



# Welcome to CS 152 Data Structures with Java



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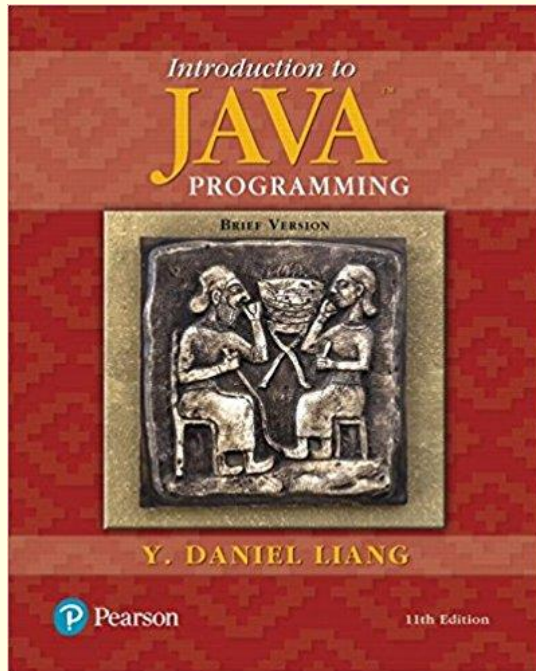
# Computer Science Course Sequence

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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



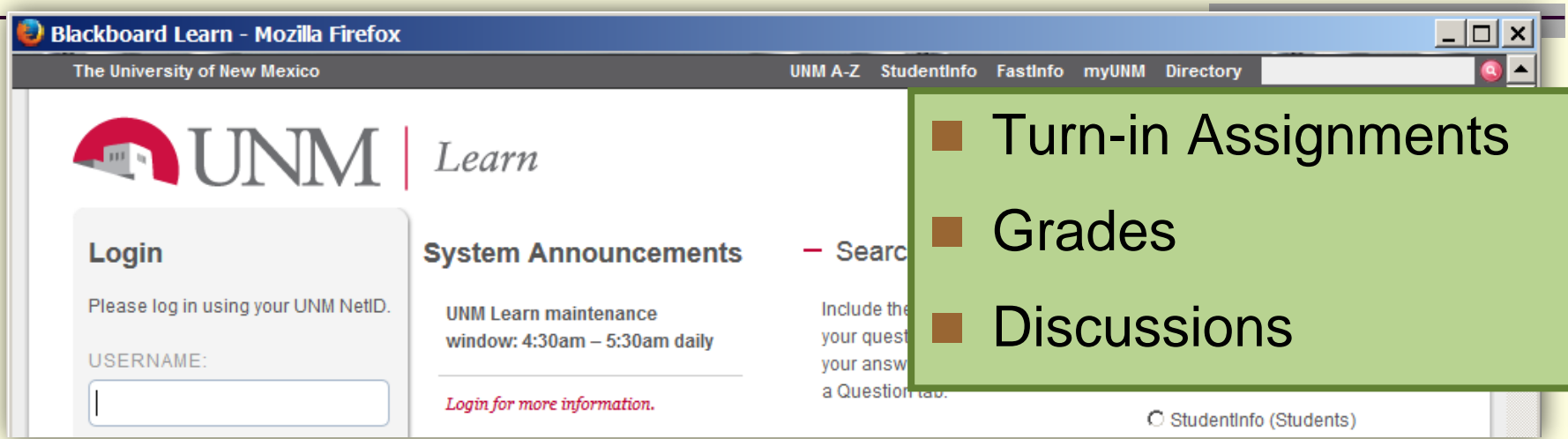
Due Friday: Aug 25

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/>



- 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/

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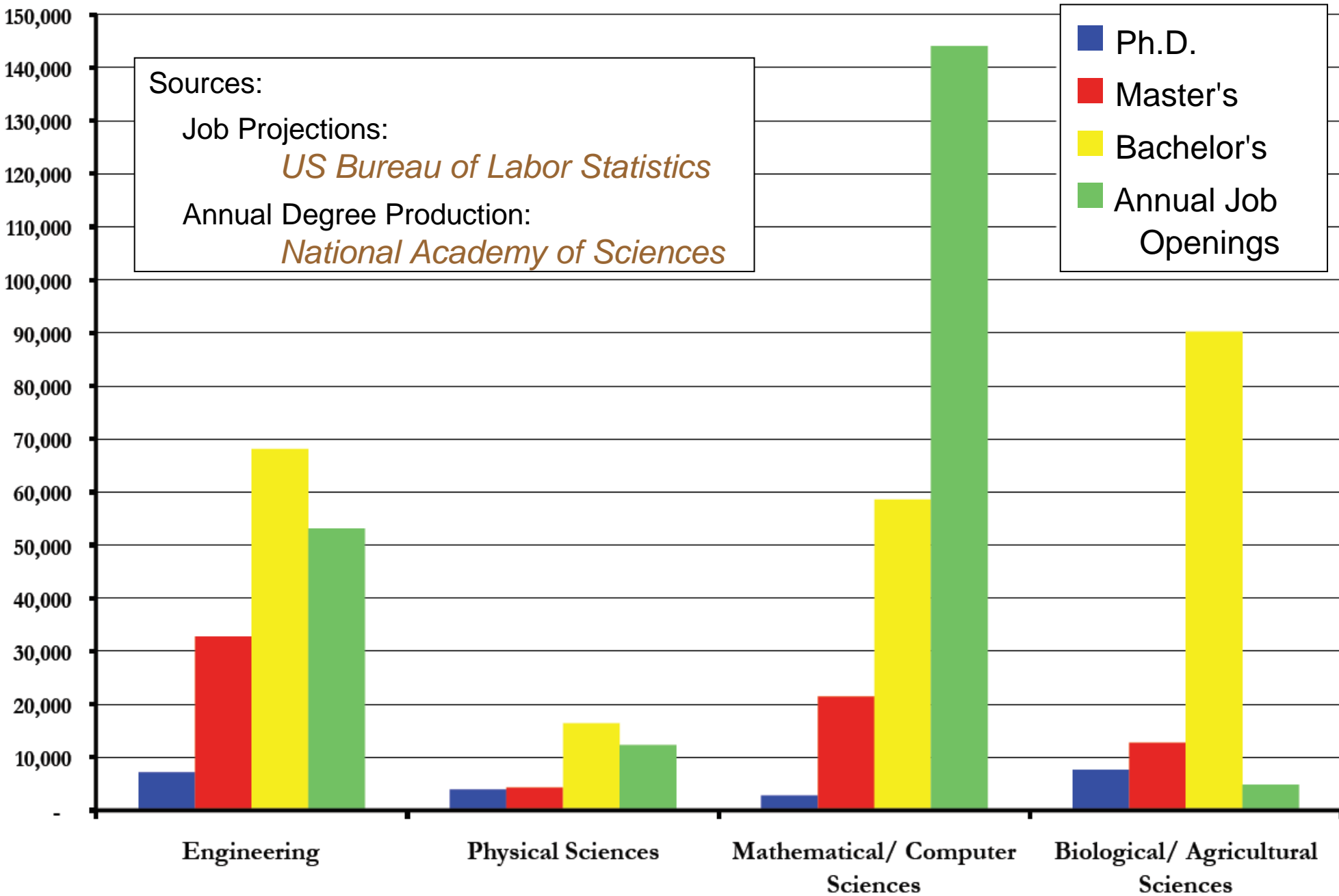
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ABOUT COMPUTER SCIENCE	PROGRAMS & DEGREES	RESEARCH	STUDENTS
<ul style="list-style-type: none"><li>Computer Facilities</li><li>Department Scholarships</li><li>History of the Department</li><li><b>Peer Tutoring Program</b></li><li>Research Areas</li><li>Faculty Directory</li><li>Employment Opportunities</li></ul>	<ul style="list-style-type: none"><li>▪ Mailing Lists: csundergrad, cssports, Colloquia, ...</li><li>▪ How to get CS account &amp; 24x7 Building Access</li></ul>		

Ph.D. Student Highlights	Admissions & Financial Aid	Faculty & Staff	Useful Links
<p><b>Ben Edwards</b> &lt; &gt;</p>  <p>How can we make the Internet a safer place? PhD student Benjamin Edwards uses tools from Complex Systems</p>	<ul style="list-style-type: none"><li>• Undergraduate Admissions</li><li>• Graduate Admissions</li><li>• International Graduate Admissions</li><li>• Financial Aid</li><li>• Student Employment Opportunities</li></ul>	<ul style="list-style-type: none"><li>• Faculty Directory</li><li>• Staff Directory</li><li>• Graduate Directory</li><li>• By Research Area</li><li>• Employment</li></ul>	<ul style="list-style-type: none"><li>• Computer Facilities</li><li>• Webmail</li><li>• Map &amp; Directions</li><li>• Schedule a Visit</li><li>• Contact an Advisor</li><li>• News &amp; Colloquium Archive</li></ul>

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

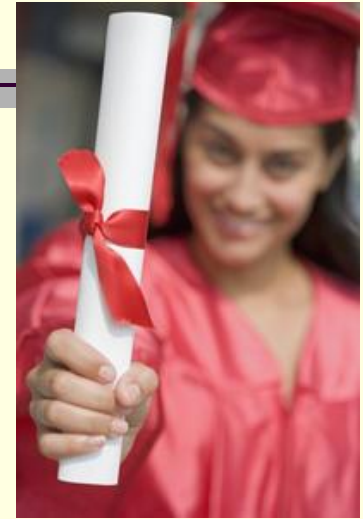


# U.S. Bureau of Labor Statistics

(<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?

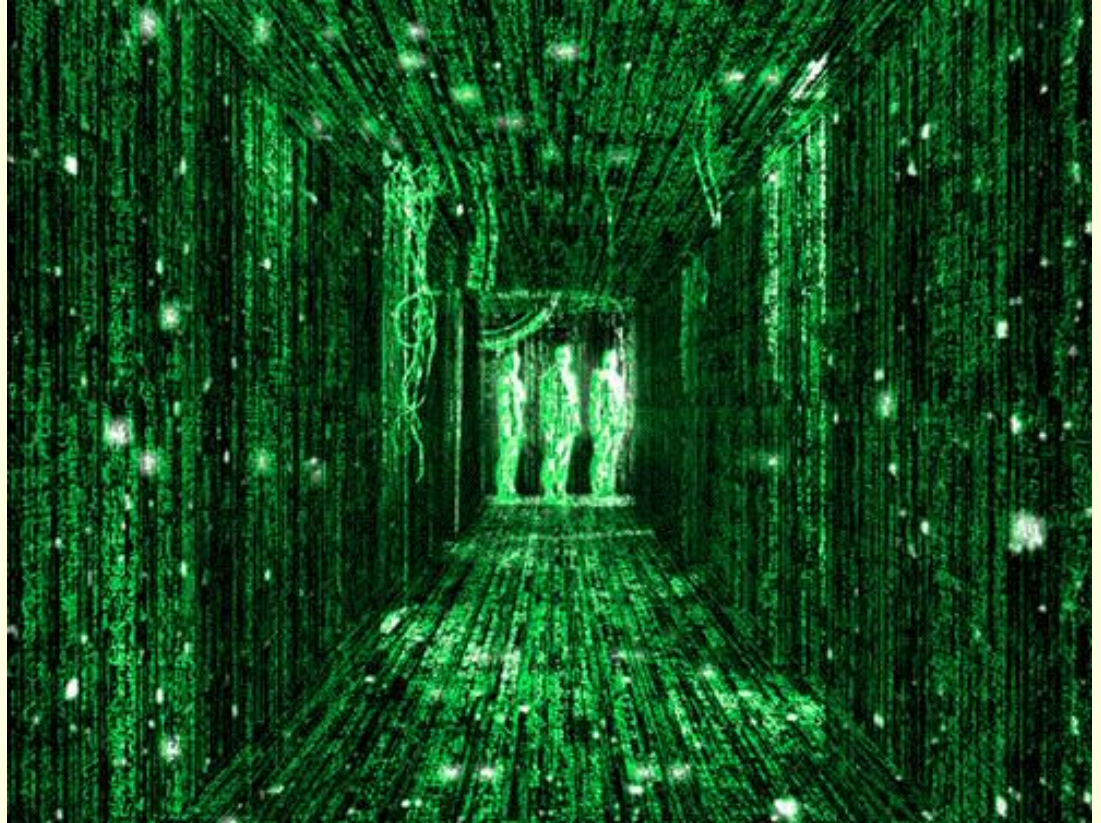
# Forgotten i-clicker?

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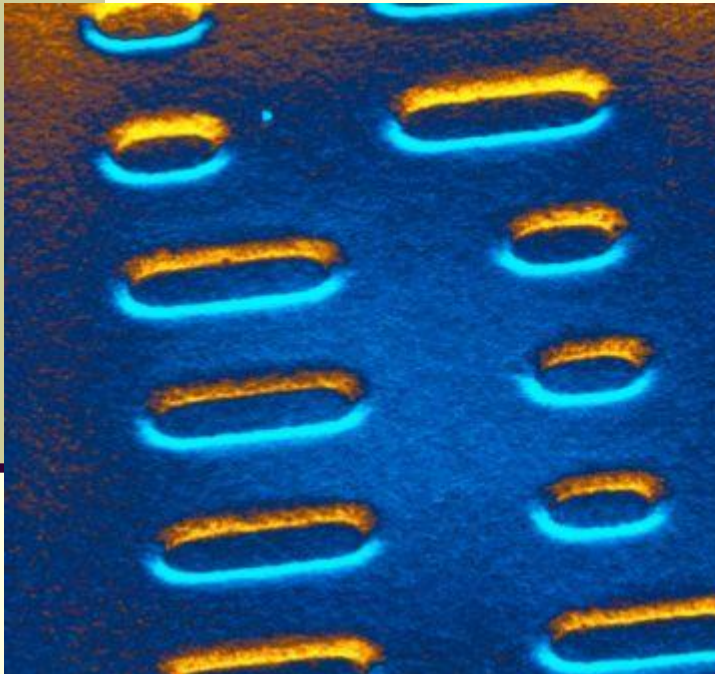
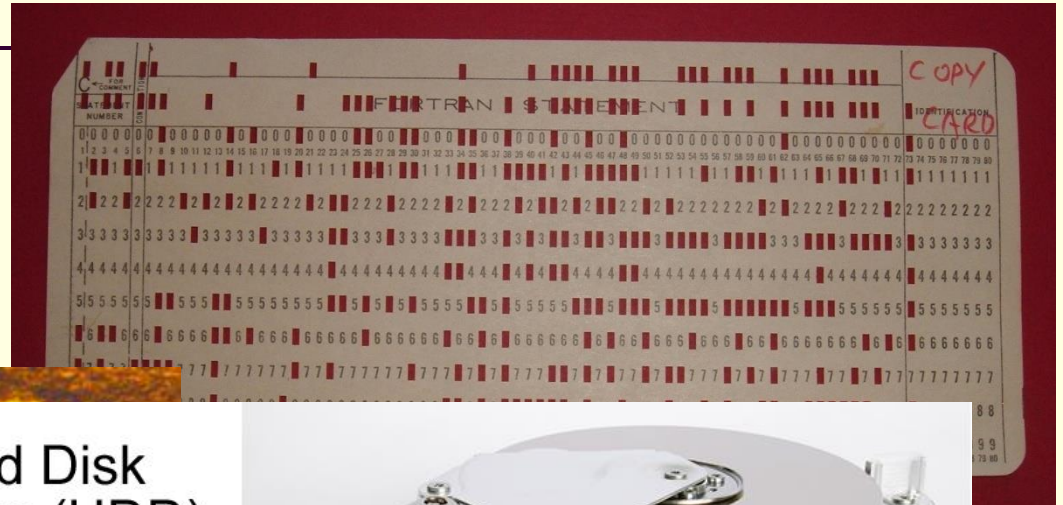
- If you forget your i-clicker, you may borrow one of my loner i-clickers.
- Each loner i-clicker has an animal picture.
- If you borrow an i-clicker, then to get credit, you must ***e-mail me on the same day:***
  - **Subject:** CS-152 borrowed i-clicker
  - **Body:** Name, Date, and Animal.
- Loner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

# In the Computer it is All Just Numbers

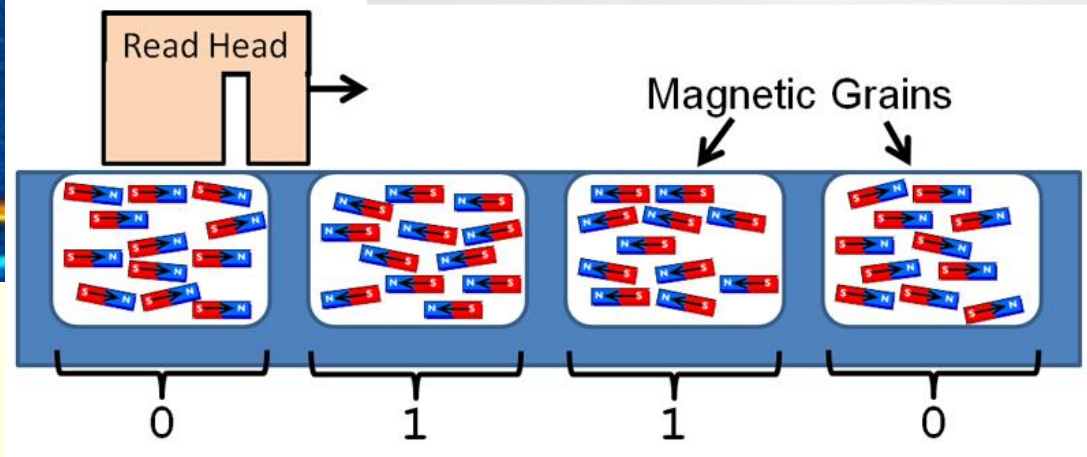
- Bach's Sonata No. 5 in F minor
- Owl City's Fireflies
- The motion picture: Shrek Forever After
- Hamlet, Prince of Denmark.
- World of Warcraft



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



Hard Disk Drive (HDD)

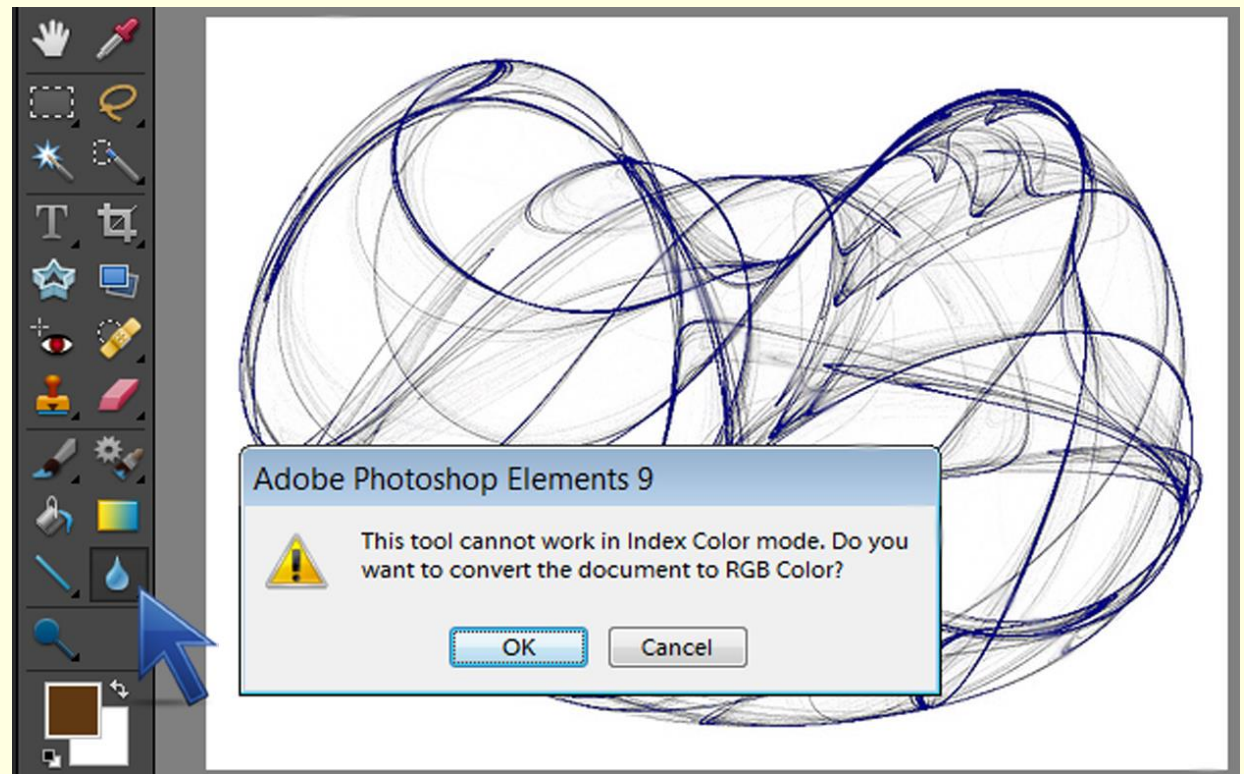




# *Writing* verses *Using* Software

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**.



# 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

## 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

