Welcome to CS 5001: Intensive Foundations of CS

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Why do we care about CS?

How do you use computers daily?

What would be really hard to do with no computer?

What is easy for you to do but hard for a computer?

What is Computer Science?

Equal To

Programming == CS?

NO!

Programming != CS

"Computer science is no more about computers than astronomy is about telescopes."
     -- Dijkstra, computer scientist

Programs are a **tool**, but not the final product.

Q: Okay, then what *is* computer science?

Using computer **programs** as a tool to **solve problems efficiently**, and thus improve people's lives!

Big Questions in CS:

- Can you solve this problem?

- Can you create a process to solve such problems?

- How quickly can you find solutions?

- Do you have the "best" solution?

Which of these are programming?

(Some) areas of Computer Science

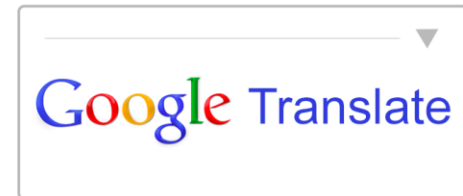Human computer interaction
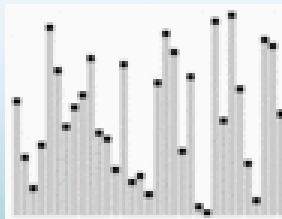
Computer graphics

Robotics
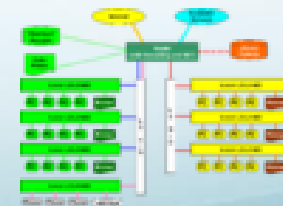
Computational biology

Speech recognition

Natural language processing

Programming languages

Algorithms

Computer networks

Who can be a computer scientist?

Complete Computer Science Education
interestingengineering.com

This computer scientist beats hackers ...
universityofcalifornia.edu

Computer Science | Community College of ...
ccp.edu

This 29-Year-Old Computer Scientist ...
sciencealert.com

Computer scientist vs Programmer vs ...
geeksforgeeks.org
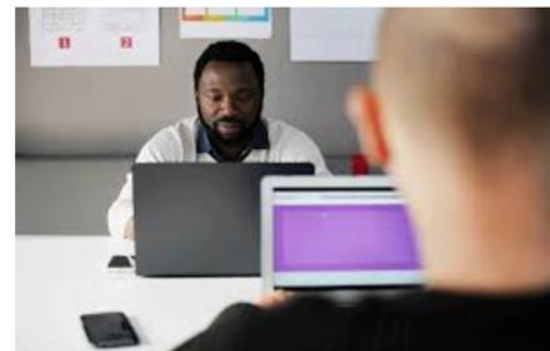
Computer Science Graduates
northeastern.edu

ANYONE!

Meet Ada Lovelace (1815-1852)

Job Opportunities in CS ☺

U.S. Bureau of Labor Statistics Outlook:

- Software Developers: median salary $105,590

- Data Scientists: median salary $120,370

Today's Learning Objectives

Students will be able to:

✓ Explain Computer Science and **why it's important**.

- Differentiate between coding and Computer Science.
- Write a Python program with **print**.
- Write code with good style by using **comments**.
- Read an error log to find **bugs**.

Q: Alright, what's a *program*?

A **computer program** is a **sequence of instructions** telling the computer how to perform a computation.
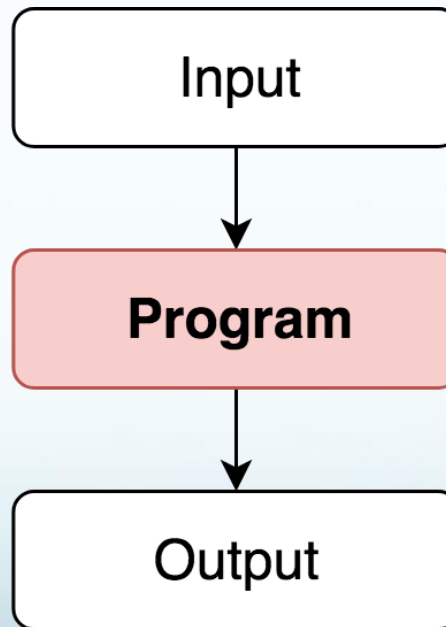
Writing a program

1. Identify the problem.

2. Come up with a strategy.

3. Break up the solution into subtasks.

4. Write down a sequence of operations using **syntax** (i.e., rules) of the programming language.

5. Test it.

Group activity

Write a "program" (in English) that helps your professor take a sip from a water bottle.

1. Identify water bottle

2. …

Q: What is a programming language?

A **programming language** is a **formal language** to express instructions to the computer.

Natural (human) languages

- Syntax less crucial
- Ambiguous
- Redundant
- Idioms and metaphors

Programming languages

- Strict syntax (e.g., must use colons to define functions)
- No ambiguity
- Concise
- Literal

Q: What is a programming language?

A **programming language** is a **formal language** to express instructions to the computer.

Natural languages

Ex: Hi, siht classssssss si 5001.

Programming languages

```
print('hi')
```

Programming languages

ActionScript	dBase	HaXe	make	POP	SOAP
Alice	Delphi	Hugo	Mathematica	PostScript	SQL
AppleScript	Emacs Lisp	Hume	MATLAB	Processing	STATA
Assembly	Erlang	Java	Maya	Prolog	Subtext
BASIC	Euclid	JavaScript	ML	Python	Turing
Bourne Shell	Euler	jScript	MOO	QtScript	UNITY
C	EXEC	jQuery	.NET	R	Unix
C++	F	Jython	OCaml	Ruby	Verilog
C#	F#	LaTeX	Onyx	Scala	Visual C++
CL	Flex	Legoscript	Opal	Scheme	WebQL
Clojure	Fortran	LINC	Oracle	Scratch	XAML
COBOL	GNU E	Lisp	Pascal	sed	YQL
Cobra	Gödel	Logo	Perl	Simulink	Z
ColdFusion	GPSS	Lynx	PHP	SMALL	Zeno
Curl	Haskell	machine code	Pico	SmallTalk	*…and more…*

Wikipedia lists 650 notable programming languages…

Python

Python combines remarkable **power** with very **clear syntax**.

It is used as the language in many intro CS classes.

It is also used by:

and more!

Today's Learning Objectives

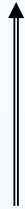Students will be able to:

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Your first program!

```python
print('hi')
```

Python 3

```python
print 'hi'
```

Python 2

Syntax!

See the difference?

Example of a bug

```
print 'hello there'
```

```
  File "/tmp/sessions/1169adce4ea1e3e6/main.py", line 1
    print 'hello there'
                       ^
SyntaxError: Missing parentheses in call to 'print'. Did
you mean print('hello there')?
```
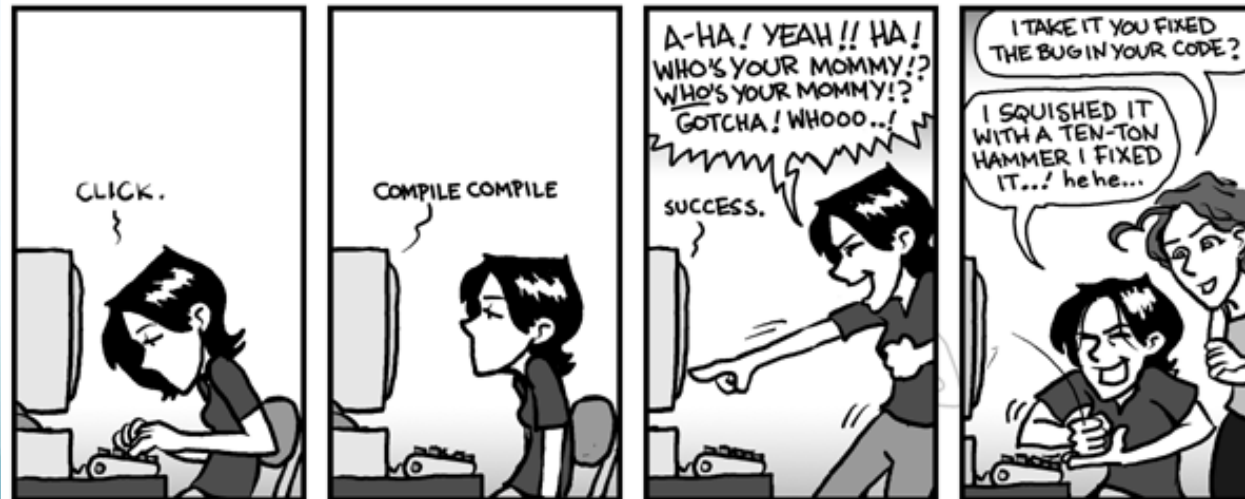
What's wrong?!

Debugging

Programming is complicated! We all make mistakes.

Errors are called **bugs**.

Finding and **removing bugs** is called **debugging**.

Good code style: comments!

To limit errors and make debugging easy, your code should always be:

- readable

- consistent

- **commented**

```
"""
This is a multi-line comment.
"""
# this is a one-line comment
```

In-class activity

Read the syllabus together and discuss the following:

- Which of the learning outcomes are most important to you personally, and why?

- Compared to other college courses, do you expect this one to require more or less time, and why?

- What might you like to work on for the final project?

- **Academic honesty**: why is this important? Come up with a situation that is tricky—is it cheating, or not?

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- Use the Terminal to navigate to folders.
- Create files and folders from the command line.
- Move, copy, and remove files and folders.

Command line (Terminal)

Faster and more powerful way to interact with the computer than with the graphical user interface (GUI).

Opening the Terminal

Mac: Open Spotlight search with **Command + spacebar**, then type **Terminal**.

Windows: **Git Bash**

…these aren't the *only* ways, but for consistency let's stay with these for now

Listing a folder's contents

ls: **list** the files in this folder

pwd: **p**rint **w**orking **d**irectory (i.e., *Which folder am I in?*)
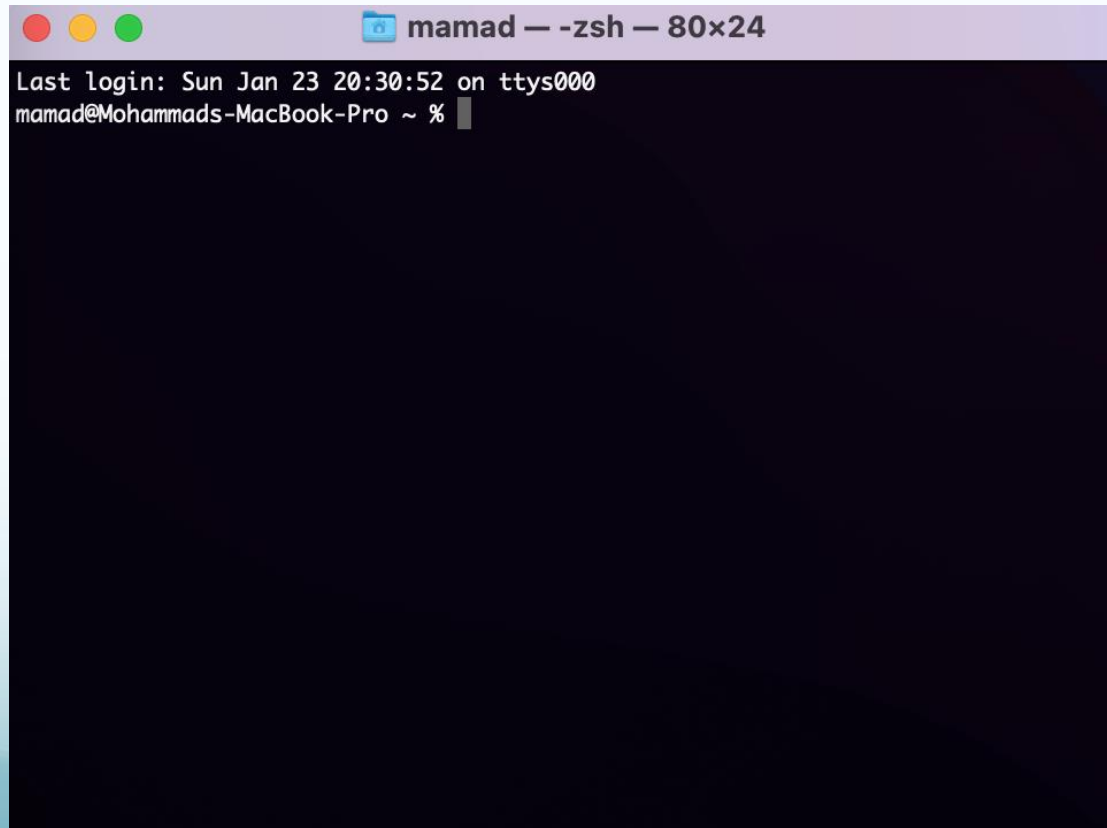
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Navigating to a folder

cd: **c**hange **d**irectory

> cd Documents

Go up one level with ..

> cd ..

Go to the home directory with ~

> cd ~

Tip: Autocomplete with Tab

cd Doc → *Press the Tab key!* → cd Documents

Q: What happens if I type "Do" and there are multiple folders that start with "Do"?

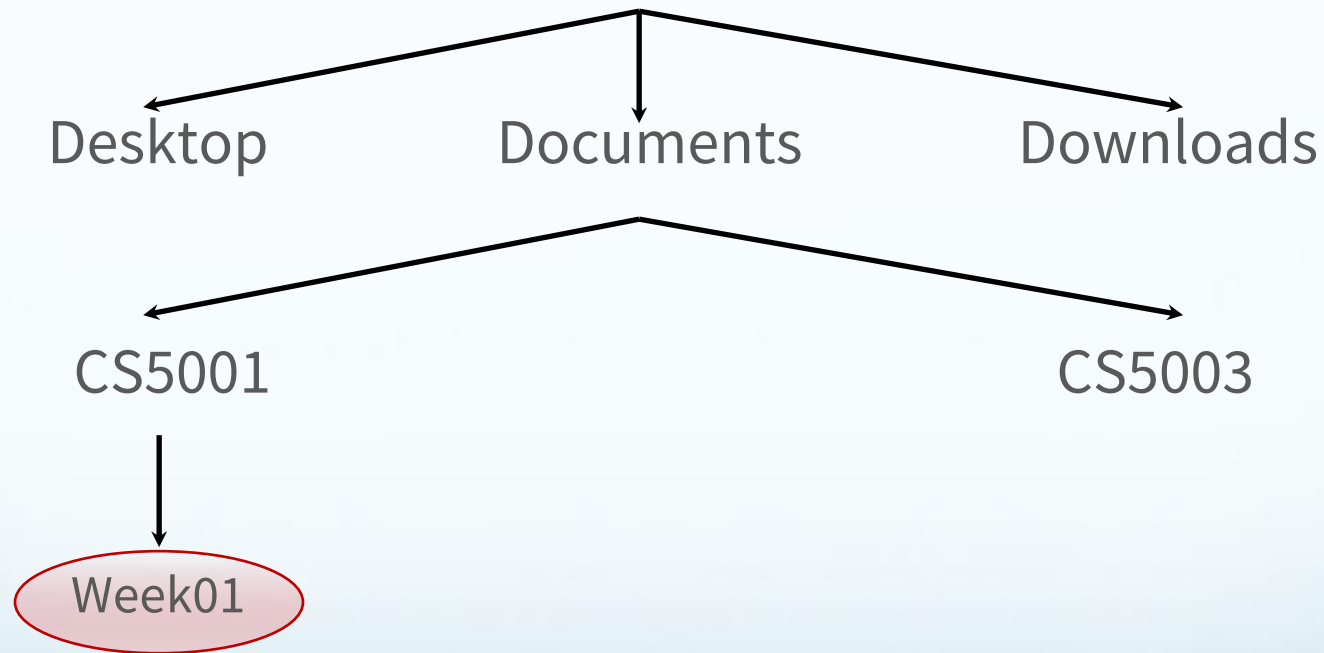*Q: What happens if I type "Do" and there are **no** folders that start with "Do"?*

Tip: Up arrow shortcut

If you type the Up arrow on your keyboard, it will pull up the previously typed command.

Q: What happens if you type the Up arrow twice?

Parent and child directories

~ (i.e., /Users/Mohammad)

Desktop   Documents   Downloads

CS5001   CS5003

Week01

Q: How would I navigate to Week01 from home?

File paths

Option 1:

```
cd ~
cd Documents
cd cs5001
cd Week01
```

Option 2:   `cd ~/Documents/cs5001/Week01`

Your turn! In-class activity

Use ls to see what's inside your current directory.

Navigate to your home folder (~) and list its contents.

Move inside one of the folders inside your home directory, and use ls to see what's inside it.

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Making files and directories

touch: create a new file

> touch test.txt

mkdir: **m**a**k**e a new **dir**ectory

> mkdir my_new_folder

For now: no spaces in command-line filenames please! There's a way to do it but we don't want to overload things

Moving and copying files

mv: **m**o**v**e a file or directory to a new location

mv test.txt ~/Desktop

cp: **c**o**p**y a file to a new location (now there are 2 copies)

cp test.txt ~/Desktop

cp **-r**: **c**o**p**y a folder to a new location (i.e., **r**ecursively)

cp -r my_new_folder ~/Desktop

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Deleting files and directories

rm: **re**move a file (**warning: this cannot be undone!**)

rm ~/Desktop/test.txt

rm **-r**: **re**move a folder (i.e., **r**ecursively)

rm -r ~/Desktop/my_new_folder

Your turn! In-class activity

Create a new directory (e.g., cs5001).

List the contents of the current directory.

Move the new directory into Documents (or Desktop).

Go into Documents (or Desktop) to see it there.

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✓ Move, copy, and remove files and folders.

1) What is the command to move file.txt to your home directory?

```
mv file.txt ~
```

2) What is the command to fully delete a folder called new_folder?

rm -r new_folder

3) What key should you use
to autocomplete the name
of a file/folder?

Tab!

Today's Learning Objectives

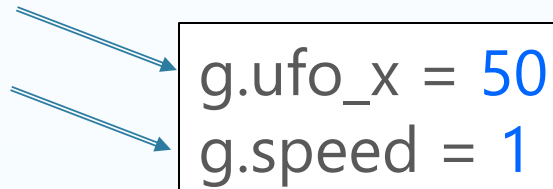Students will be able to:

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Next Week…

Variables, Expressions, & Conditionals

Variables

g.ufo_x = 50
g.speed = 1