

# What is Programming?

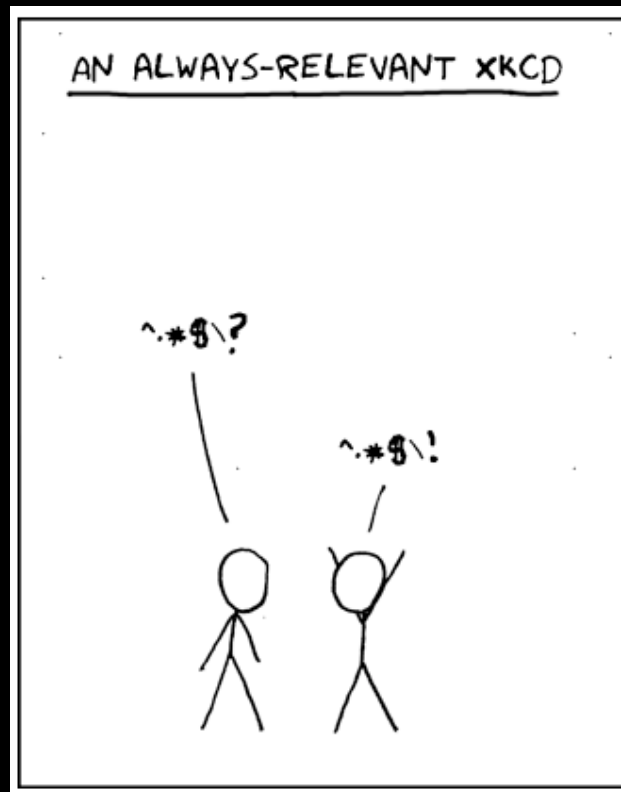
Cristel Thomas (Molecular Biology PhD!!!)

# pro·gram·ming

*/ 'prō ,gramɪŋ /*

*noun*

1. the action or process of writing computer programs.
  2. the magic key to understanding some XKCD jokes.
- 



# Programming

Set of instructions given to a computer to do something

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Set of instructions given to a computer to do something

Problem?

# Programming

Set of instructions given to a computer to do something

Problem

Steps to solve the problem (in plain English)

# Programming

Set of instructions given to a computer to do something

Problem

Steps to solve the problem (in plain English)

Steps to solve the problem (in computer speak)

# Programming

Set of instructions given to a computer to do something

*Problem:* which worms on the plate are expressing GFP?

*Steps to solve the problem (in plain English):*

- get a fresh plate for the green worms
- look at all the worms
- identify glowing worms and move them to the fresh plate

Steps to solve the problem (in computer speak)

# Programming

Set of instructions given to a computer to do something

*Problem:* which worms on the plate are expressing GFP?

*Steps to solve the problem (in plain English):*

- get a fresh plate for the green worms
- look at all the worms
- identify glowing worms and move them to the fresh plate

*Program:*

```
var greenWorms = [];  
allWormsOnThePlate.forEach(function(worm) {  
    if (worm.color === 'green') {  
        greenWorms.push(worm);  
    }  
});
```



# Programming Languages



# Programming Languages

## *JavaScript*

```
var greenWorms = [];  
allWormsOnThePlate.forEach(function(worm) {  
    if (worm.color === 'green') {  
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# Programming Languages

## JavaScript

```
var greenWorms = [];  
allWormsOnThePlate.forEach(function(worm) {  
    if (worm.color === 'green') {  
        greenWorms.push(worm);  
    }  
});
```

## PERL

```
my @green_worms;  
for my $i (0..$#all_worms_on_the_plate) {  
    if ($worm_color[$i] eq 'green') {  
        push(@green_worms, $all_worms_on_the_plate[$i]);  
    }  
}
```

## Python

```
green_worms = []  
for worm in all_worms_on_the_plate:  
    if all_worms_on_the_plate[worm]['color'] == 'green':  
        green_worms.append(worm)
```

## R

```
green_worms <- all_worms[all_worms$color == 'green']
```

# Programming Language Choice

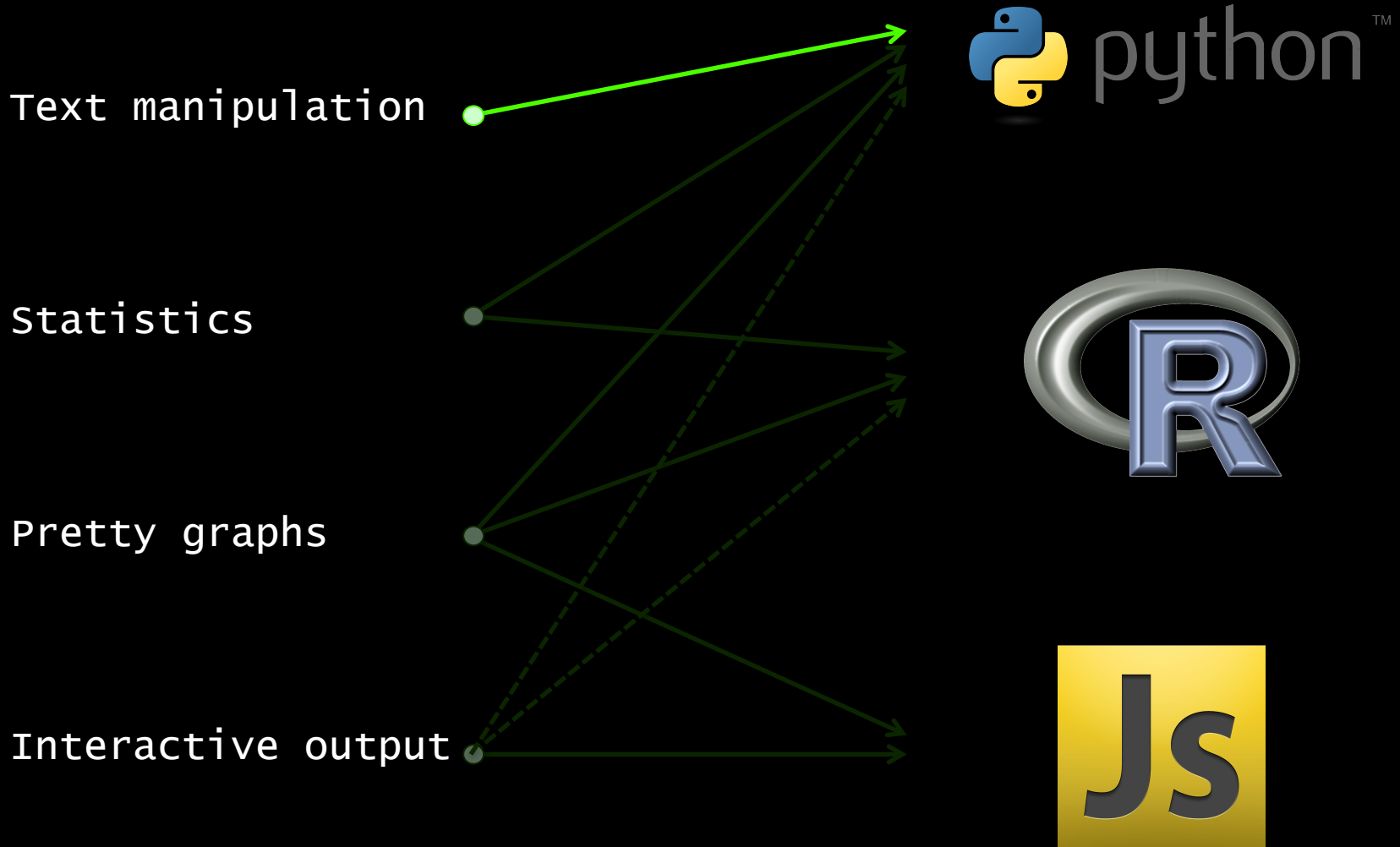
Text manipulation

Statistics

Pretty graphs

Interactive output

# Programming Language Choice



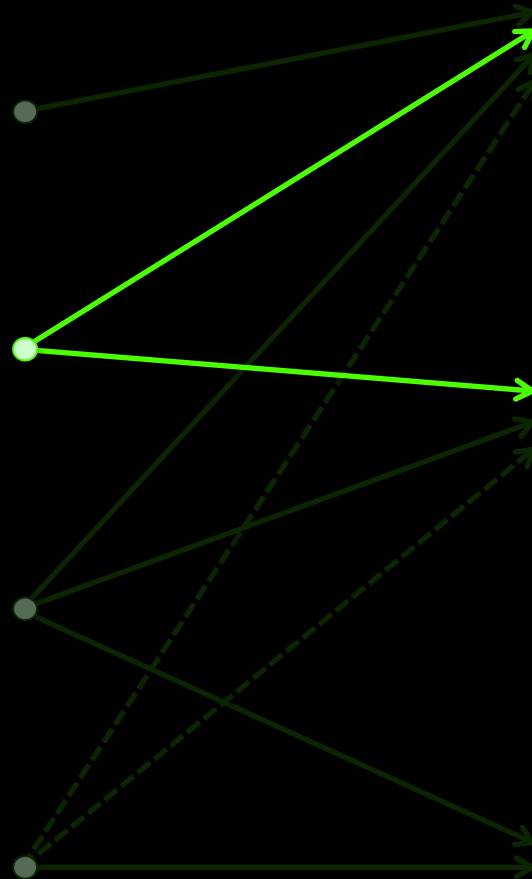
# Programming Language Choice

Text manipulation

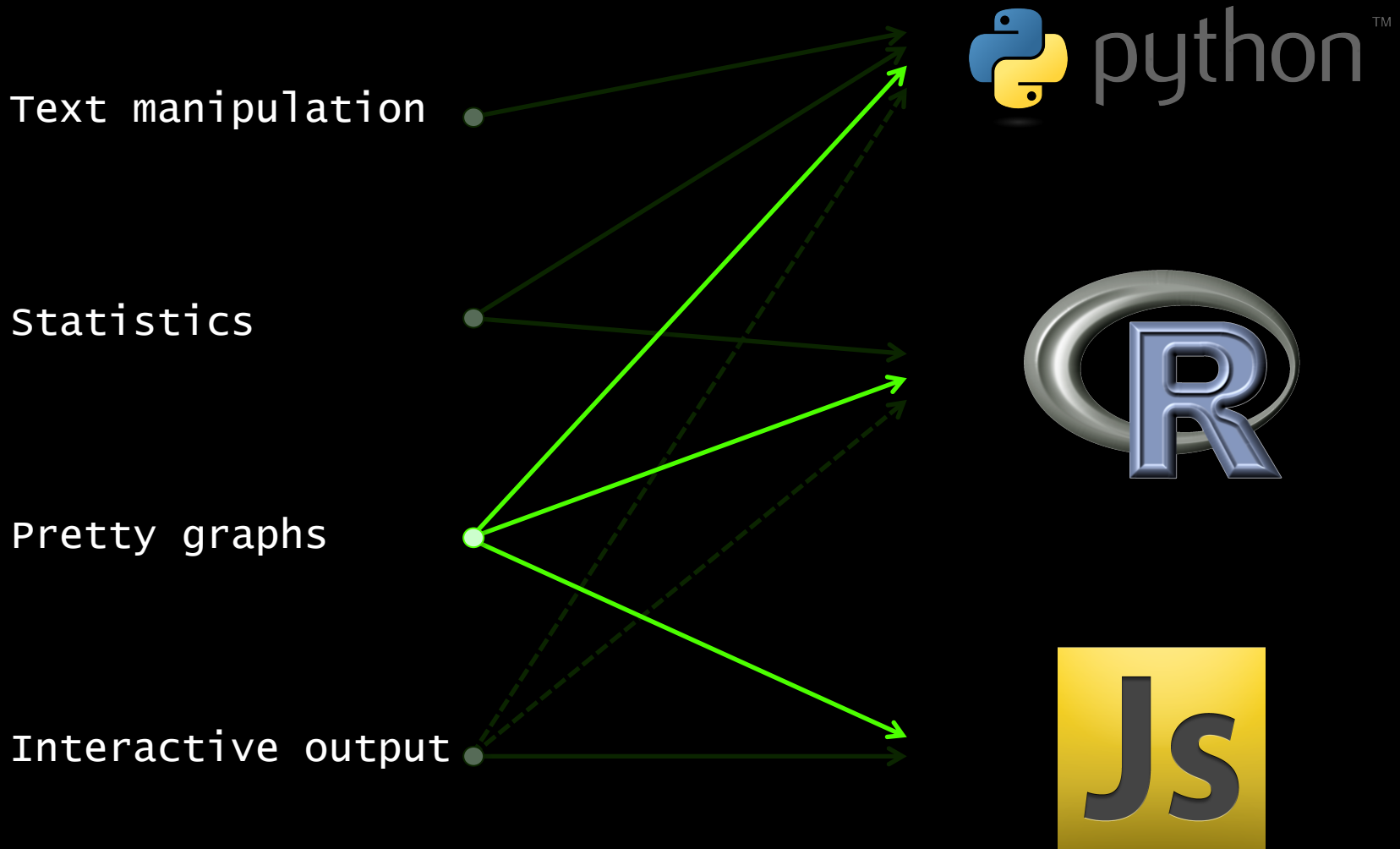
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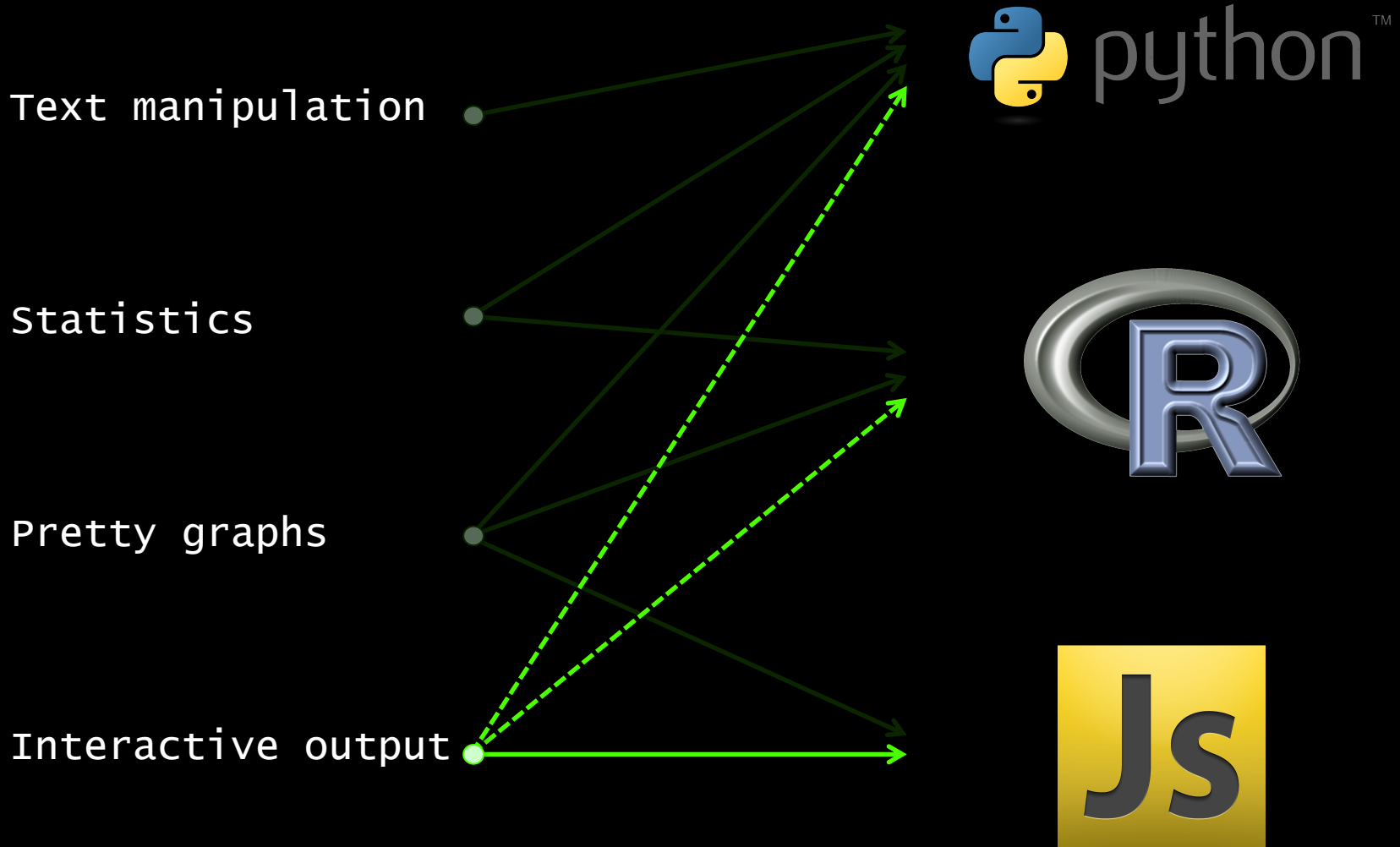
Interactive output



# Programming Language Choice



# Programming Language Choice





# Programming Language Choice

Text manipulation

Statistics

Pretty graphs

Interactive output



Ease of (re-)use

Local support



# Programming Language Choice



# Same underlying logic and concepts

# Programming Language Choice



# Best practice for all

# Programming Language Choice



# Programming Languages



Spend some time

- online
- talking with your local expert
- reading papers

# Getting Started – What do you need?

- Computer
- Brains
- Coffee/Tea/Beer
- Terminal
- Text editor (not word)
- Interpreter / Compiler
- Developing environment
- Access to internet

Different operating  
systems handle  
programming languages  
differently

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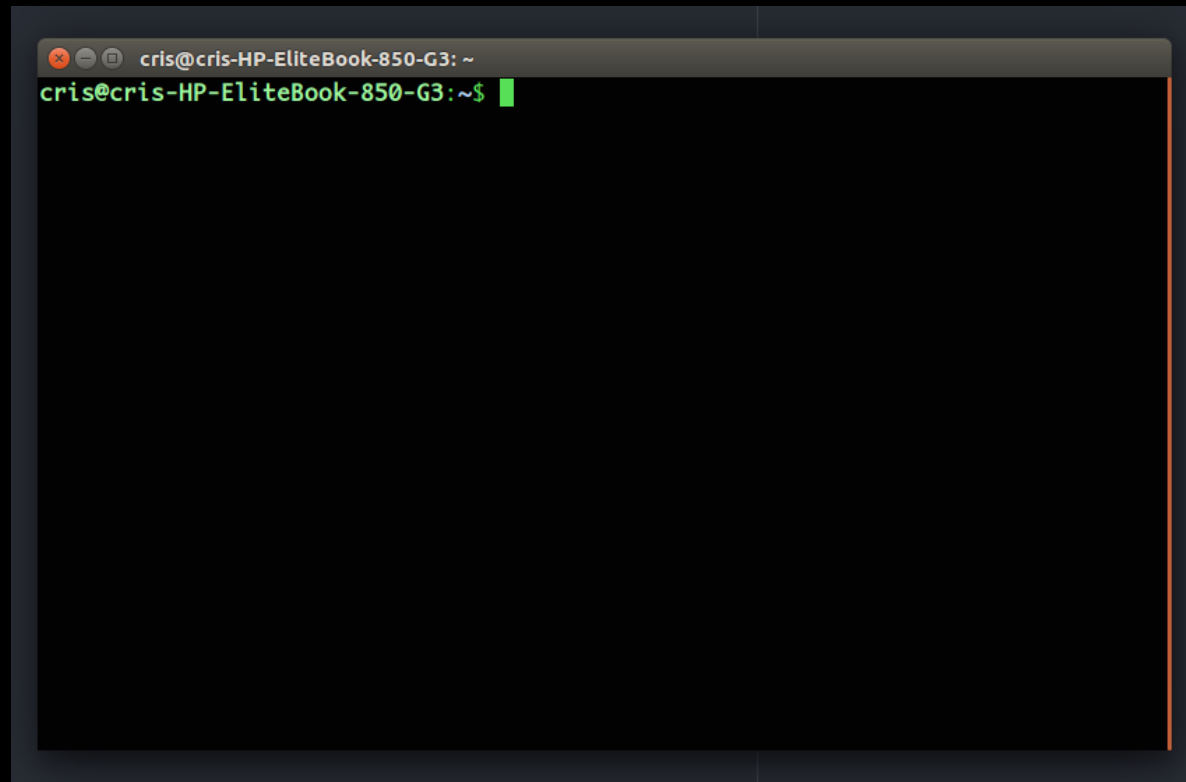
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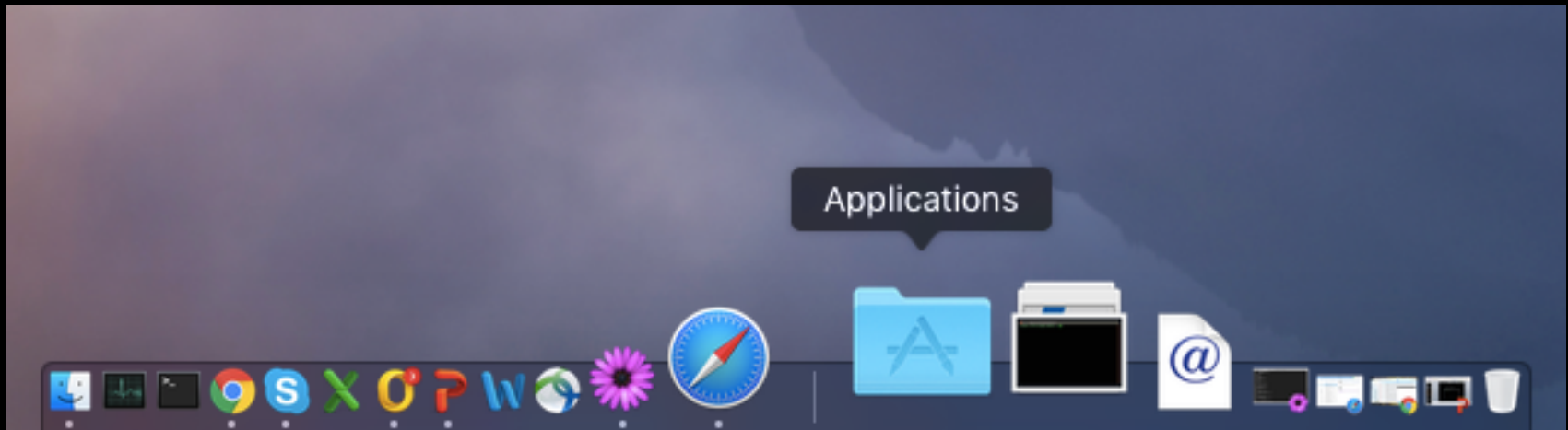
# Command Line Prompt - Unix

Ctrl - Alt - T



# Command Line Prompt - Apple

Applications/Utilities/Terminal



# Command Line Prompt - Apple

## Applications/Utilities/Terminal



# Command Line Prompt - Apple

## Applications/Utilities/Terminal



# Command Line Prompt - Apple

## Applications/Utilities/Terminal



# Command Line Prompt - Windows

Depends on windows version:

Windows 10/8/8.1

Start  
All apps  
Windows System  
Command prompt

Windows 7/XP/Vista

Start  
All programs  
Accessories  
Command prompt

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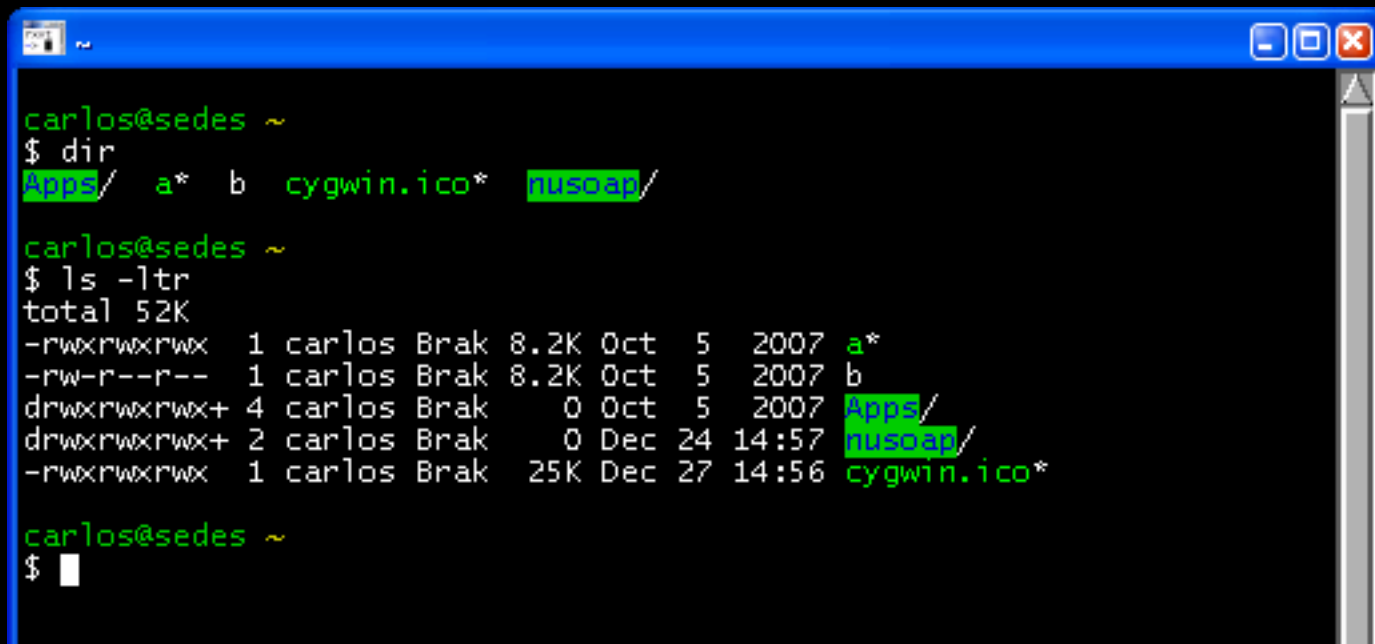
or, install **Cygwin**

<https://www.lifewire.com/how-to-open-command-prompt-2618089>  
<https://cygwin.com/install.html>

# Command Line Prompt - Windows

## Cygwin

Command line prompt for windows



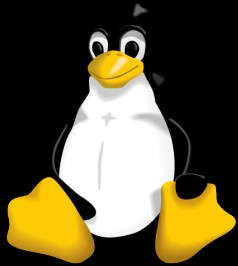
```
carlos@sedes ~  
$ dir  
Apps/  a*  b  cygwin.ico*  nusoap/  
  
carlos@sedes ~  
$ ls -ltr  
total 52K  
-rwxrwxrwx  1 carlos Brak 8.2K Oct  5  2007 a*  
-rw-r--r--  1 carlos Brak 8.2K Oct  5  2007 b  
drwxrwxrwx+ 4 carlos Brak  0 Oct  5  2007 Apps/  
drwxrwxrwx+ 2 carlos Brak  0 Dec 24 14:57 nusoap/  
-rwxrwxrwx  1 carlos Brak 25K Dec 27 14:56 cygwin.ico*  
  
carlos@sedes ~  
$ █
```



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# Simple Text Editors



Linux



Apple



windows

gedit

TextWrangler  
TextMate

Notepad++

atom  
sublime Text

## Pros:

Syntax highlighting  
Integrated code linting

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Depends on  
programming  
language

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# Good (online) resources

- Google
- Stack overflow
- Whatever website for your favorite language / library
- Youtube (tutorials / pycon)
- Coursera / edX
- Your local bioinformatician