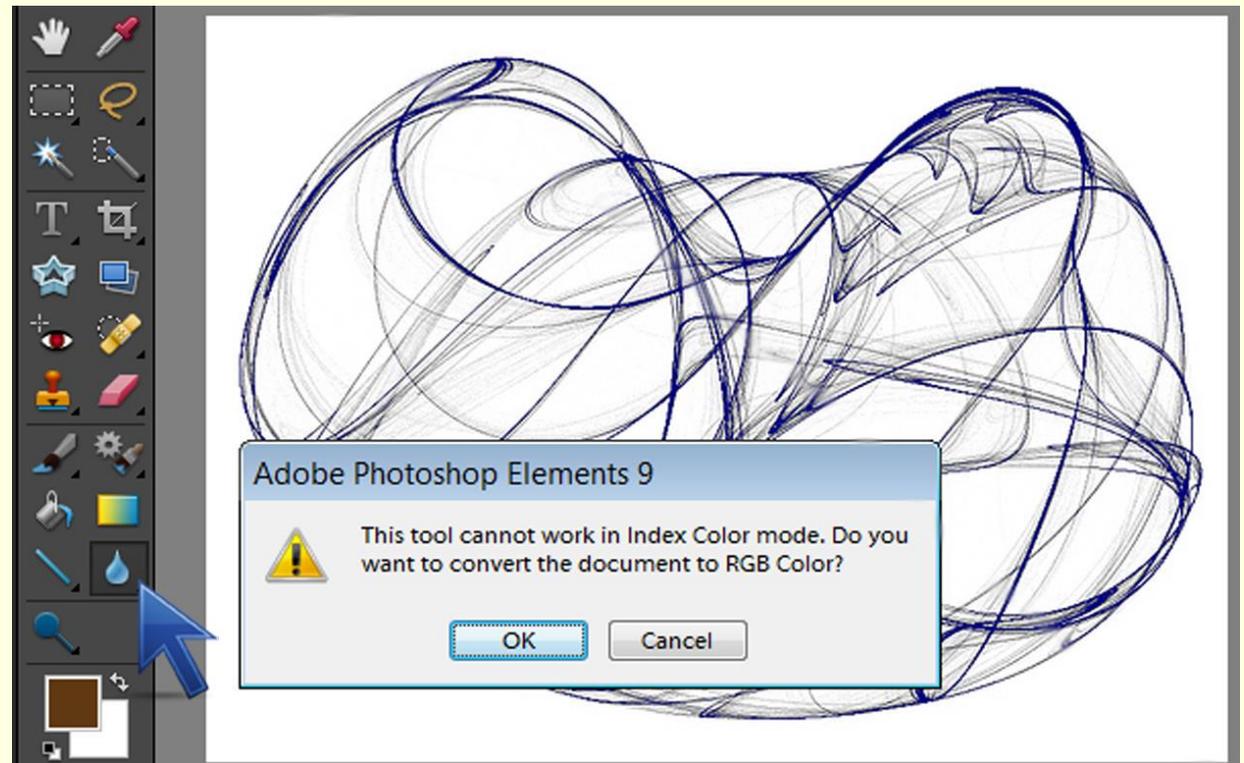
Hard Disk Drive (HDD)



# *Writing* verses *Using* Software

Authoring a computer program is like writing an essay.  
NOT like learning to use software such as Photoshop,  
PowerPoint or League of Legends.

Software, such as  
Photoshop, is  
often learned by  
*"click and explore"*



# Computer Programming Language

A **computer programming language** is a set of symbols and rules designed for humans to more easily represent computer instructions.

A **computer program** is a sequence of instructions – like a recipe.

However, in a computer program, the instructions usually contain many **branches** and **loops**.

recipe card

*the healthy ginger* sweet potato + black bean wrap



Ingredients:

- 2 large sweet potatoes
- 4 parsnips
- 2 large handfuls of kale
- medium onion
- 1.5 cups quinoa (I already had this cooked + in the fridge)
- 1 cup black beans (these were also already made + in the fridge)
- 2 cloves of garlic
- 1 Tbsp coconut oil
- S.S + P to taste
- optional: balsamic glaze
- sprouted grain tortillas

Method:

1. Wwash + chop sweet potatoes, parsnips + onion into bit size pieces, add to wok or pan at medium heat with 1 Tbsp of coconut oil
2. Cook approx 15 minutes or until veggies are soft.
3. Add the quinoa, black beans, kale, garlic, S.S + P and cook for 3-5 more minutes or until everything is warmed.
4. Add mixture to a wrap and top with balsamic glaze (option).

# Syntax Errors Verses Semantic Errors

## Syntax Errors

“I getted the milk and putted them into me coffee.”

```
System.println("Hello");
```

## Semantic Error

- 1) Place two slices of Mozzarella cheese, a slice of tomato and some small fresh basil leaves between two slices of bread.
- 2) Lightly spread outside of sandwich with butter.
- 3) Place skillet on medium heat and cook sandwich in skillet for one hour.

# Save, Save As..., and Multiple Media



Whenever you spend an hour or more working on a program, please, create a backup copy with a version number added to the filename.

Whenever you finish working for a few hours, copy your latest backup to a different media.

# Small Language with Complex Usage

- Programming Languages are much smaller than natural languages.
- However, programming languages are primarily used to express **complex conditional (branching) logic** not found in common uses of natural languages.
- Logic skills (from one programming language or from Philosophy or Mathematics) have strong carryover.



# Window into How Computers Think

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## Easy:

- Using only standard arithmetic operations, it takes a few hours to write a Python program that can solve large systems of differential equations.

## Hard:

- Being given a bunch of photographs of everyday life, the world's most powerful computer running the world's best artificial intelligence software is currently incapable of deciding this is a photo of a woman walking a dog.



# Java Versions



- The newest version of Java is Java 8
- <http://www.oracle.com/technetwork/java/javase/downloads/index.html>
- **JRE**: Java Runtime Environment (*run*, not build, applets and applications)
- **JDK**: Java Development Toolkit (compile java source code and run applets and applications).
  - **Java SE** (Standard Edition): **What we use in CS-259.**
  - **Java EE** (Enterprise Edition): Includes extra classes to handle running of multi-user servers.

# What is Java?

- Java is a programming language originally developed by James Gosling at Sun Microsystems and was released in 1995.
- Originally, Java **was** slow. Now, Java is *fast!*
- Java applications are compiled to bytecode (class file) that can run on any Java Virtual Machine (JVM) regardless of the underlying computer architecture.
- Java is a general-purpose, **Object-Oriented Programming** (OOP) language.
- Java's Moto: "**Write once, run anywhere**".
- Java places a strong emphasis on **early detection of errors**.



# Java Compilation and Run Process

plain text file

Source Code:  
\*.java

Java Compiler  
(JDK)

Machine Independent  
Bytecode \*.class

Java Virtual Machine (JVM)

Just-In-Time  
Class Loader

Just-In-Time  
Compiler

Native  
Machine  
Code

**Note:** the JVM is NOT  
an *interpreter*.

HotSpot Optimization

# Developing Brick skills

