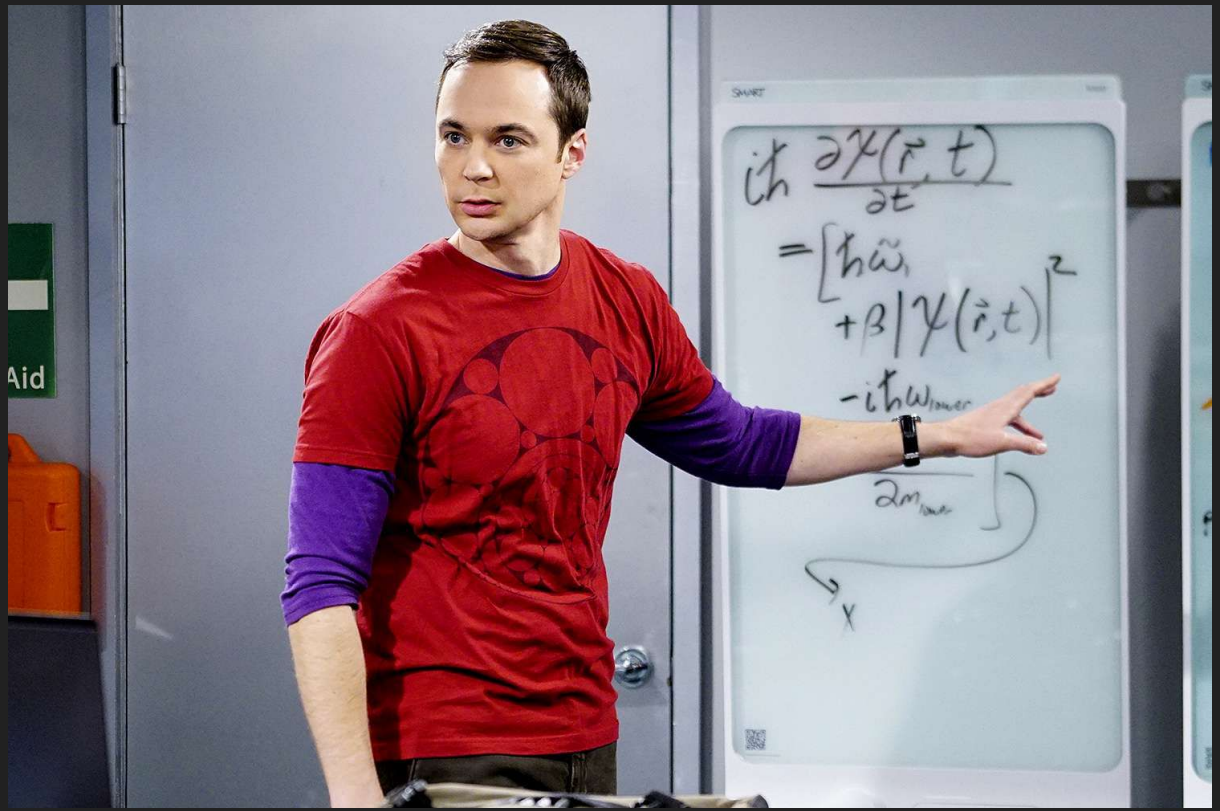
Introduction to Programming in Python (CSC 109)

Prof. Dr. Marcus Birkenkrahe

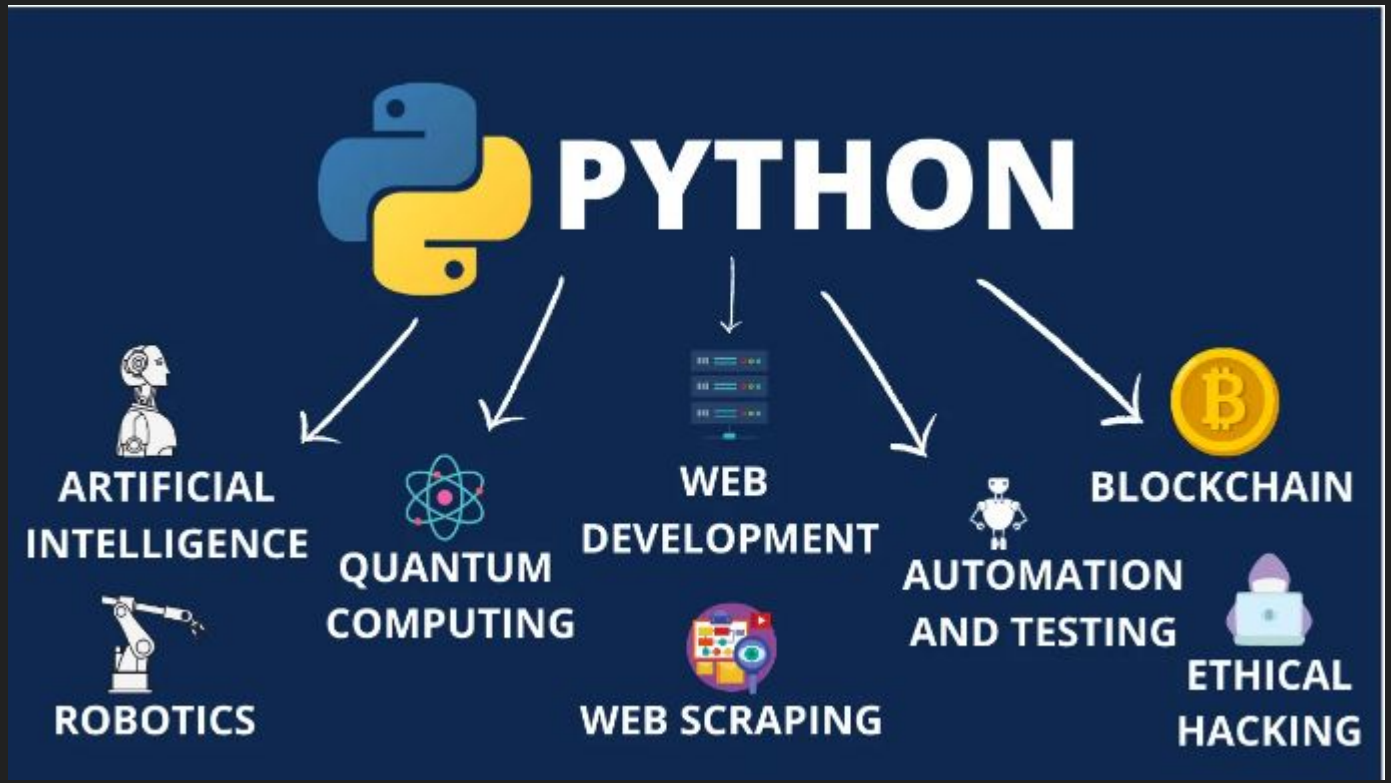
Course overview - August 21, 2023

Who is your lecturer?



My first programming language was BASIC

Why (not) Python?



Natural vs. programming languages

C/C++ is like Latin

SQL is like English

is like Sign language

FORTRAN is like Hebrew

Lisp is like French

R is like Italian

is like Chinese

Python is like Spanish

The Importance of Infrastructure

What do you expect from this course?

What careers do Lyon College graduates have?

What careers did our students have?

- Full stack developer @ OneBrief (military planning software)
- Cybersecurity @Sierra Nevada (aircraft engineering)
- Software engineer @Riot Games (League of Legends game company)
- Database specialist @DHS (Department of Homeland Sec)
- Data analyst @FutureFuel (chemical/biodiesel manufacturing)
- IT director @Bad Boy Mowers (High performance lawn mowers)

What will we do in this course?

How will you be evaluated?

REQUIREMENT	UNITS	PPU	TOTAL	% of TOTAL
Home assignments	15	10	150	30.
Class participation	15	10	150	30.
Multiple-choice tests	15	10	150	30.
Capstone project	1	50	50	10.
TOTAL			500	100.

Which tools are we going to use?

1. GitHub (app)
2. Canvas (app)
3. Zoom
4. Colaboratory
5. GDrive (app)
6. Replit (app)
7. DataCamp (app)
8. Pythontutor

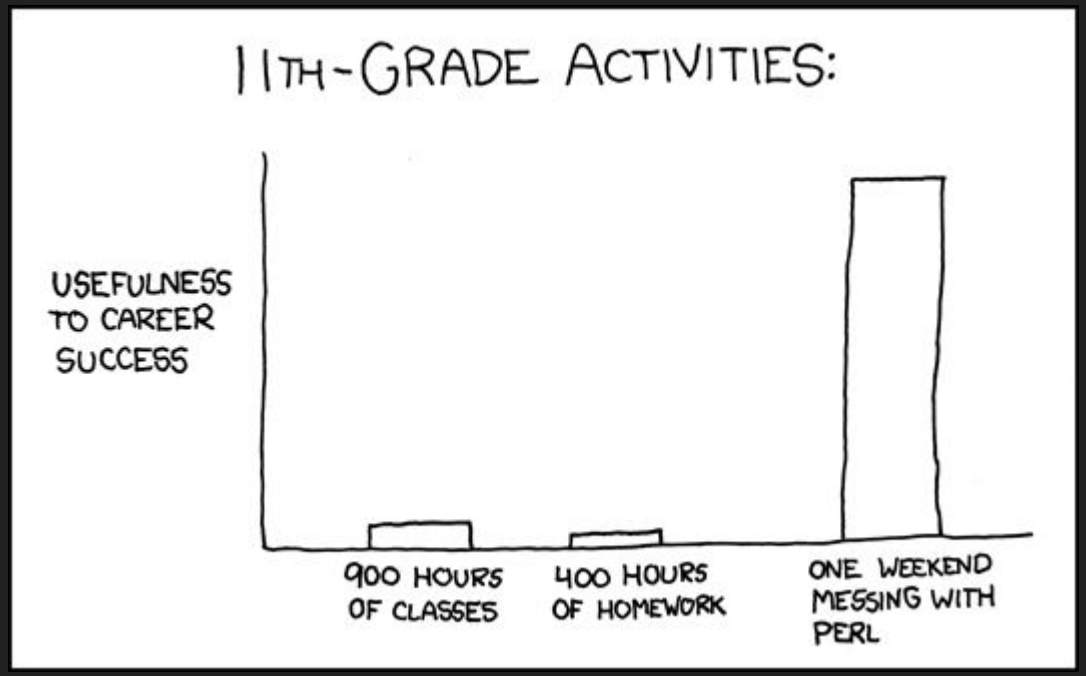
Can we use AI coding assistants?

1. ChatGPT
2. Claude
3. LLaMa (app)
4. Copilot

When are the first assignments due?

Will you need to buy any books for this course?

Come up with a program you'd create in Python if you had infinite, mad programming skills already!



What is literate programming? (GNU Emacs + Org-mode)

Humans

Machines

```
emacs@LCJVYZ1B3
#+options: toc:1
* Test 2 Base R plots
** Data science DSC 205 (CSC 482)

   * Density plot: this is a smoothed histogram, and it does not look
     quite as positive as the histogram. Negative outliers are rather
     overaccentuated: note that the density values are very small.

     #+begin_src R :session :results graphics file :file test2density.png
       results <- c(15,14,17.41,11.08,13.38,16.75,8.33,
                    17.17,14.16,11.91,16.16,14.8,13.67)
       results2 <- c(17,16,17,16.17,13.17,19.67,
                     15.67,18.67,13.17,16.67,19.17,16.33,18)
       ave2 <- mean(results2); d2 <- density(results2)
       ave1 <- mean(results); d1 <- density(results)
       par(mfrow=c(1,2))
       plot(d1, col="red", main="Test 1 results")
       abline(v=ave1,col="red", lty=3)
       text(x=19,y=0.15,col="blue",label=c("Test 2"))
       plot(d2, col="blue",main="Test 2 results")
       abline(v=ave2,col="blue",lty=3);
       text(x=13,y=0.16,col="red",label=c("Test 1"))
     #+end_src

     #+CAPTION: Density plot - test results for DSC 205
     #+RESULTS: density2
     file:test2density.png

** References
   * DataCamp (2022). 2022 Data trends and predictions. URL:
     datacamp.com.
   * ESS (n.d.). Emacs Speaks Statistics. URL: ess.r-project.org
   * Emacs Speaks Statistics (Mar 19, 2021). First Steps With Emacs
     [video]. URL: youtu.be/1YOrd7NCGkg.
   * GNU Emacs (n.d.). GNU Editor. URL: gnu.org/software/emacs/
   * R Core Team (2021). R: A language and environment for statistical
     computing. R Foundation for Statistical Computing, Vienna,
     Austria. URL https://www.R-project.org/.

1 U\---  test.org      All (13,60)    (Org)
```

```
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             17.17,14.16,11.91,16.16,14.8,13.67)
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1 -\---  test.R      All (11,43)    (ESS[R] [R] Flymake:Wait[0 0] +
```
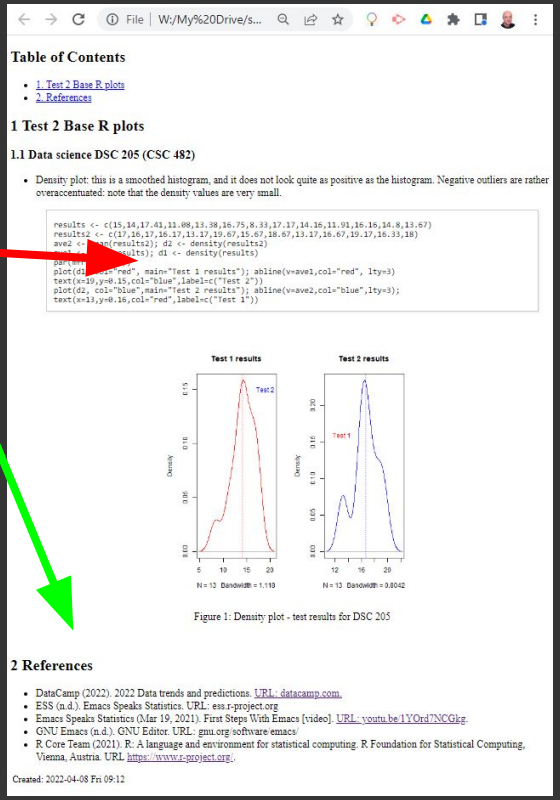



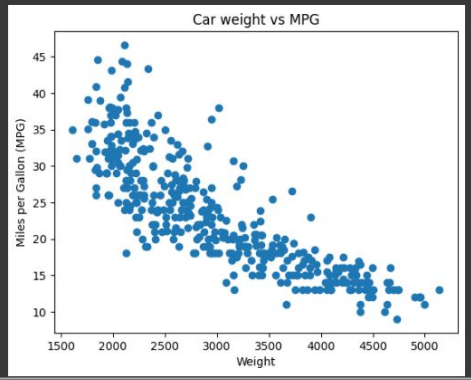
Story + code = source code + documentation

What is literate programming? (Google Colaboratory)

Scatter plot for miles-per-gallon vs. weight

In this code, `sns.load_dataset('mpg')` loads the 'mpg' dataset from seaborn. We then create a scatter plot using `plt.scatter()` with car weights on the x-axis and mpg on the y-axis. The `plt.title()`, `plt.xlabel()`, and `plt.ylabel()` functions are used to add a title and labels to the plot. Finally, `plt.show()` is called to display the plot.

```
import seaborn as sns
import matplotlib.pyplot as plt

# Load the 'mpg' dataset from seaborn
mpg = sns.load_dataset('mpg')

# Create a scatter plot of weight vs mpg
plt.scatter(mpg['weight'], mpg['mpg'])

# Add title and labels
plt.title('Car weight vs MPG')
plt.xlabel('Weight')
plt.ylabel('Miles per Gallon (MPG)')

# Display the plot
plt.show()
```



Humans

Machines

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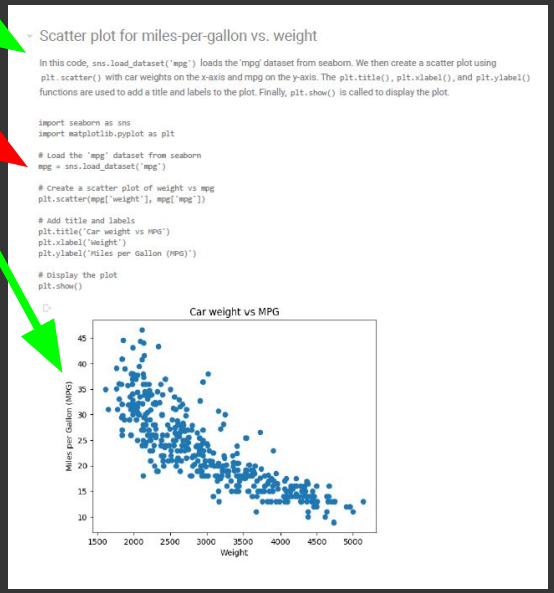

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Practice: Google Colaboratory / Replit / DataCamp

1. Google Colab
2. Replit.com
3. DataCamp

Questions you should be able to answer

1. What kind of programming language is Python?
2. What is Python used for?
3. What is a weakness of Python?
4. Which tools are we going to use in this course?
5. Whether you are allowed to use AI tools in this course?
6. What is a compiler?
7. What type of Python do Google Colab and DataCamp workspace use?
8. What is a REPL?
9. What is a shell (in computer science)?
10. What is literate programming?