CSE 416 Section 1!

~~Zoom University - Pandemic Special Quarter 2~~

(Can't believe we made it to summer but when can we go outside?????)

JUNE 25, 2020

HONGJUN JACK WU 😆

This material is made with color blind folks in mind.

If there is anything that is not clear or you cannot distinguish **PLEASE** let us know so we can fix it ASAP.

Goal for today!

MAIN GOAL:

INTRO TO PYTHON & NOTEBOOK & PANDAS

Materials of the Day

There are notebooks available for you to use.

We'll post the notebooks to the website sometime after we are done with all sections. (Also #24 in this presentation)

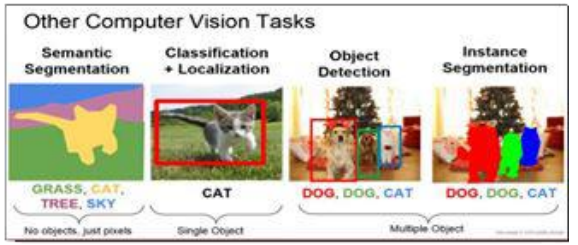
Pretty much all the notebook we are using from now on will be available to you. No worries!

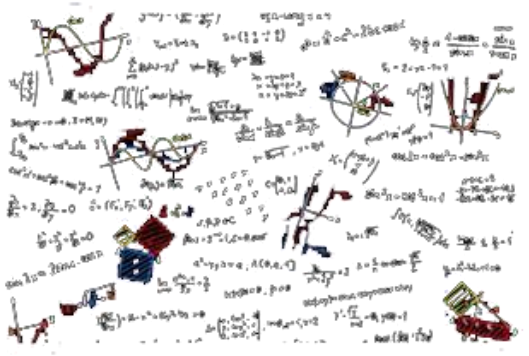
Just sit back, relax, and enjoy!

Beginning of the course

End of the course

After becoming an expert





Hmmmm... this makes sense!

Python.

(OPTIONAL PART I)

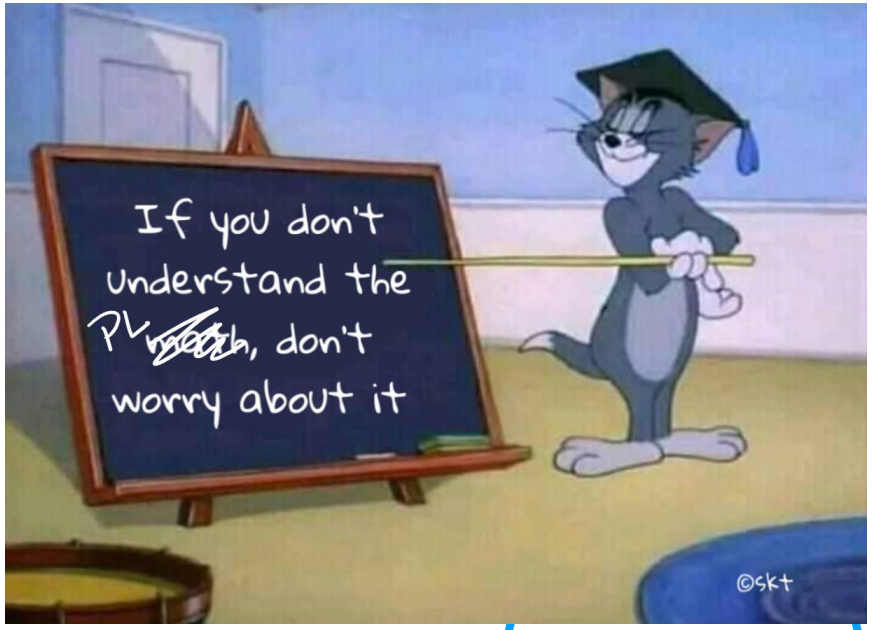
JUST FYI…

Things we are gonna talk about in this part is just extra stuff…

But I think it is necessary to talk about them when we introduce a new programming language.

No pressure! We will **NOT** test you on this.

(Well, it's just stuff I made up that is not part of the 416 curriculum…more like 341)



PROGRAMMING LANGUAGE PERSPECTIVE

When talking about a new programming language (PL):

> The "**Semantics**" of the language is more important than the "**Syntax**" of the language.
> (Dan Grossman, aka the PL God in CSE )

Semantics: "What primarily define a PL and its pros/cons" (Brett Wortzman)

Syntax: "How you write something."

In other words, we try not to talk too much about the syntax differences.
(The `{}` and `;` in Java, `System.out.println();` vs. `print()`, etc)

Focus what fundamentally makes two programming languages different.

INTERPRETED VS. COMPILED: SEMANTICS

Interpreted (Python)

Python is an "**interpreted**" **language**. This means it uses an **interpreter**. An interpreter is very different from the compiler.

An interpreter executes the statements of code "line-by-line".

```
python HelloWorld.py
```

Compiled (Java, C++, etc)

The **compiler** executes the code entirely and lists all possible errors at a time.

You need to compile human code into machine code before you execute code.

```
javac HelloWorld.java
```

```
java HelloWorld
```

PYTHON SEMANTICS I

Python is an **interpreted**, **high-level**, **general-purpose** programming language.

Interpreted:
Uses an interpreter, no a compiler. (Compiled PL: Java, C, C++, SML).

High-Level:
Abstract, user friendly, write code using human logic. (Low level PL: Assembly)

General Purpose:
Can do many things. Machine learning, web scraper, games, etc.

PYTHON SEMANTICS II

Python is **dynamically typed** and **garbage-collected**.

Dynamically Typed:
Provide mutation, no type checking restrictions, no need to declare type. (Python: a = 1)

Statically Typed (In Contrary):
You need to declare the type of the variable when you declare it. (Java: int a = 1;)

Garbage Collected:
Provide auto garbage collection.
Like in Java, automatically get rid of a linked list node when nothing is pointing at it.

PYTHON SEMANTICS III

Python supports multiple programming paradigms, including **structured**, **object-oriented**, and **functional** programming.

Structured:
Use if/then/else, for/while, block structures (aka sub functions).

Object Oriented Programming:
Treat elements like objects, use fields, constructors, etc. (Java!)

Functional Programming:
Programs are constructed using functions, (Example: SML, Racket).

RANDOM STUFF ABOUT HW0

Python is very straightforward and easy to understand.

In theory even if you don't have any python experience as long as you have some Java experience and just google "`python for loop`", "`python toString`", "`python list`" the entire quarter you can still succeed in 416 😅.

To make your life easier we made the intro to python and intro to pandas (aka HW0) so as long as you do it it'll save you a lot of time googling.

So do it!!!! It'll help you a lot in future assignments.

Ummmm yeah! 416 is fun and chill, don't stress out and we promise you'll walk out with something useful to apply to whatever happen in the future.

Colaboratory Notebook.

(PART II)

PYTHON AS AN INTERPRETED LANGUAGE

Big Takeaway:

An "Interpreter" runs code one by one, and no need to re-compile the entire thing!

Why is that important?

- You can test a small snippet of code without re-run the entire thing.
- That means all other variables and loaded data will still be in the memory.
- Imagine you have a HUGE dataset, takes an hour to load, and you realized made a typo in your code after you press the run button.
- In compiled languages, it's gonna be a nightmare!!!!

Some terms:

Markdown: Neat way to format text. Looks great.

Notebook (Generally): Python code snippets + Markdown for explanation.

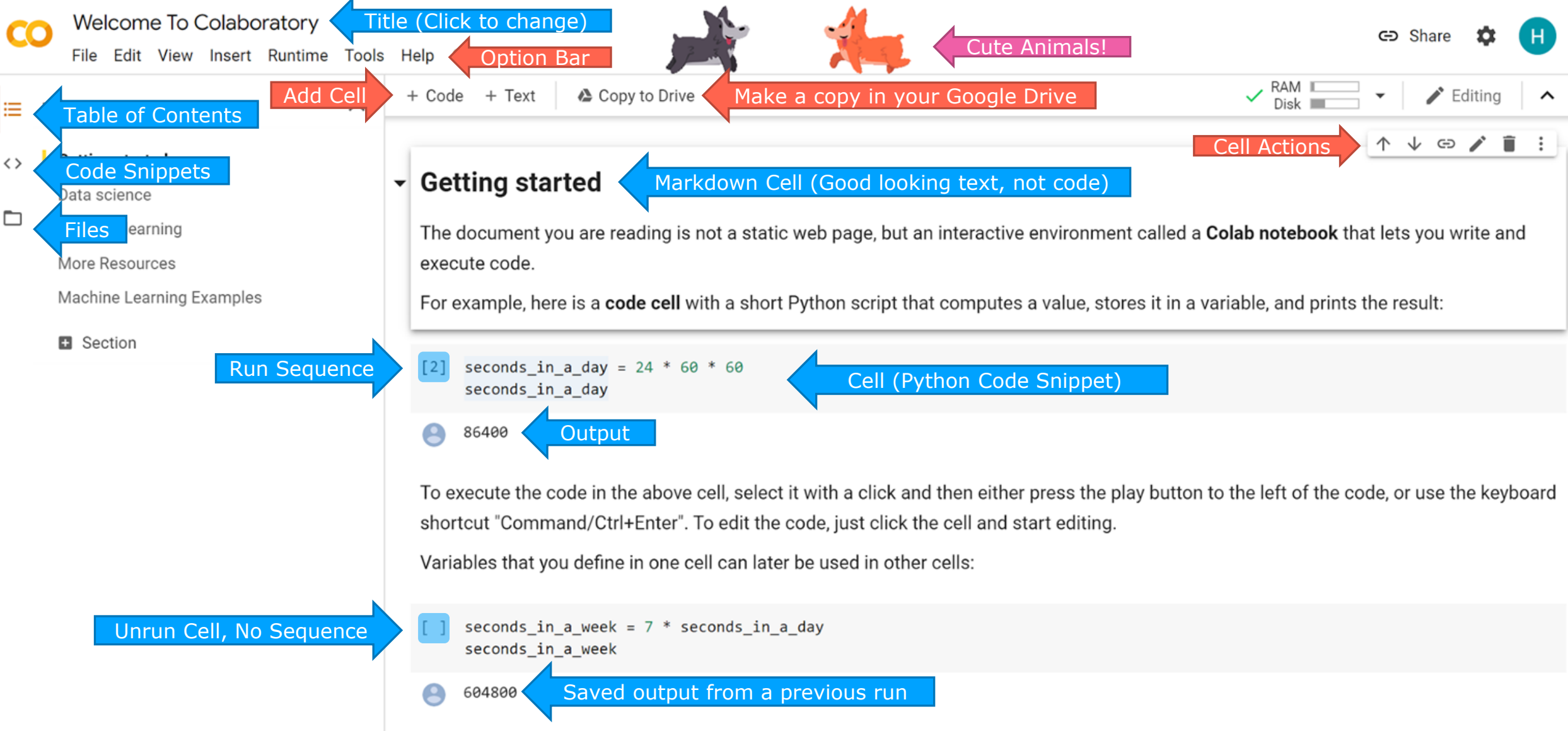
COLABORATORY NOTEBOOK

For the past couple quarters we've always given students options to use either a local Jupyter Notebook or Google Colaboratory Notebook (A Jupyter Notebook hosted by Google on the cloud with free GPU support).

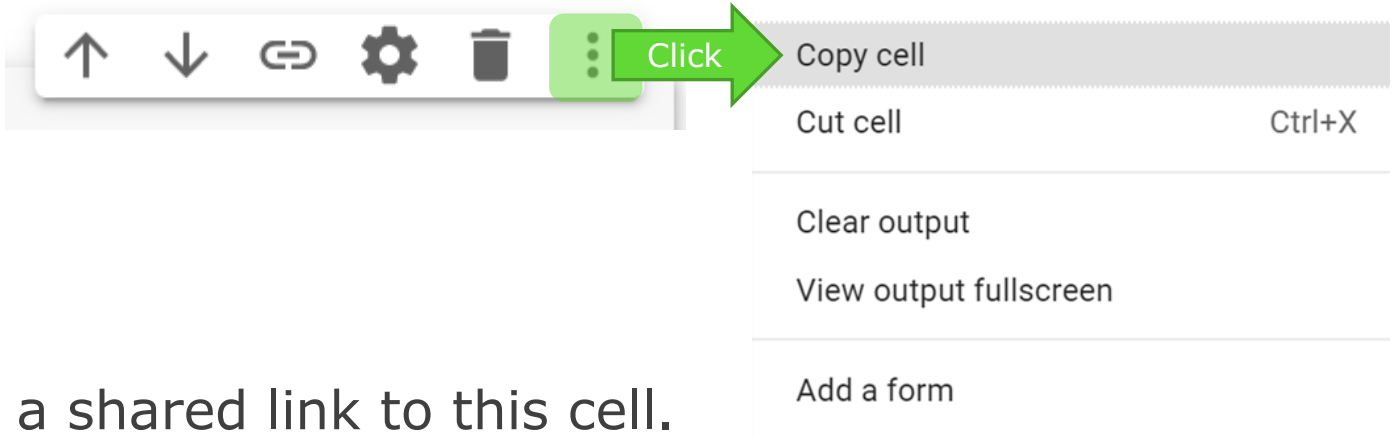
However, it's tOo mUcH tROuBle for everyone to setup an environment and install all the required packages with the correct versions. **We'll use the Google Colaboratory as the official notebook for Summer 2020.**

You are welcome to setup an Python environment on your computer and run your personal projects. **We will just treat everyone the same as if they did all their homework using Google Colaboratory**.

COLAB FOR NOOBS – MAIN INTERFACE



CELL ACTIONS INTERFACE



: Move Cell Up

: Move Cell Down

: Link to Cell - Create a shared link to this cell.

: Colaboratory Editor Settings

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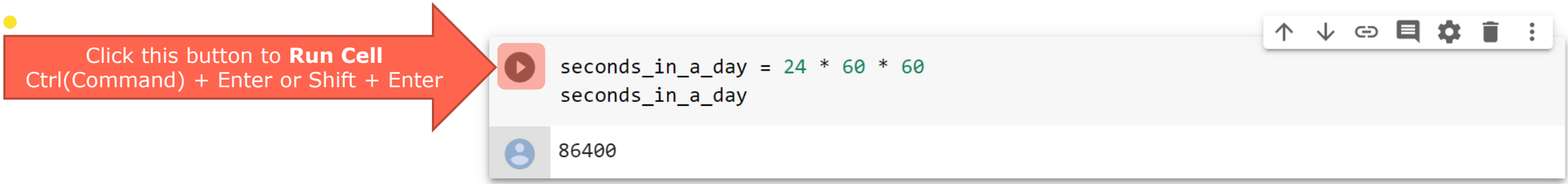
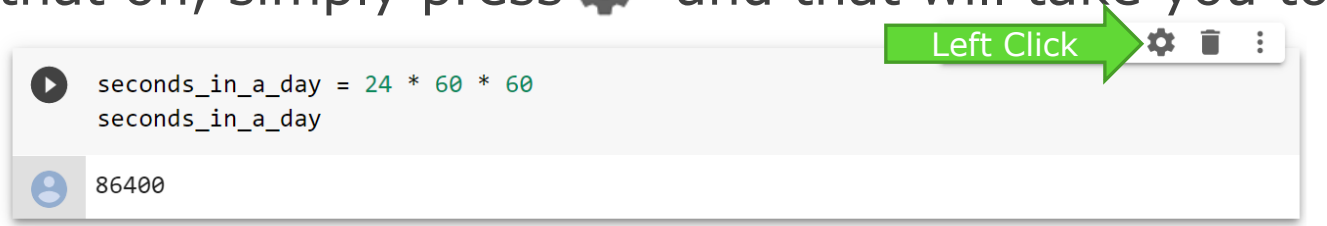


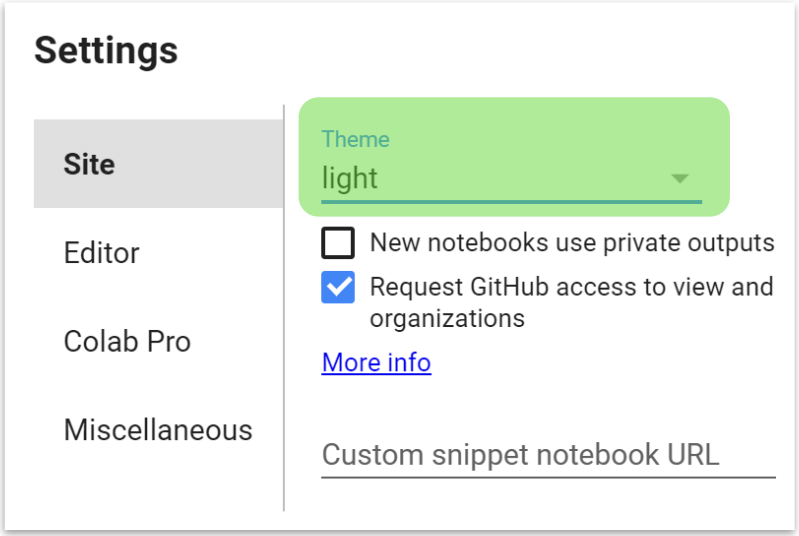
BUT I'M A CAT PERSON!!!!!!

Colab has very cute kitty mode and corgi mode, as well as dark mode.

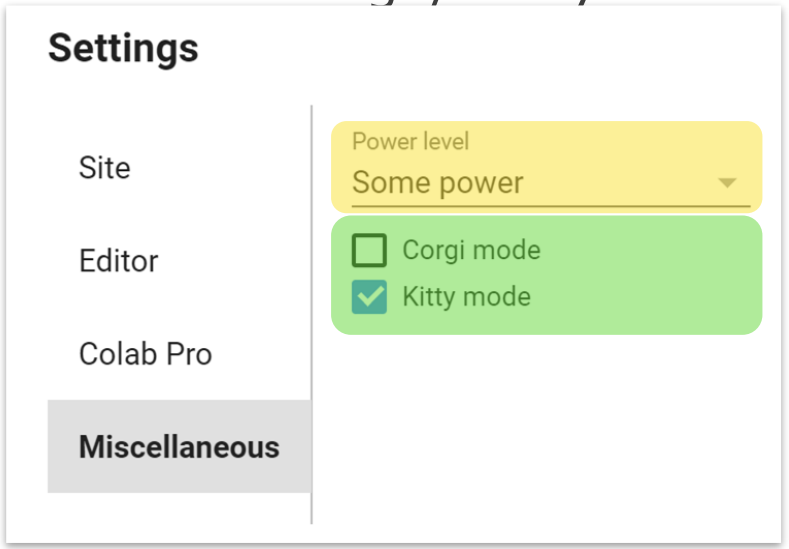
To turn that on, simply press ⚙ and that will take you to settings.



Switch to Dark Mode:

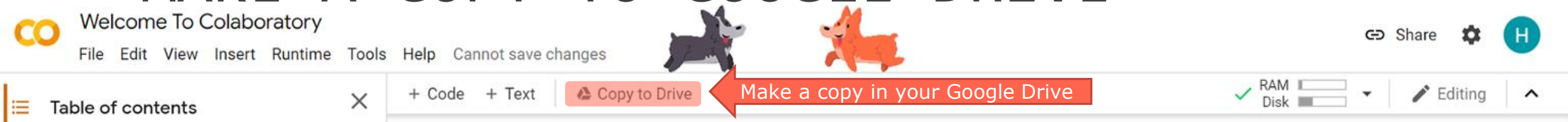


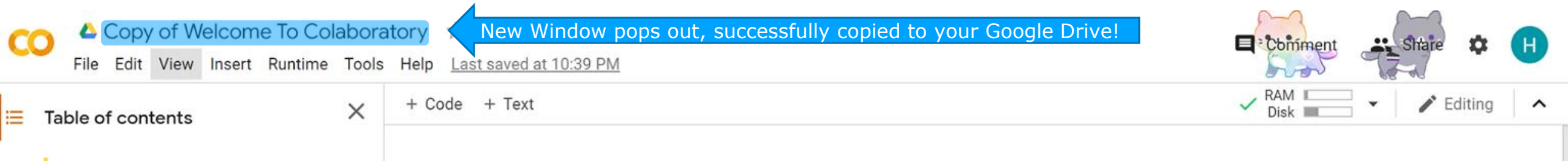
Switch to Corgi / Kitty Mode:

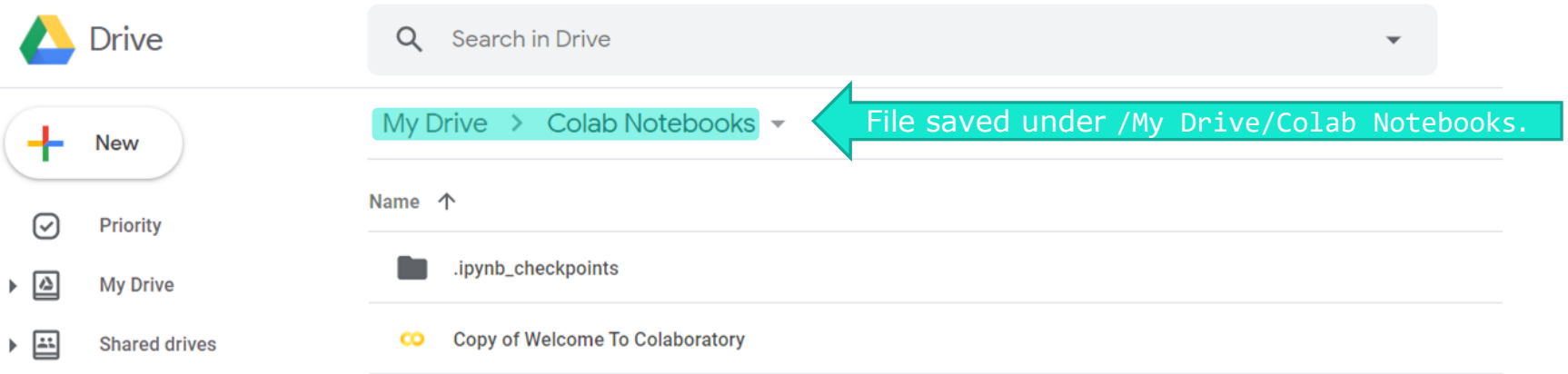


We'll leave power level a fun thing for you to explore.

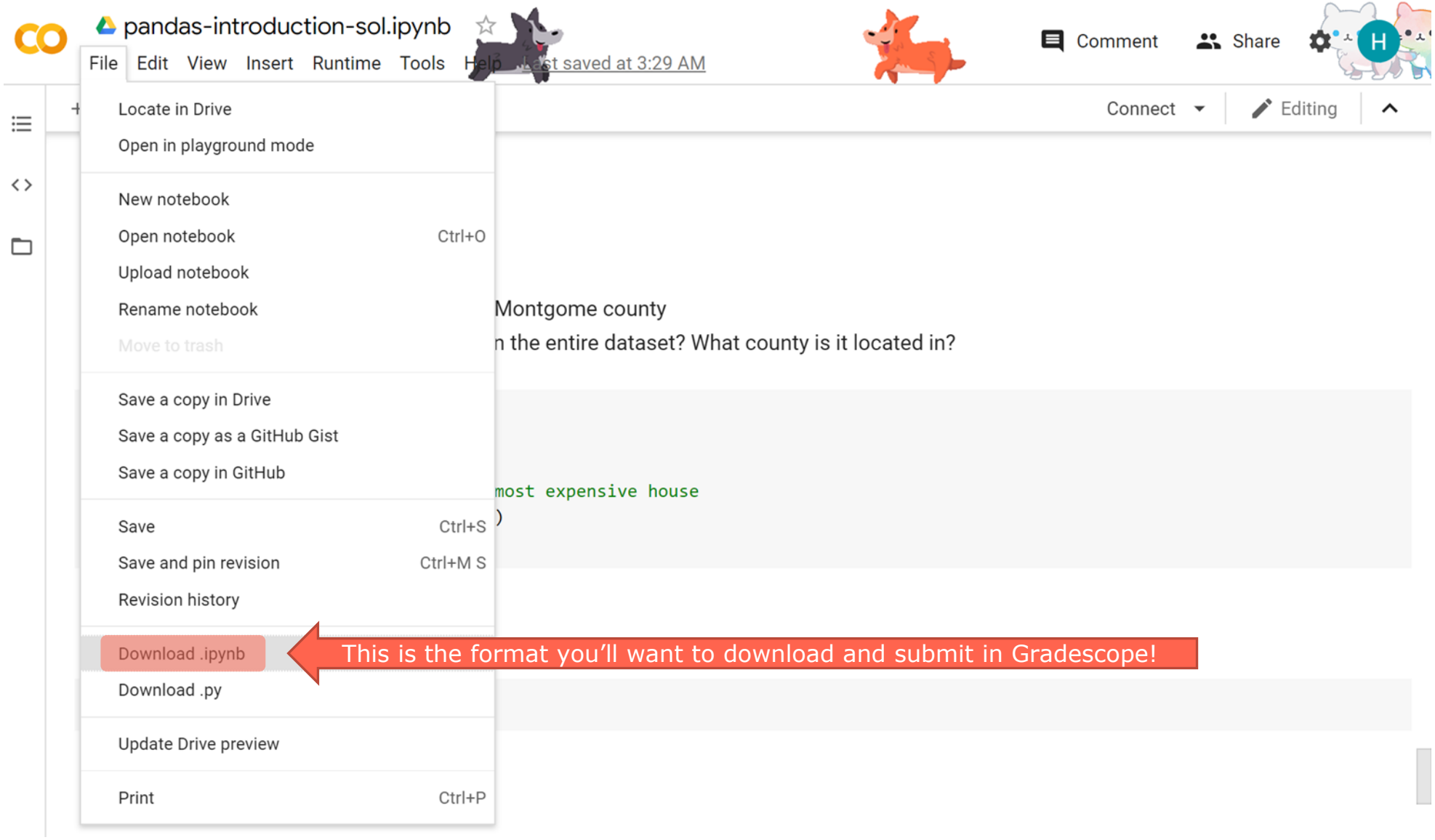
MAKE A COPY TO GOOGLE DRIVE



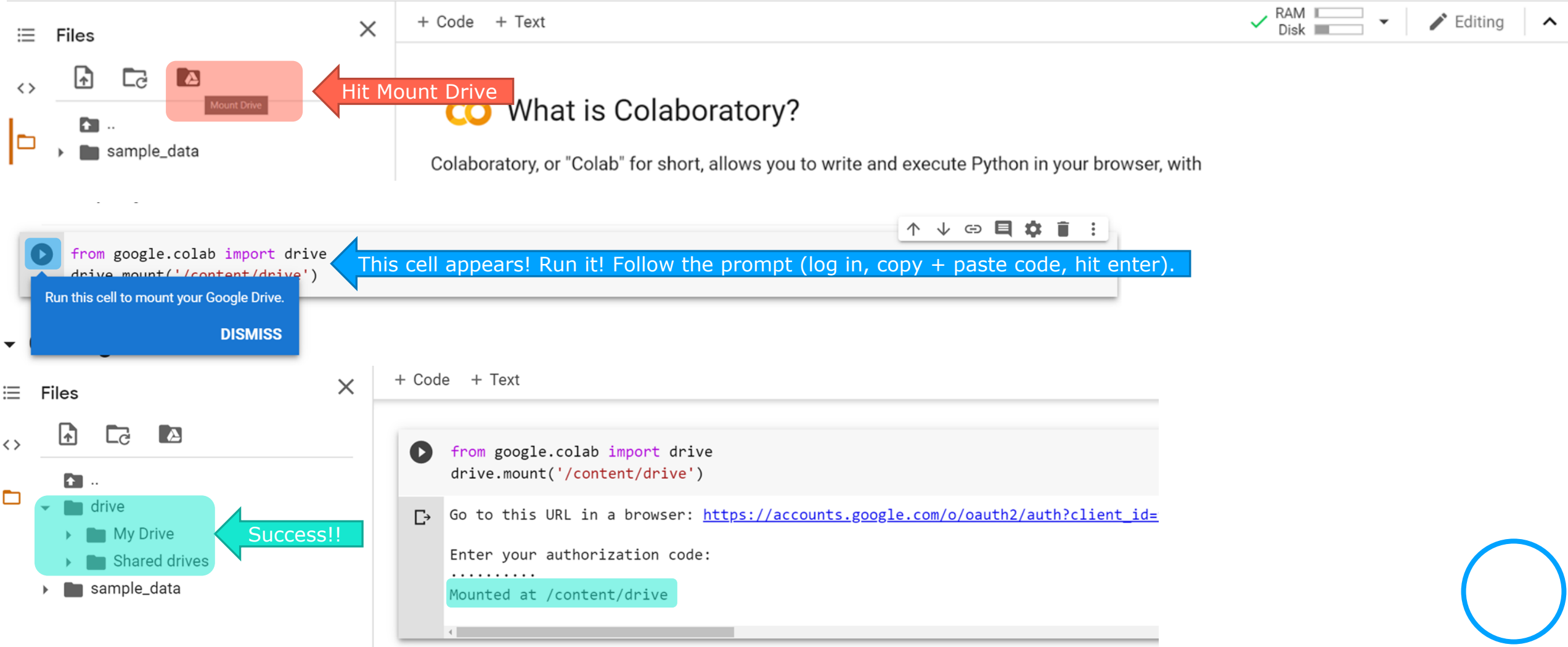




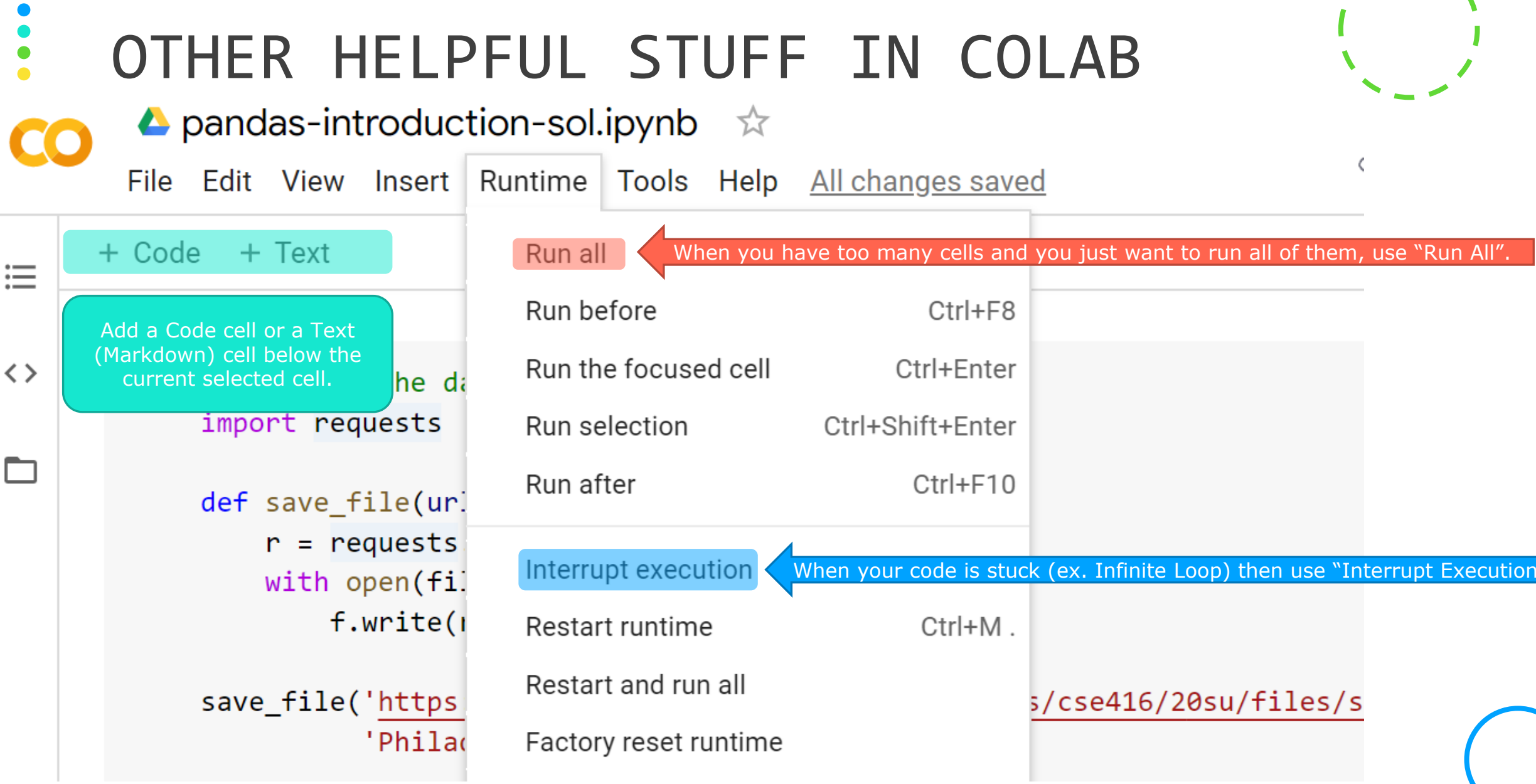
DOWNLOADING FILE TO SUBMIT



MOUNT GOOGLE DRIVE IN COLAB



OTHER HELPFUL STUFF IN COLAB



LEARN MARKDOWN IN FIVE MINUTES

Markdown:

A super easy way to make text look nicer. [Markdown Guide](#) website is very useful.

Without making stuff too complicated, the minimum amount to get you started:

Headings: Prepend "# " in front of your heading, the **FEWER** "#" you have the bigger the heading, and you need a space between that and the actual heading to make it work.

Paragraphs: Just use a blank line to separate one or more lines of text.

Bold: **Text you want it bold**

Italic: *Text you want it italic*

Blockquote: >Text you want to be blockquote

Code: `your code here`

Ordered Lists: Prepend the number you want, like "1. ", "2. ", "3. " in front of stuff you want to list.

Unordered Lists: Just prepend "* ". ("+ ", "- " will work too)

Links: [Make sure to like and subscribe to CSE416](https://courses.cs.washington.edu/courses/cse416/20su/)

Python & Pandas.

(PART III)

NOTEBOOKS WE WILL USE:

Introduction to Pandas (Blank)

Introduction to Pandas (Solution)

WORKING WITH PANDAS IN ONE PAGE

Import package: import package as nickname (too lazy to write full name)

Import CSV (aka dataset): dataset = nickname.read_csv()

Look at the first couple data in the set: dataset.head()

Specific column: dataset[‘Column Name’]

- (add .min() .max() .mean() to calculate whatever you want to calculate)

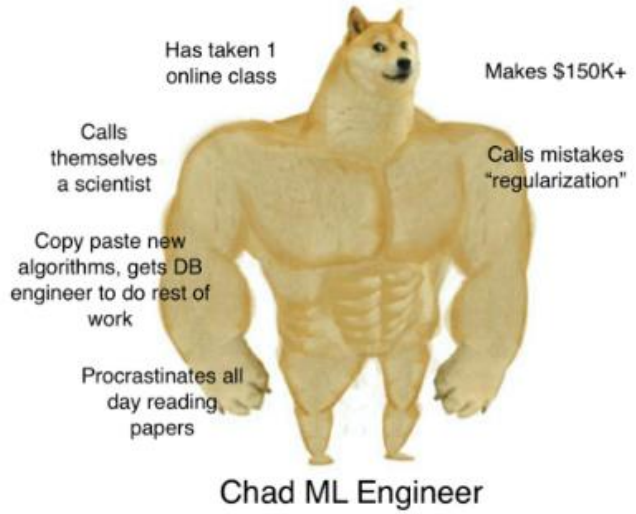
Index a specific cell in dataset: dataset[‘Column Name’].iloc[index]

Filter: dataset[boolean condition]

How many rows: len(dataset)

How many columns: len(dataset.columns)

Names of columns: dataset.columns



Other Stuff

(PART IV)

INSTALL PYTHON LOCALLY (JUST FYI)

This slide exists just for your information, you don't need this.

More info check out Spring 2020 course website

Video I recorded last year on installing (Python 3.6) might be helpful if you can't figure out how to install.

How to install a package if missing:

```
conda install whatever_you_want_to_install
```

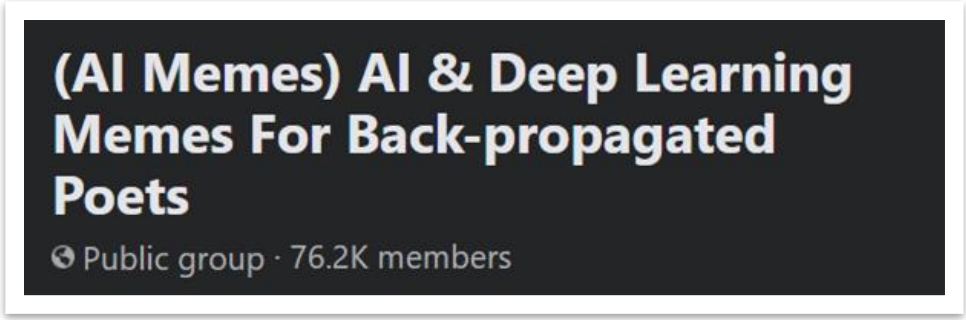
- Windows: Run **Anaconda Prompt** / macOS and Linux: **Terminal**
  - If doesn't work, try `pip install whatever_you_want_to_install`
- Colab: I believe you can just type `pip install whatever_you_want_to_install` into one of the cells and it would install.

MEMES

Tbh the most fun thing (at least for me) after taking 416 is you start to understand memes about machine learning…

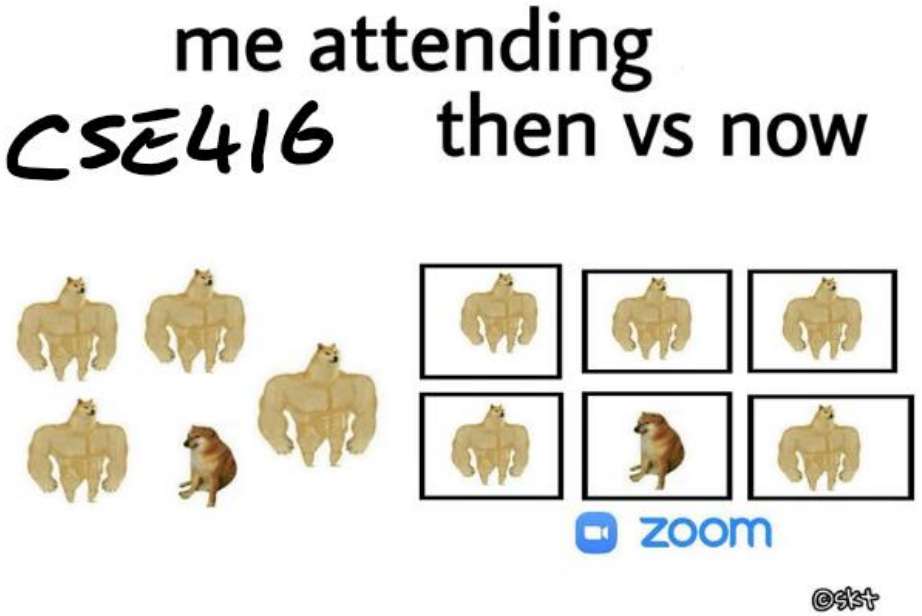
Here’s my source of memes lol as the quarter goes you’ll understand these memes more and more!

https://www.facebook.com/groups/1638417209555402



CREDITS

1. Syntax and Semantics, Slide #4
2. Kaggle, Learn Python



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