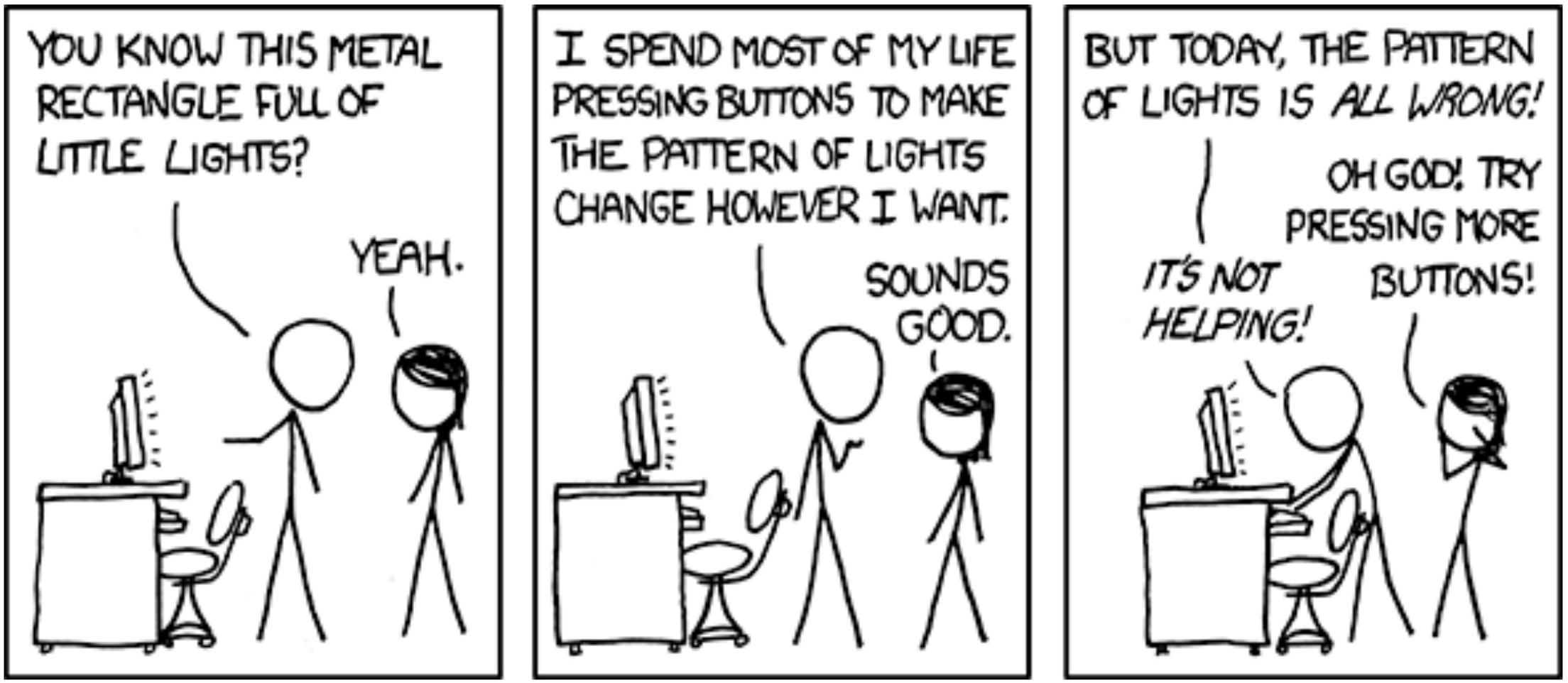

CSCI 141

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Algorithms and Pseudocode

Goals

- Know the definition and purpose of **algorithms** and **pseudocode**, how they differ from Python code, and where they fit into the software development process.

Our Simple Program

Multiply 3 by 4
Add 2 to the result
Print the final result to the screen.

Is this a Python program?

Our Simple Program

Multiply 3 by 4
Add 2 to the result
Print the final result to the screen.

Is this a Python program?

Let's find out...

Our Simple Program

Multiply 3 by 4
Add 2 to the result
Print the final result to the screen.

Is this a Python program?

No!

Algorithms

Multiply 3 by 4
Add 2 to the result
Print the final result to the screen.

Is this a Python program?

No, but it is an **algorithm**.

An algorithm is a sequence of steps that solve a problem.

Pseudocode

Problem solving and software engineering

Designing an algorithm: what sequence of steps?

Ignore Python syntax: describe the steps in English or pseudocode.

Pseudocode is partway between English and Python:
an **informal but precise** description of an algorithm.

Why Pseudocode?

An algorithm for solving problems:

1. Devise an **algorithm** to solve the problem
2. Write the algorithm in **pseudocode**.
3. **Translate** the pseudocode into a programming language to implement the algorithm.
4. Execute and **test** the program, fixing errors until it solves the problem correctly.

Thought Exercise: PB&J

- Suppose I asked you to write pseudocode for an algorithm to make a PB&J sandwich.
- An alien from a different planet will try to execute your algorithm.

Thought Exercise: PB&J

- Suppose I asked you to write pseudocode for an algorithm to make a PB&J sandwich.
- An alien from a different planet will try to execute your algorithm.
- Problem:
  - aliens don't know what a sandwich is
  - aliens don't know what bread is
  - aliens don't know which way to turn the lid of a jar
  - ...

The Point

- Computers are the aliens in this story:
  - they can’t “fill in the gaps”
  - they don’t “know what you meant”
- Computers are stupid. You have to be **precise** and **patient** in order to communicate with them.

The Point

- Computers are the aliens in this story:
  - they can’t “fill in the gaps”
  - they don’t “know what you meant”
- Computers are stupid. You have to be **precise** and **patient** in order to communicate with them.
- Humans are smart! So we can converse in pseudocode. But: **You still have to be precise.**

Pseudocode - Examples

Pseudocode:

Multiply 3 by 4
Add 2 to the result
Print the final result to the screen.

Python implementation:

```
print(3 * 4 + 2)
```

Pseudocode - Examples

Pseudocode:

> Repeatedly prompt a user for numbers and store them in a list.
> If the user enters anything other than a number, print the sum of the numbers they entered and terminate the program.

Pseudocode - Examples

Pseudocode:

For each pixel in an image, multiply its brightness by 2.

Also pseudocode:

Load the image pixels into a 2-dimensional array
For each row of the image:
  for each column in that row:
    change that pixel's value to twice its original value

Notice: level of detail depends on context/audience.

Pseudocode: Takeaways

- An algorithm is a sequence of steps to solve a problem.
- Pseudocode is an **informal but precise** description of an algorithm.
- The precision necessary depends on the audience.
- For our purposes, strive to write pseudocode that your classmate could unambiguously translate into working Python code.