STAT 453: Introduction to Deep Learning and Generative Models

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Lecture 07: Cloud computing resources

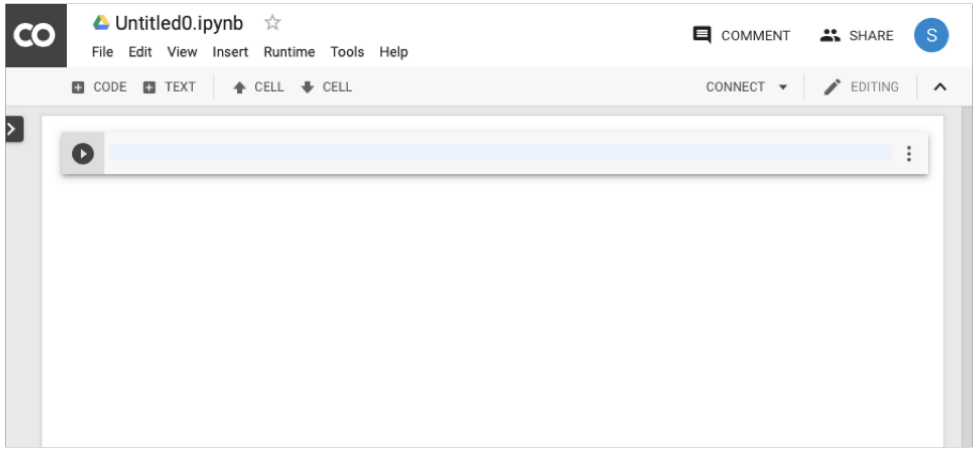
September 24, 2025

Today: Computing partial derivatives with PyTorch

1. **Google Colab**
2. Center for High-Throughput Computing

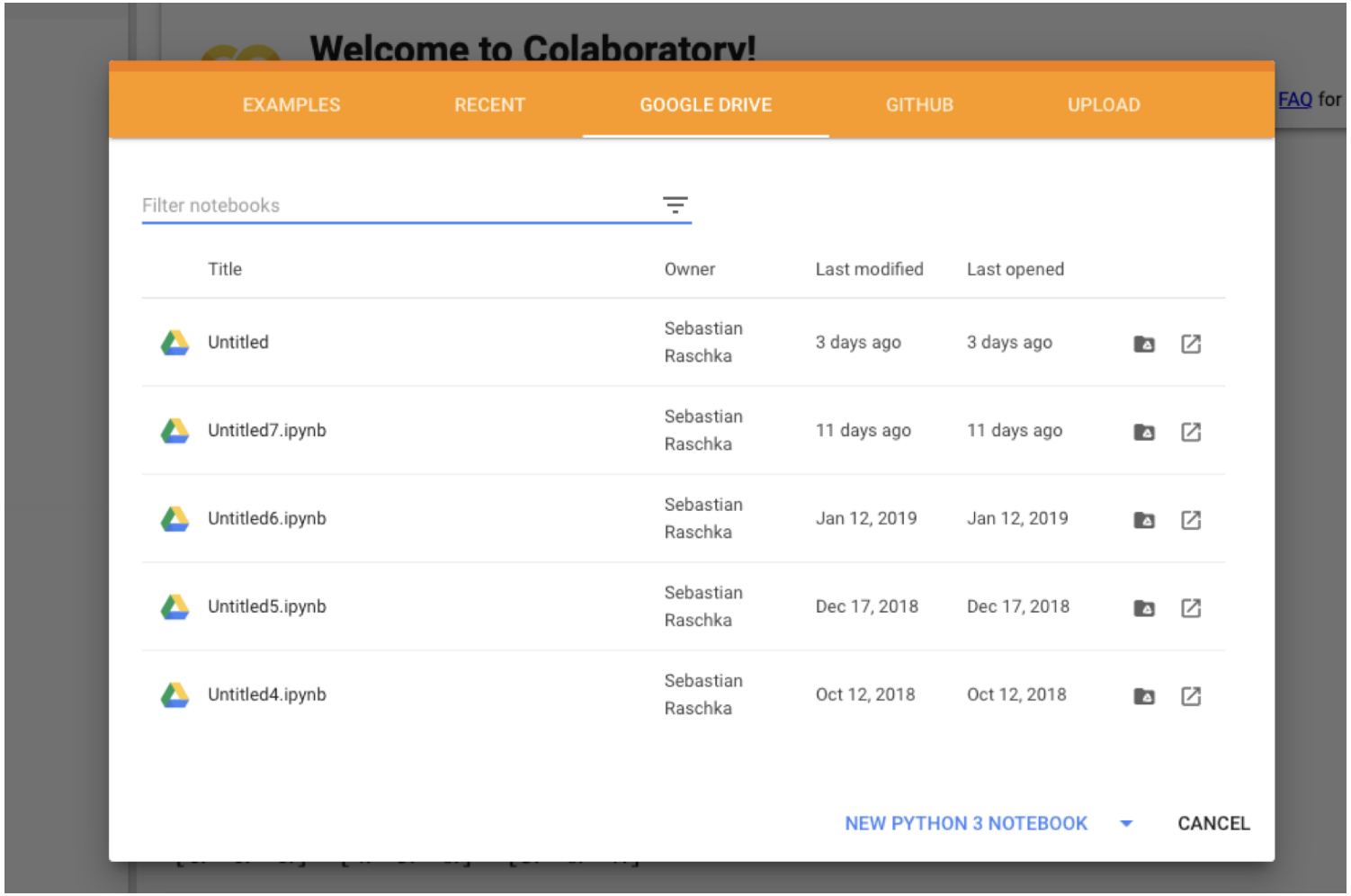
Google Colab

https://colab.research.google.com



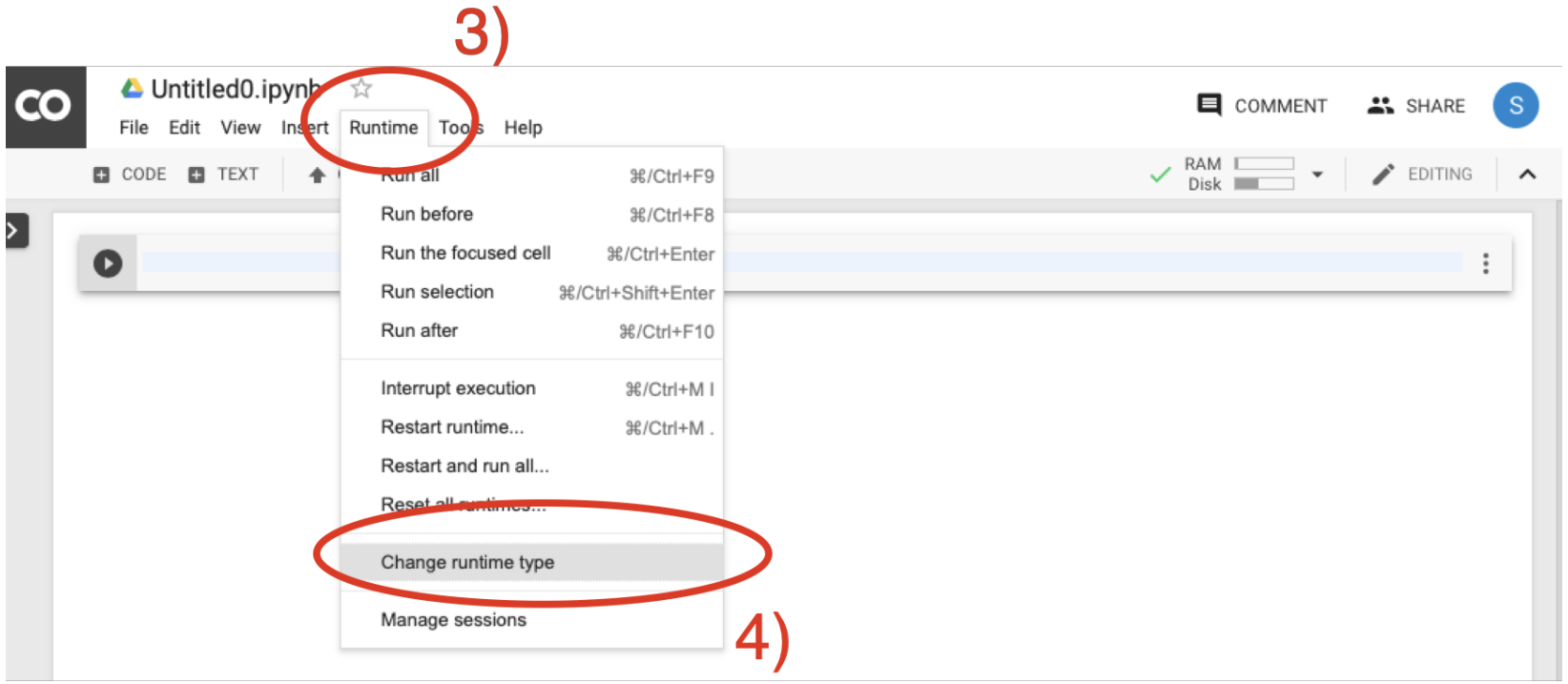
- Free Google-flavored Jupyter Notebooks in the Cloud
- For each notebook, they spin up a custom (Linux-based) computing instance
- Computations limited to ~12 h though; you won't lose your notebook, but computations will be interrupted
- Maybe useful for quick testing/experimenting/sharing (but maybe tedious as you need to reinstall packages each time)

Google Colab



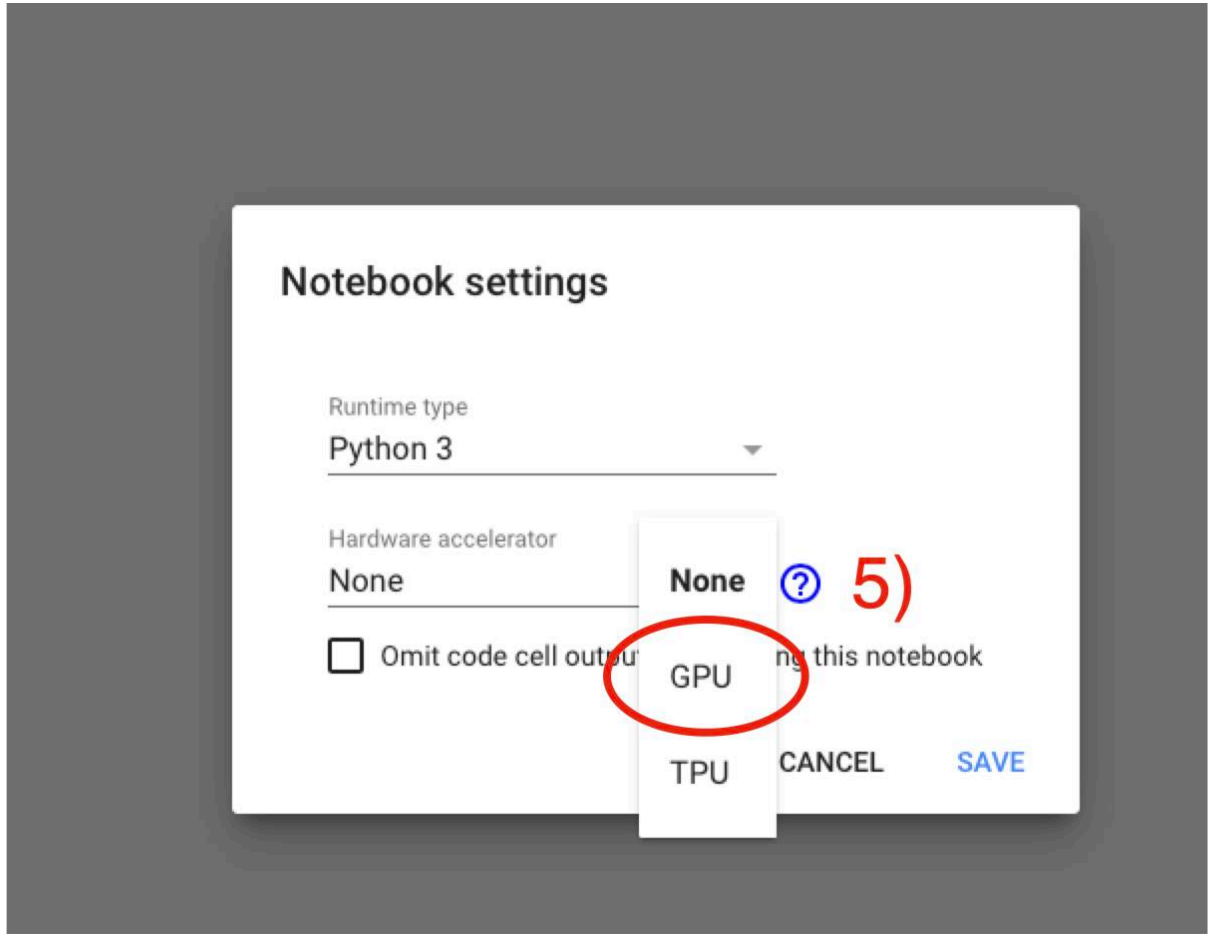
Menu appears if you visit https://colab.research.google.com

Google Colab



Follow these steps for running code on GPU later (default is CPU)

Google Colab



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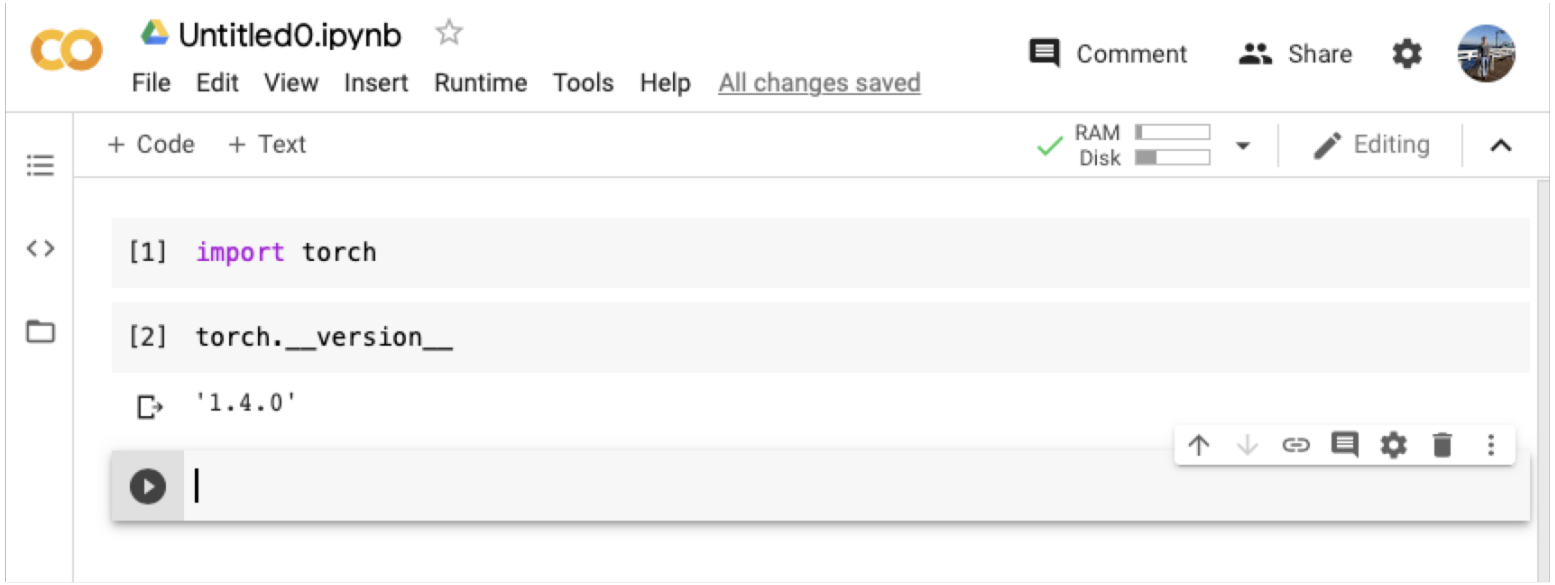
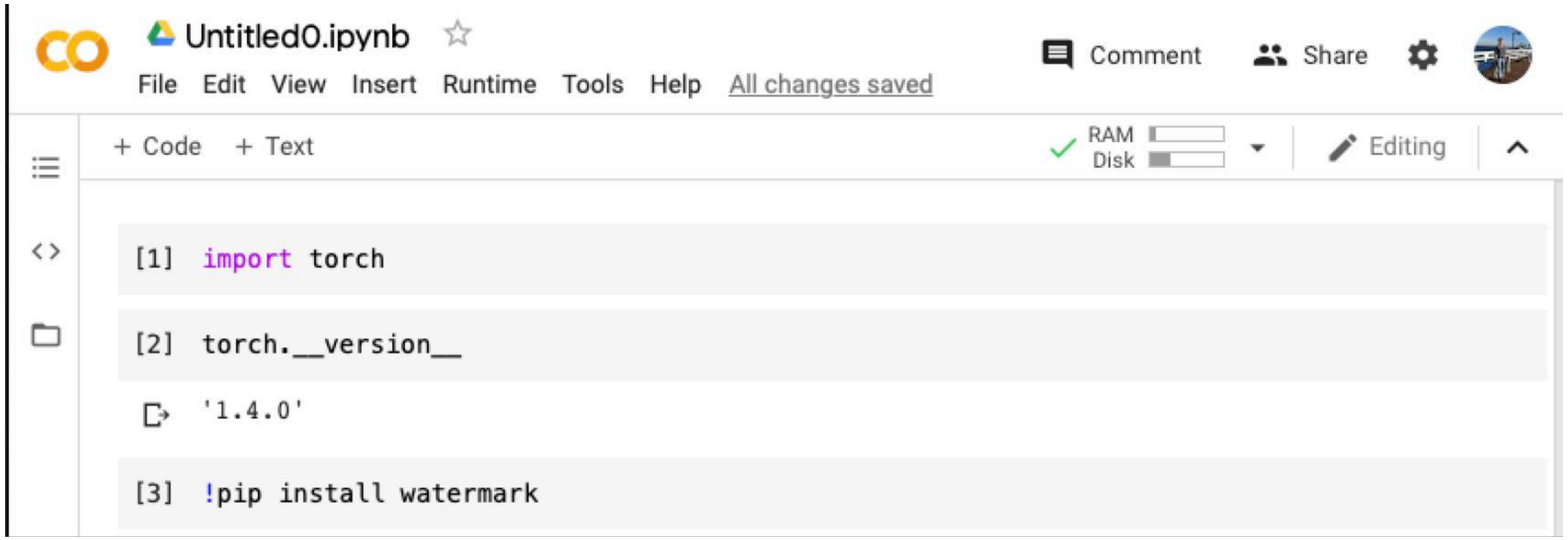
Google Colab



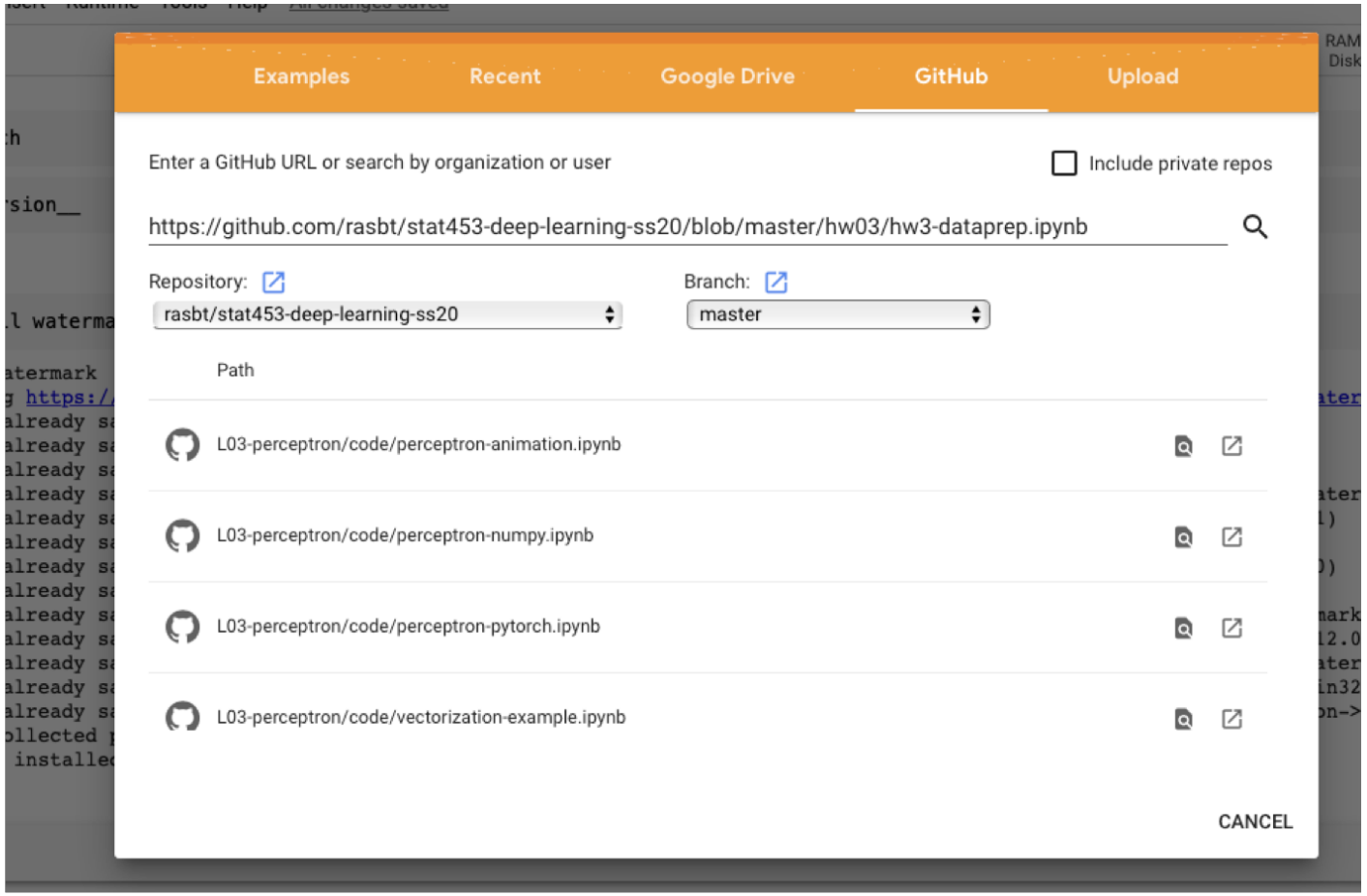
- This is nice! It appears that PyTorch is already pre-installed now (it wasn't always the case)

Google Colab



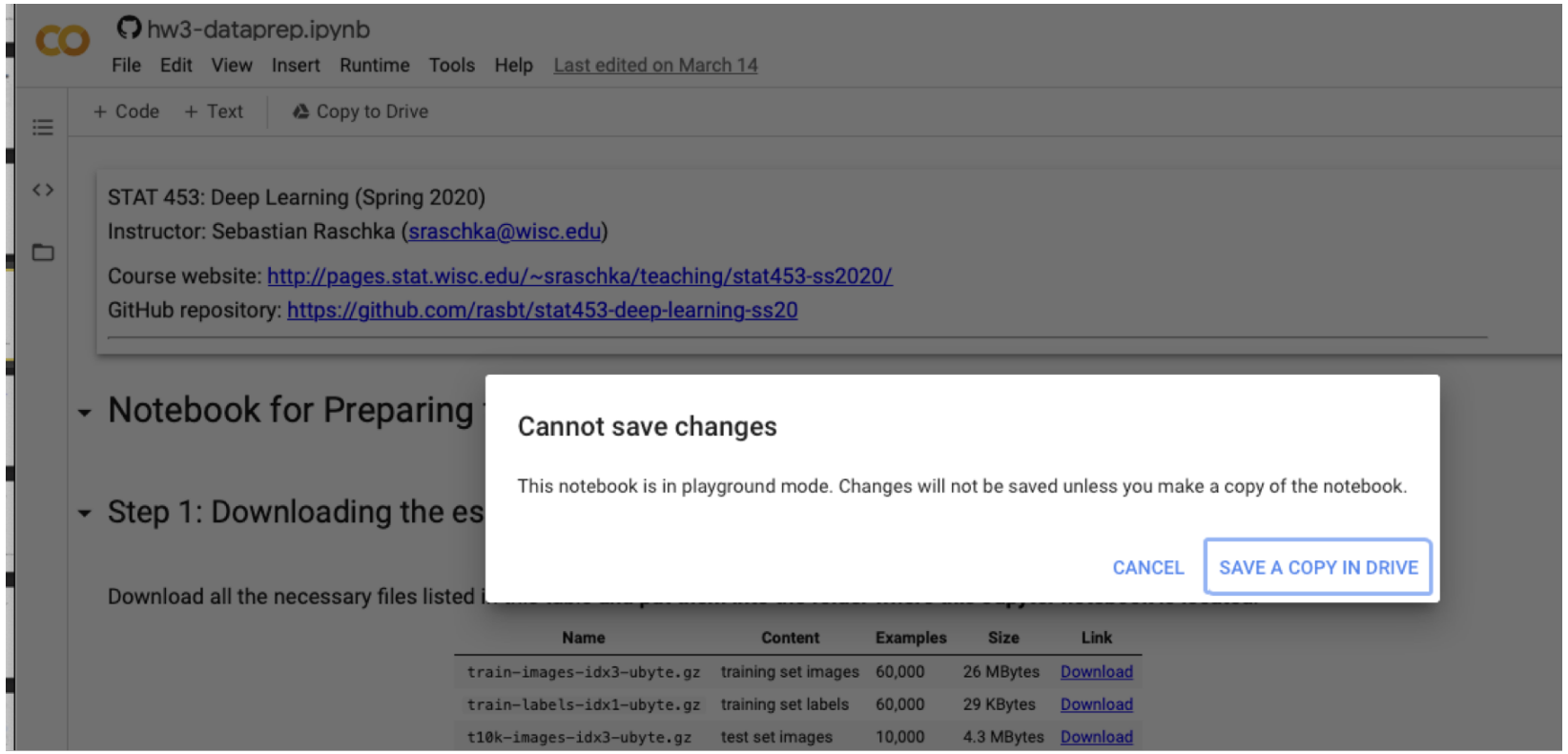
- In any case, if you'd like/need to install packages, you can do it as shown in the example above
- Note that in Jupyter Notebooks, the "!" indicates that what follows on that line is a "shell command" (you can think of a "shell" as the Linux & macOS command-line terminal, e.g,. a Bash Shell)

Google Colab



- You can also upload Notebooks or directly paste GitHub links to notebooks

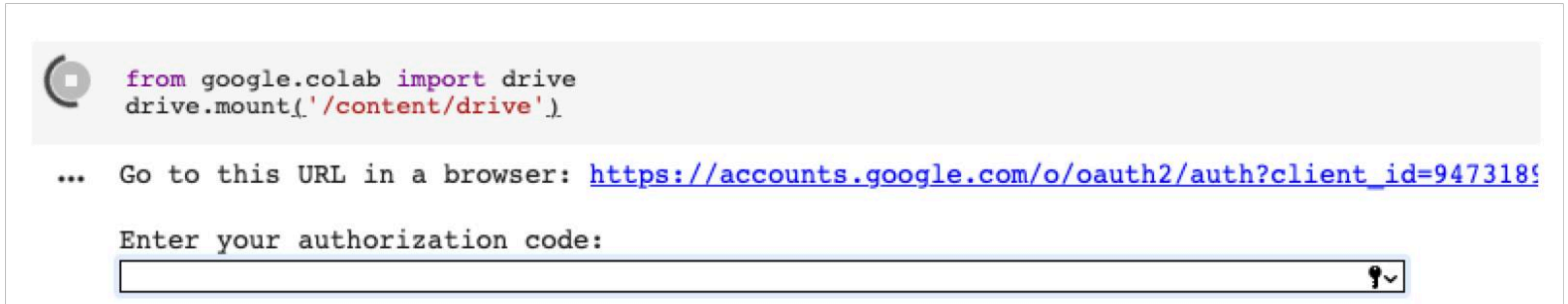
Google Colab



When you import a Notebook from a GitHub link, make sure to save it in your Google Drive if you plan to make edits, otherwise it will be gone later

Mounting your Google Drive to the Notebook

1)



Then, click on the link and enter it in the field above

2)

3)

Mounting your Google Drive to the Notebook

Once mounted, you can open dataset files

```
[16] # this code cell unzips the .gz files

     import sys
     import gzip
     import shutil
     import os

     writemode = 'wb'
     zipped_mnist = [f for f in os.listdir('/content/drive/My Drive/Colab Notebooks/hw03') if f.endswith('ubyte.gz')]
     for z in zipped_mnist:
         path = os.path.join('/content/drive/My Drive/Colab Notebooks/hw03', z)
         with gzip.GzipFile(path, mode='rb') as decompressed, open(path[:-3], writemode) as outfile:
             outfile.write(decompressed.read())
```

```
        with open(labels_path, 'rb') as lbpath:
            magic, n = struct.unpack('>II',
                                     lbpath.read(8))
            labels = np.fromfile(lbpath,
                                 dtype=np.uint8)

        with open(images_path, 'rb') as imgpath:
            magic, num, rows, cols = struct.unpack(">IIII",
                                                   imgpath.read(16))
            images = np.fromfile(imgpath,
                                 dtype=np.uint8).reshape(len(labels), 784)

        return images, labels


    X_train, y_train = load_mnist('/content/drive/My Drive/Colab Notebooks/hw03', kind='train')
    print('Rows: %d, columns: %d' % (X_train.shape[0], X_train.shape[1]))

    X_test, y_test = load_mnist('/content/drive/My Drive/Colab Notebooks/hw03', kind='t10k')
    print('Rows: %d, columns: %d' % (X_test.shape[0], X_test.shape[1]))
```

```
Rows: 60000, columns: 784
Rows: 10000, columns: 784
```

Center for High-Throughput Computing (CHTC)

Last Year Serving UW-Madison

1K Facilitator Interactions

312 Projects Supported

34K HTC Core Years

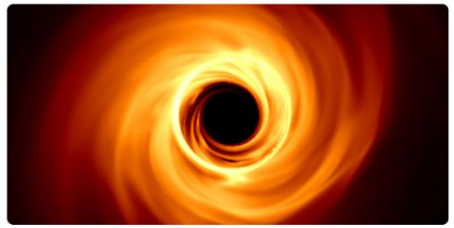
6K HPC Core Years

College	Projects Supported	HTC Core Years	HPC Core Years	Facilitator Interactions
Agricultural and Life Sciences	62	8,038	54	159
Education	5	216	-	10
Engineering	66	3,342	4,221	316
Law	1	181	-	1
Letters and Sciences	112	11,645	1,244	440
Medicine and Public Health	42	7,172	54	154
Off-Campus Collaborations	14	2,852	138	-
Pharmacy	5	75	258	7
Veterinary Medicine	5	21	-	-
Total	312	33,542	5,969	1,087

Center for High-Throughput Computing (CHTC)

chtc.cs.wisc.edu

HTCondor Celebrates 40 Years Powered by Community
July 25, 2025



HTC Strikes Again
June 09, 2025

The Center for High Throughput Computing (CHTC), established in 2006, aims to bring the power of High Throughput Computing to all fields of research, and to allow the future of HTC to be shaped by insight from all fields.

Are you a UW-Madison researcher looking to expand your computing beyond your local resources? Request an account now to take advantage of the open computing services offered by the CHTC!

Request Account

Upcoming Events

Questions?