← Go Back to Elective Project

Course Content

Project FAQ - SVHN Digit Recognition

Frequently Asked Questions

Deep Learning Project

1) For the deep learning project, should I use Google Colab or Jupyter?

The Deep Learning Projects are supposed to be completed on Google Colab only. While working on deep learning projects, a higher value of RAM would be needed (because we may need to operate on large data sizes). To handle that Google colab is a better option than Jupyter.

Besides, the notebooks import many libraries whose installation in local systems, often become an issue. The Tensorflow library is the best example for the same. There is often a version mismatch that creates problems while importing certain dependencies.

2) I'm getting the error "No module named Google.colab" and/or "!pip install Google" is unable to download any library called Google.

The module 'Google' is not available in local environments like Anaconda / Jupyter. You'll need to use Google Colab from your preferred browser. The first relevant link will take you to their online code editor.

3) Do I need to install every library on Google Colab?

Since Colab is a cloud-based Development Environment, it has most of the libraries pre-installed and ready to be imported. We can also install some dependency/libraries or change the version of the existing libraries if we want.

4) How do I mount my drive to my Google Colab notebook?

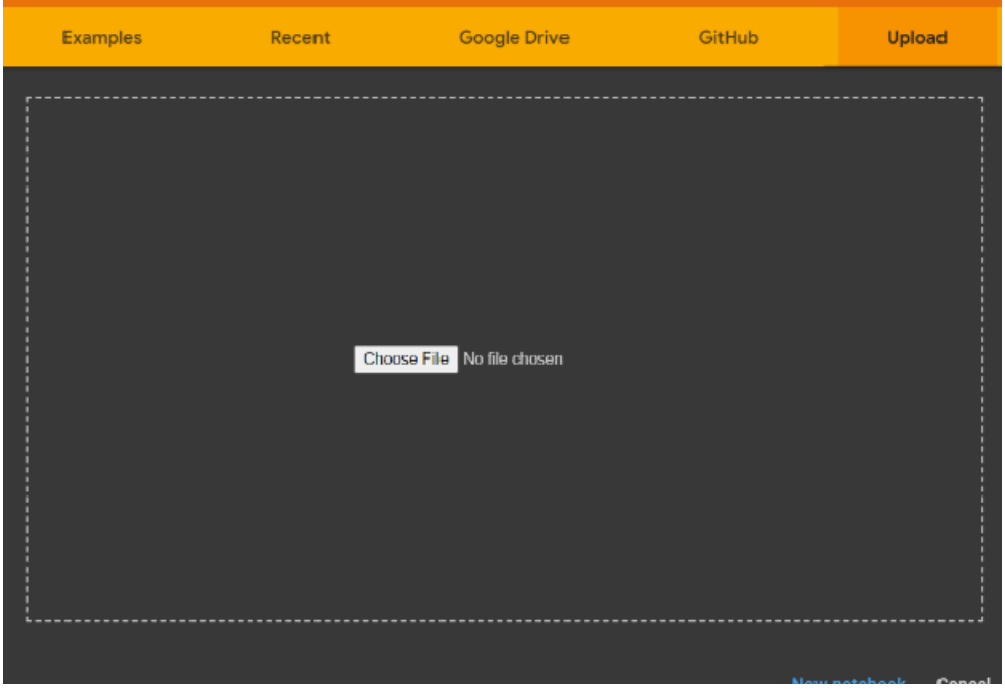
To mount your Google Drive, you need to run these two lines of code:

```
from google.colab import drive
drive.mount('/content/drive')
```

5) Can I upload my notebook from the local system to Google Colab? If yes, how?

Yes, you can upload notebooks from your local system. In the first dialog box that appears when you open up Google Colab, the horizontal bar on top has an 'Upload' tab. Click on it.

Click on ‘Choose File’.

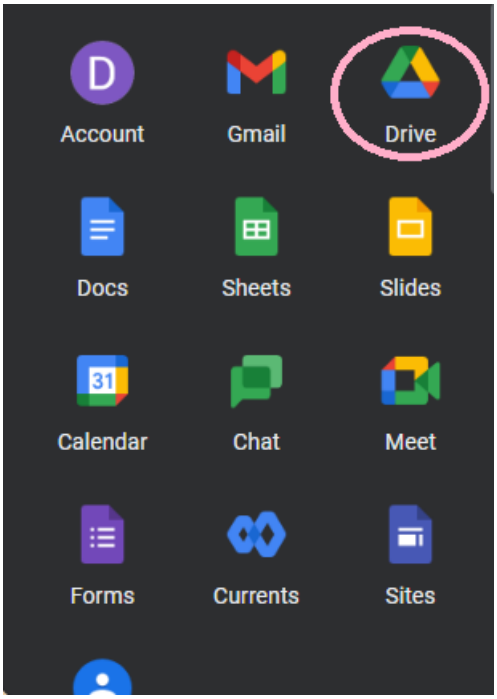


This will allow you to upload your notebook from your local system.

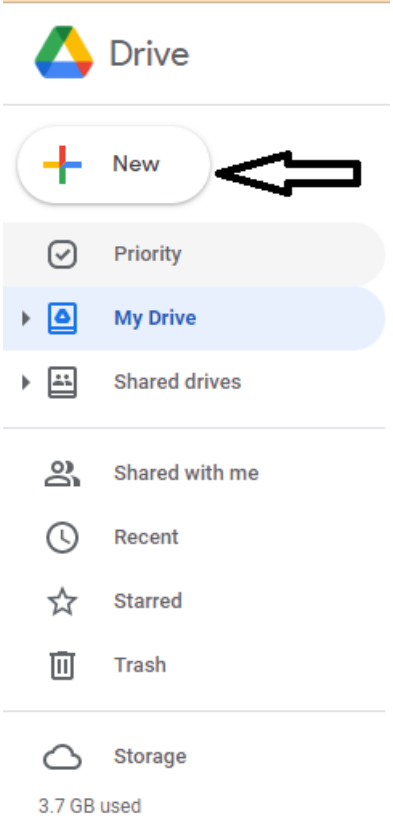
6) How should I import the dataset to my Google Colab notebook?

To import the dataset from your Google Drive, you have to download the dataset from your Learning Management System.

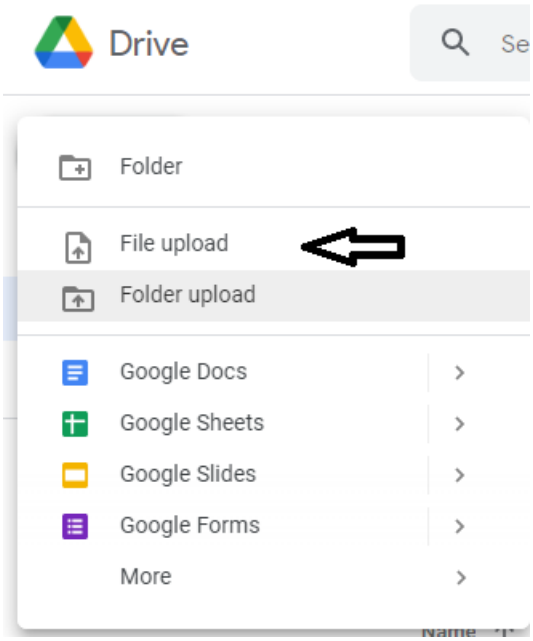
Then go to your Google Drive.



Then you need to upload the dataset to your Google Drive. To do that, first you need to click on the 'New' button



Then a drop down menu will appear. Click on the ‘File Upload’. This will allow you to upload your file to your Drive from your local system.



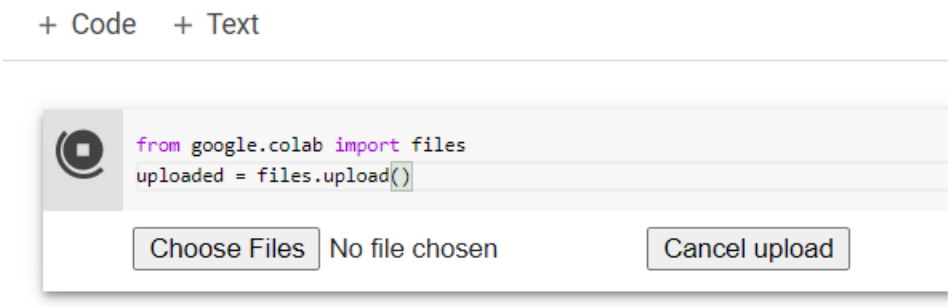
Note down the name of the dataset on your drive. Then you can import the dataset by using the path as: '/content/drive/MyDrive/example.csv'. Please note: You need to provide your file name and the appropriate extension in place of 'example.csv'. Also if your dataset is present inside a particular folder on your drive, then the path will be modified as: '/content/drive/MyDrive/folder_name/example.csv'.

To import the file directly into the notebook,

you have to run the following snippet of code:

```
from google.colab import files
uploaded = files.upload()
```

You'll see, the following options appear in the console. Click on 'Choose File'.

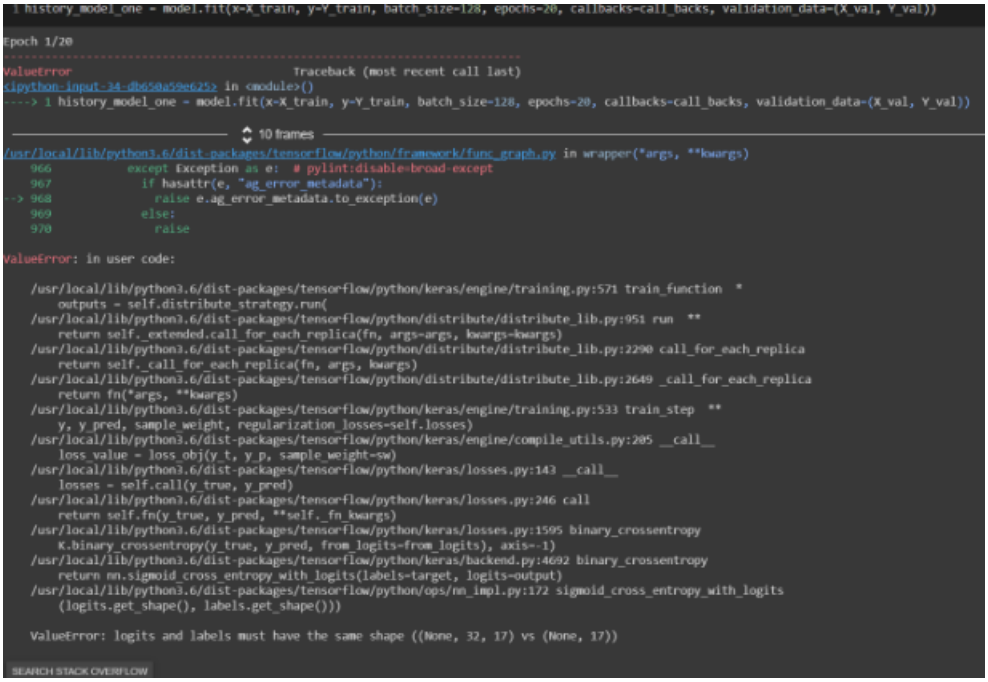


Then a window will appear that lets you upload the file from your local system. The limitation of this method is, that your dataset has to be in a single file. If it is a folder, you cannot upload it using this method. Then what you can do is, you can create a zipped version of the folder and then upload it. You can then unzip the folder using the following snippet of code.

```
path = 'example.zip'
with zipfile.ZipFile(path, 'r') as zip_ref:
    zip_ref.extractall( )
```

You can even use the above lines of code when you upload the dataset to your Google drive in zipped format and you want to unzip it after importing it. Please be sure to update the 'path' variable accordingly. Your path variable will become '/content/drive/MyDrive/example.zip'. And like mentioned before, if it's present inside any folder within the Google Drive, then your path will be '/content/drive/MyDrive/folder_name/example.zip'

7) Why am I getting an error saying 'Logits and Labels must have the same shape'?



To resolve this you need to make sure that the input shape and the number of neurons given in the final layer of your Neural Network Architecture are correct. The input shape should equal the shape of your images and in the output layer, there should be as many neurons as the number of classes you're trying to classify the images into.

8) What is a Runtime in Google Colab?

Since Colab is a cloud based Development Environment, it needs to allocate each user some Virtual RAM and some virtual GPU. But since keeping the resource allocated for a particular user, would require higher cloud computational power, Google Colab has this feature where it connects you to a runtime only when you want to run a particular snippet of code. And similarly, for saving resources, it disconnects your runtime when you are idle for long. Sometimes a poor internet connection may also lead your runtime to be disconnected.

9) What happens when my Runtime is disconnected?

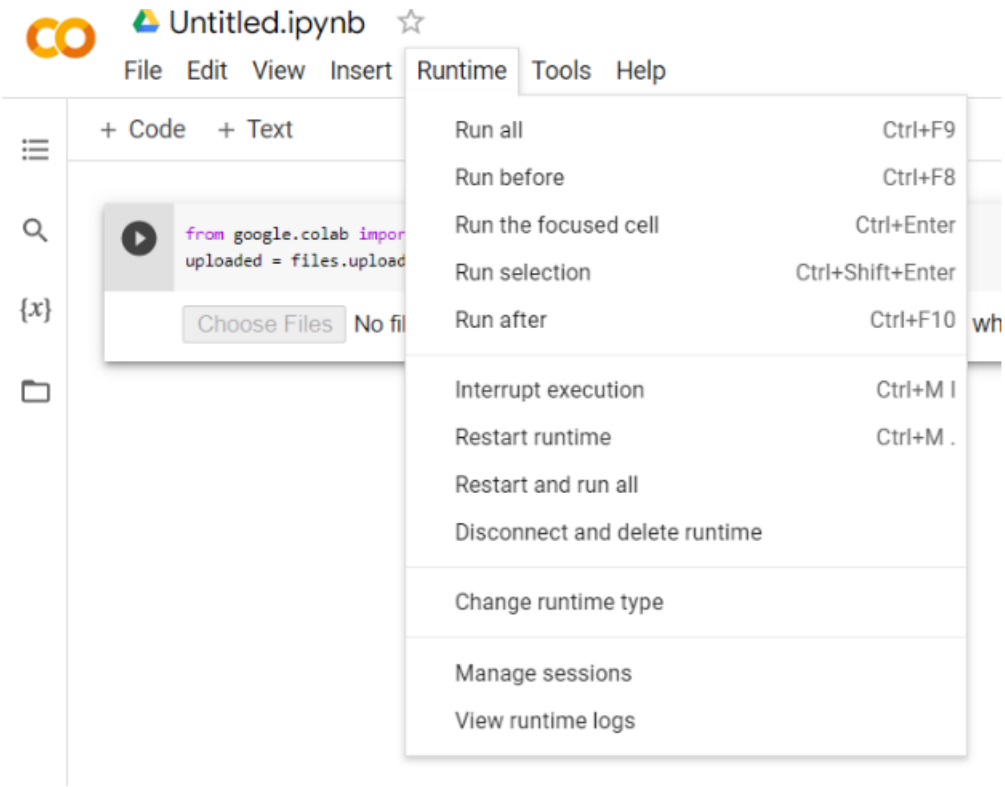
The execution of your notebook stops. You will lose your state variables and other information stored in variables. Your dataset might need to be re-imported or re-uploaded, depending on your case. And you need to run all the cells from the start of the notebook.

10) How can I prevent my Runtime from being disconnected?

We can try to reduce the idle-time spent on notebooks. However, sometimes it is not in our control. We can go for Google Colab Pro if we want longer runtimes.

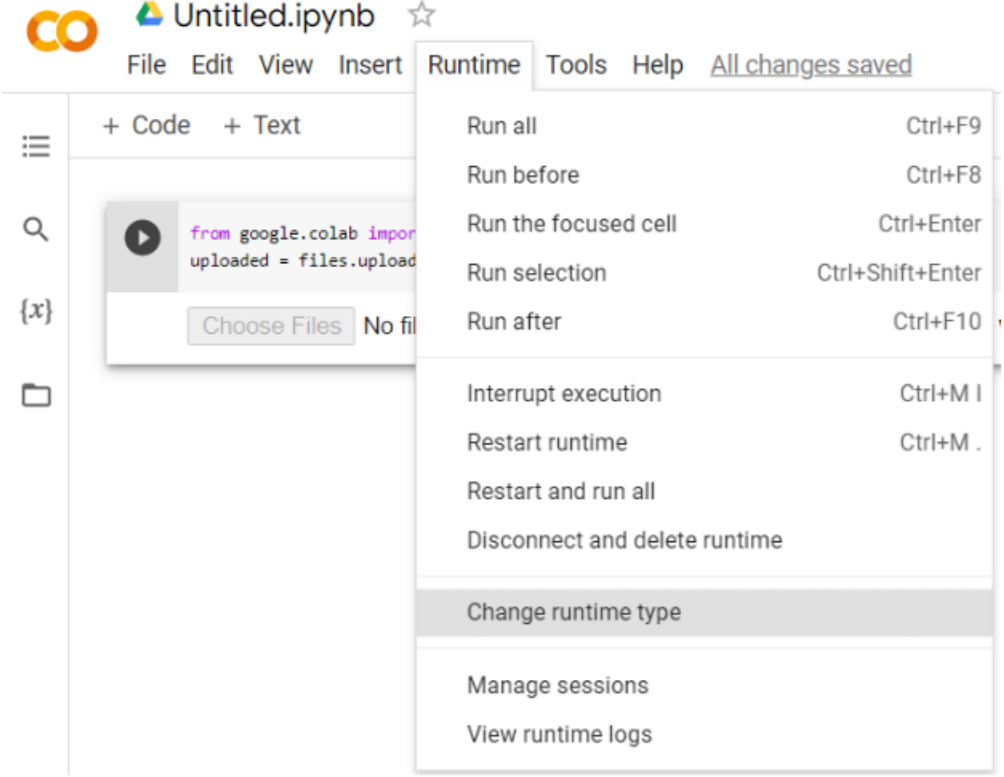
11) How can I disconnect and/or delete, interrupt runtime? Also how can I ask my notebook to run all or a selection of cells on its own without having me manually run each cell or a particular sequence of cells one by one?

The horizontal task panel on top has an option called 'Runtime'. You can click on it and a drop down menu will appear which will have all the custom execution options available within the Colab Notebook.

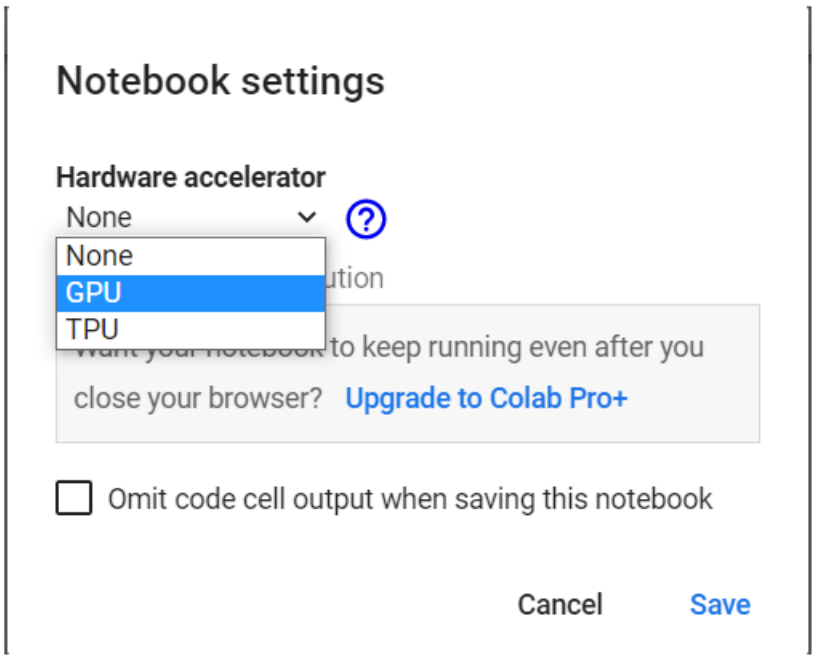


12) How to switch to a GPU Runtime in Google Colab?

In order to switch to a GPU runtime, you'll need to click on the 'Runtime' option in the option bar. Then a drop down menu will appear where you'll see the option 'Change Runtime Type'.



After clicking on 'Change Runtime Type', you'll be shown another smaller dialog box.



On the top of this dialog box, you'll see the 'Hardware accelerator' option. Select 'GPU'. Your Runtime is now accelerated by the Virtual GPU provided by Google Colab.

13) The accuracy plots/confusion matrices in my notebook are different from the ones present in the reference notebook? Am I doing something wrong?

The graphs can be different. It happens because the weights are initialized randomly and gradient descent may converge taking different routes. As a matter of fact, every time you restart your Runtime, your results will be different from the previous time.

To elaborate on why these differences are experienced, our model's weights do not actually converge to the local minima. It comes close to the optimal values, but they never converge. This happens because of two reasons. Firstly, we train our models for a limited number of

epochs, and secondly, the datasets we train our models on, might not be large enough and hence, we experience overfitting. Similarly, the confusion matrices are also slightly different each time we train the model from scratch.

Even though results don't repeat themselves exactly, you can get somewhat similar results even after restarting runtimes, when you're using a TPU Runtime instead of a GPU Runtime. Please refer to the Google Colab FAQ in case you need help with switching between TPU/GPU Runtimes.

14) Do I have to follow the exact architecture described in markdowns or can I make modifications of my own?

You can build an architecture of your own. But please be sure that your input shapes match the shape of the images and your output layer has as many neurons as the classes you're classifying these images into. You can refer to the practice case studies, practical applications, and even the MLS notebooks to get familiar with the syntax, and then you can proceed to build your architectures. Just be sure to implement what is asked in the markdowns. For example, if the markdown asks you to add BatchNormalization layers, then be sure to add them to your own architecture.

15) Why am I getting an error saying 'Dataset has already been created' or 'Dataset already exists'?

This error usually happens when you run a cell more than once that was supposed to be run exactly once. To resolve this error, please remove the 'callbacks = callbacks ' parameter from the model.fit() function. In case this parameter is not there, try restarting the runtime and running each cell sequentially and exactly once.

16) What should be the input shape in the case of ANNs and CNNs?

For ANN, the input shape should be (1024,)

```
def nn_model_1():

    model = Sequential()

    model.add(Dense(64, activation = 'relu', input_shape = (1024, )))
```

For CNN, the input shape should be (32, 32, 1)

```
# Define the model

def cnn_model_1():

    model = Sequential()

    model.add(Conv2D(filters = 16, kernel_size = (3, 3), padding = "same", input_shape = (32, 32, 1)))
```

17) Which loss function shall we use in this project?

We have to use categorical_crossentropy because this is a multi-class classification problem.

18) What should I do to increase my accuracy?

You can try playing around with your model architecture to pick the best working model. For example, you can try to increase the number of neurons or layers, add or remove Dropout layers and/or BatchNormalization layers, etc.

You can also increase the number of epochs for training. The downside to this is, that you may experience overfitting on training data.

19) How do we add activation functions to our layers in our Neural Network?

We add an 'activation' parameter in our Dense or Convolutional layers. The way it works is, that it automatically applies that activation function to the output of the corresponding layer. Let's look at an example.

```
model.add(Dense(32, activation = 'relu'))
```

In this example, a ReLu activation function is being added to the output of this Dense layer which has 32 neurons.

20) I am getting a Syntax error for a particular line of code while building my Sequential model, but I can't locate any error in that particular line.

This often happens because of a syntax error in the previous line. Oftentimes, it's just a missing parenthesis.

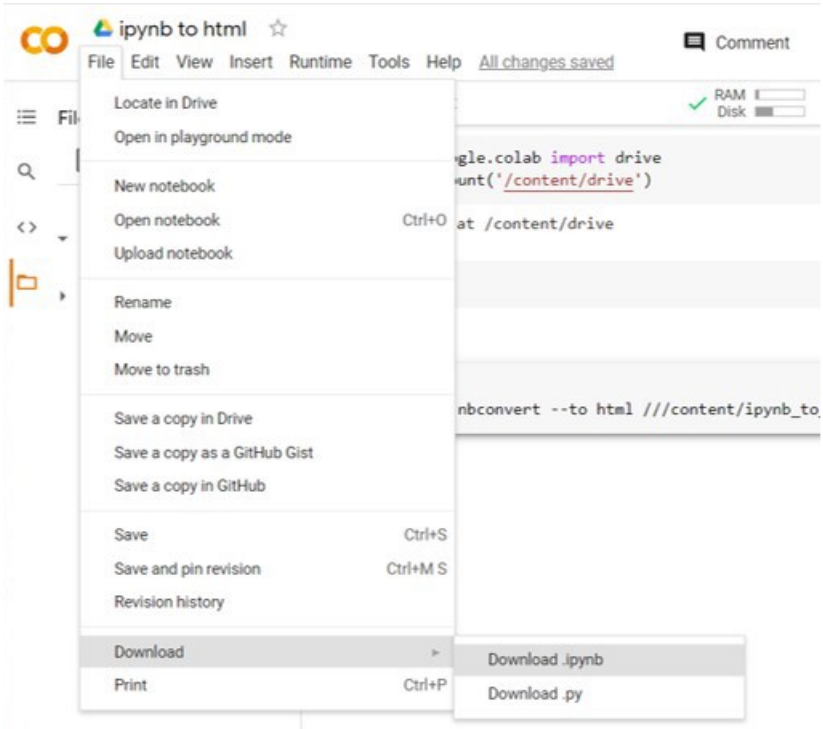
21) How to convert the .ipynb file from your Colab to .html format for submission?

There are two ways you can do this,

Let's take a look at the first method.

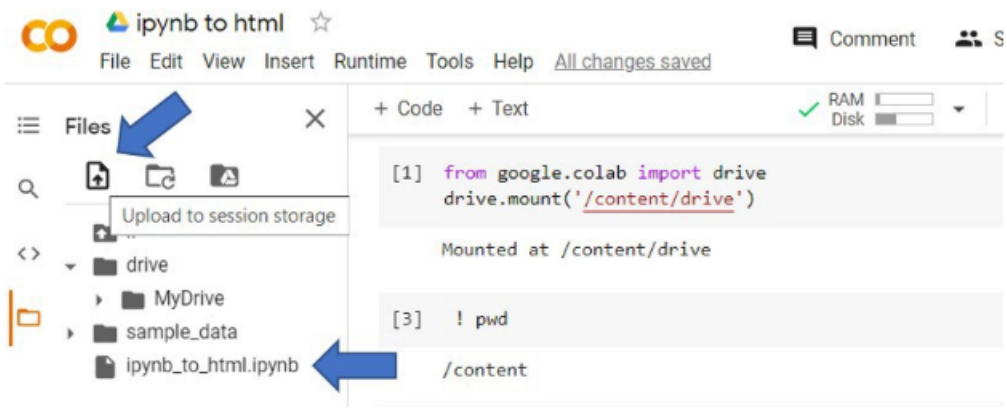
Method 1

Step.1. Download your colab notebook, at the top right, click File → Download → Download .ipynb



Step.2. Then Re-upload the downloaded .ipynb to the session storage.

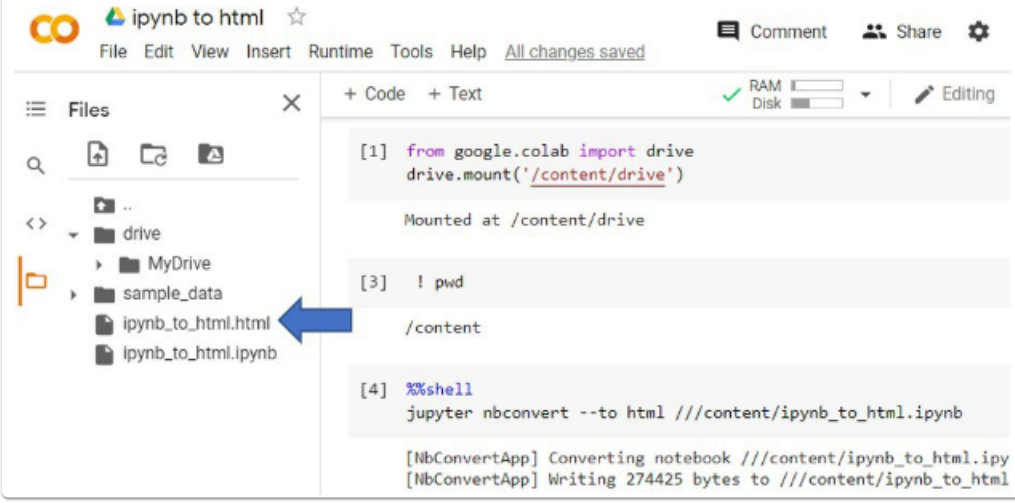
To do that, click on the button pointed at by the blue arrow at the top. Say, we have a notebook called 'ipynb_to_html.ipynb' which we want to convert from .ipynb to .html. You'll see that the file will appear in the Google Colab files, as shown by the blue arrow at the bottom.



Step.3. Run the below script and click the refresh icon under Files.

```
%%shell
jupyter nbconvert --to html //Your notebook path file.ipynb
```

You will see your notebook as .html (as marked with a blue arrow).



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