

# **CoE202**

## **Fundamentals of Artificial intelligence**

### **<Big Data Analysis and Machine Learning>**

## **How to use Google Colab**

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School of EE, KAIST

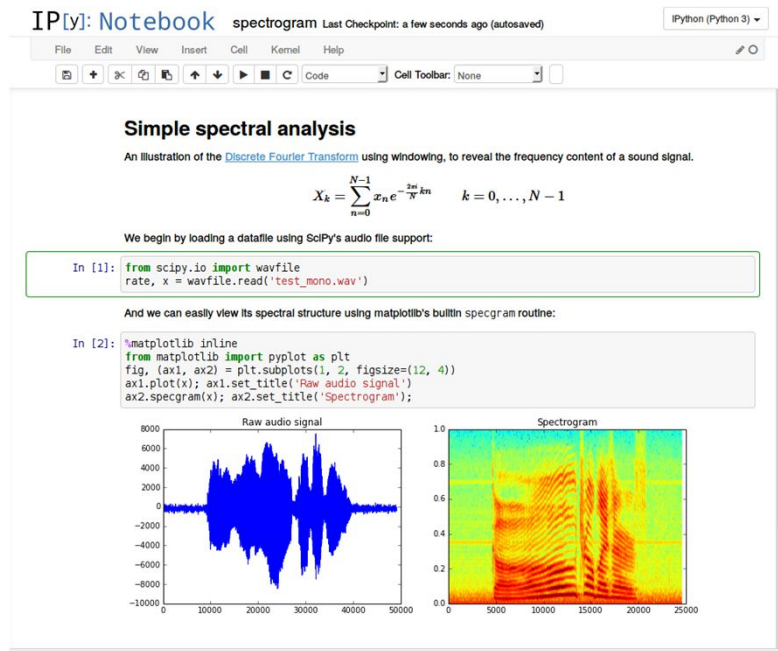
\*Colab manual by TA. Jeewon Kim

# Contents

- **iPython**
- **Google Colab**
  - **What is Google Colab**
  - **Using with Google Drive**
  - **Importing mat file**

# iPython

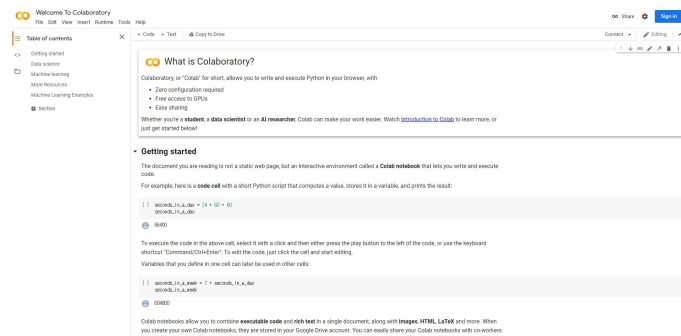
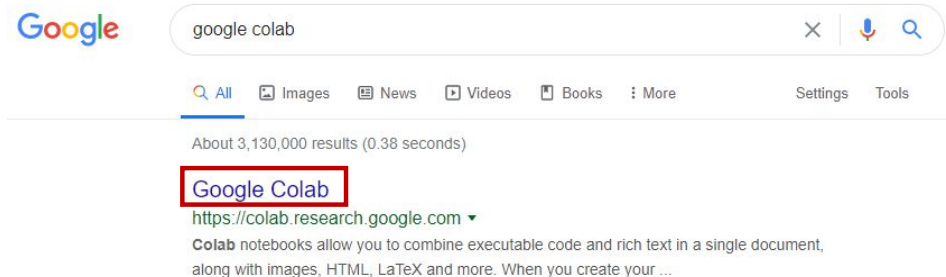
- Interactive Python
- iPython is a command shell for interactive computing
- Browser-based
- Interactive running
- Interactive visualization
- Flexible





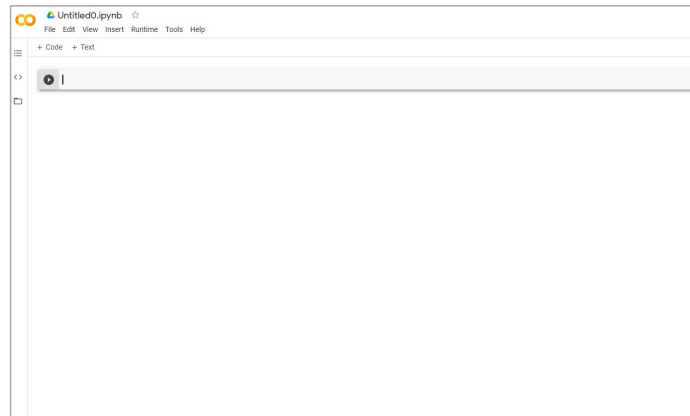
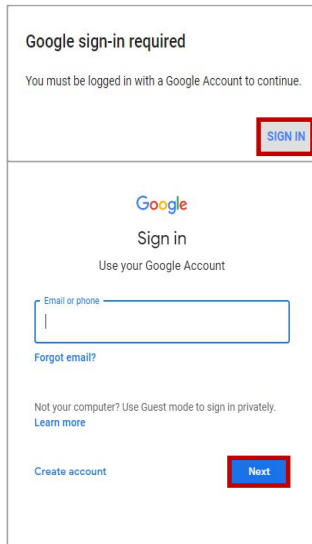
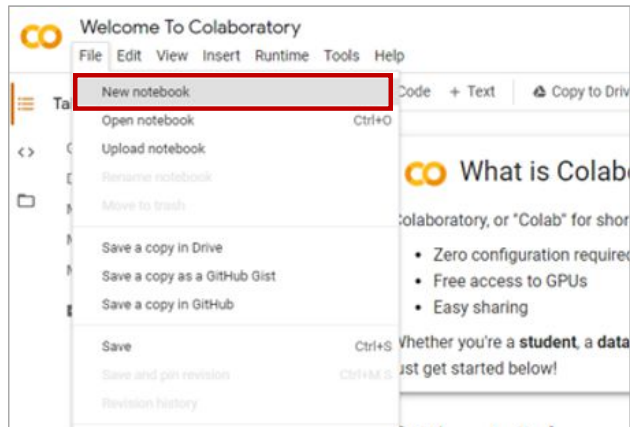
# What is Google Colaboratory

- Colaboratory, or “Colab” for short, allows you to write and execute Python in your browser
- We will use Google Colab for in-class programming
- Can easily access through google
  - <https://colab.research.google.com>



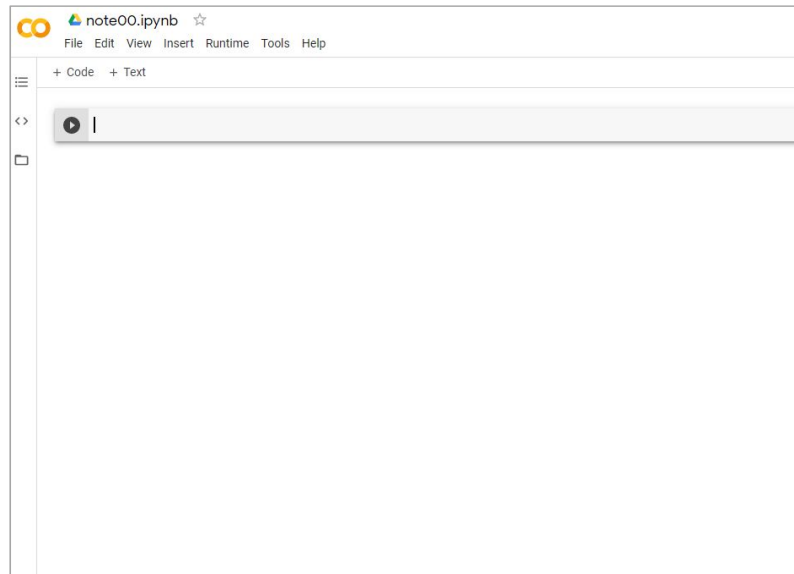
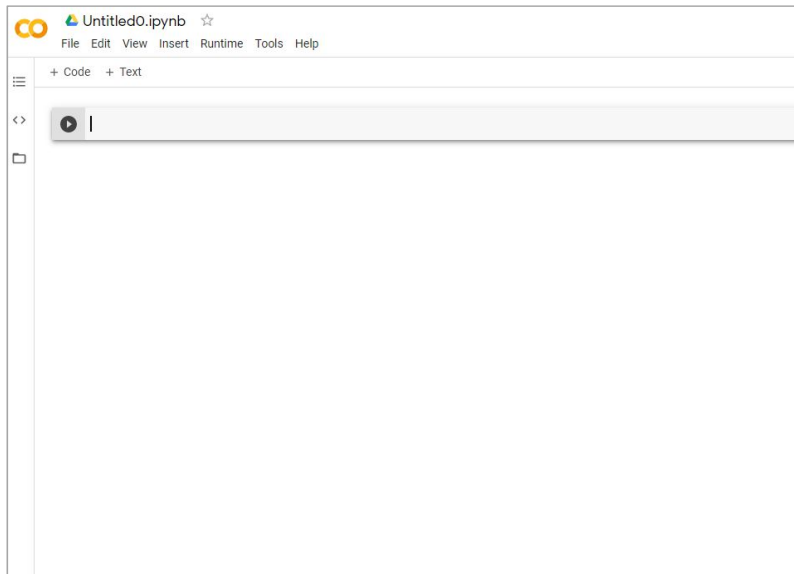
# Open New Notebook

- [File] → [New notebook]
- Sign in Google



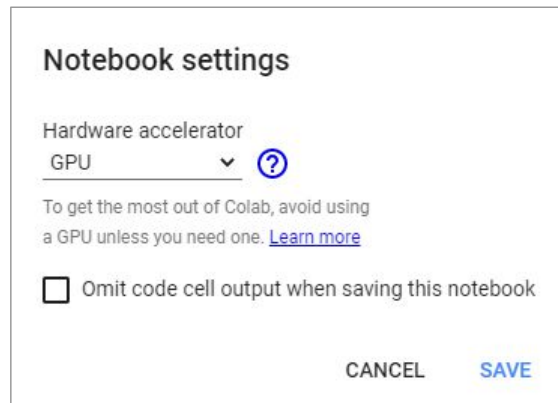
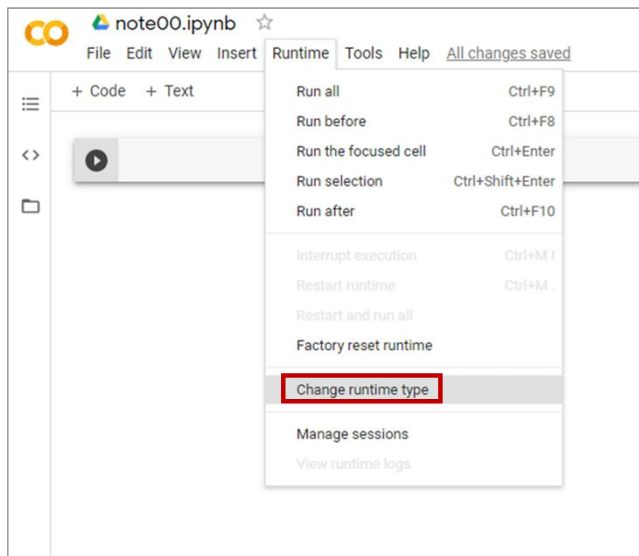
# Rename Notebook

- Left click 'Untitled0.ipynb'
- Type the name that you want (ex. note00.ipynb)



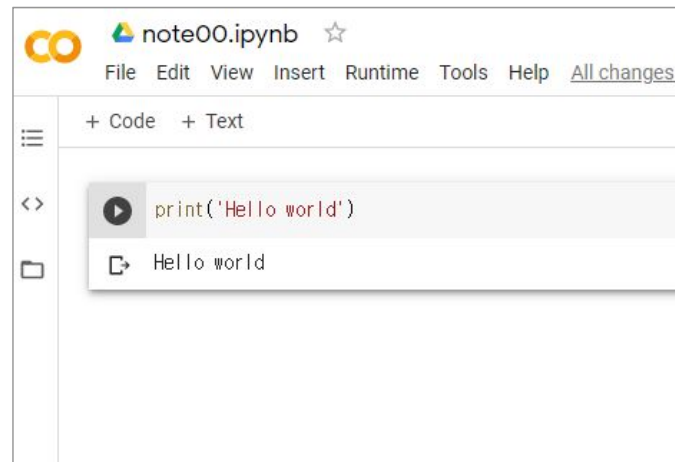
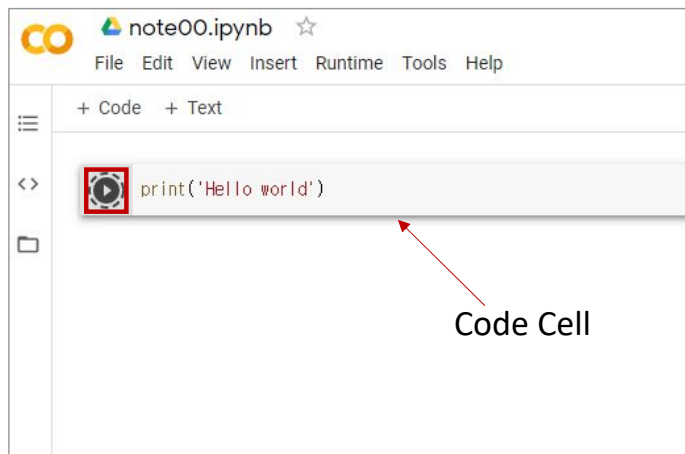
# Change Runtime Type

- Change runtime type if you need GPU
- [Runtime] → [Change runtime type]
- Set GPU for Hardware accelerator



# Python Programming in Colab

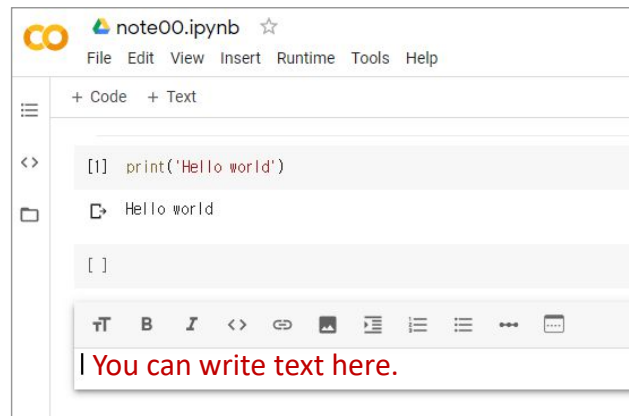
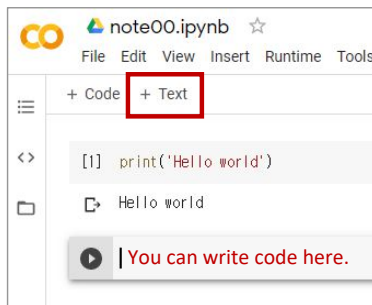
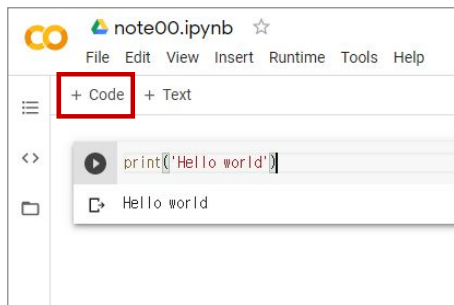
- Click play button on the left part of the code cell
- Short cut: [Ctrl] + [Enter] or [Shift] + [Enter]





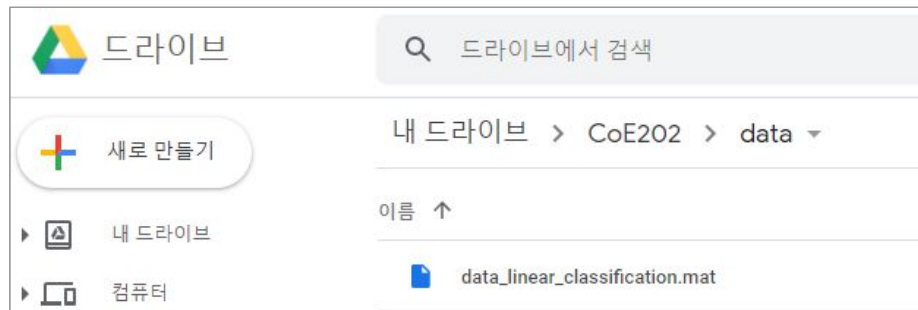
# Python Programming in Colab

- Click [+ Code] on the top to insert a code cell
- Click [+ Text] on the top to insert a text cell



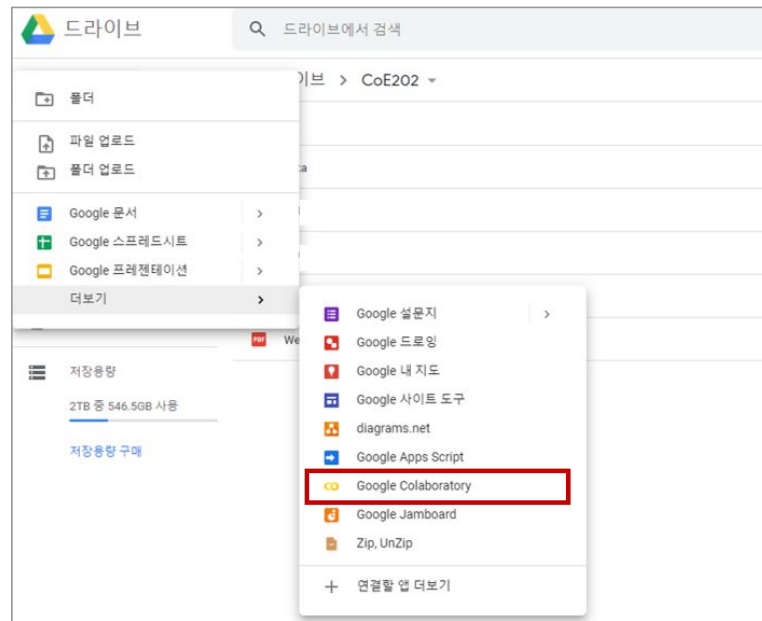
# Import .mat data file on Colab

- Download .mat data file from kims and upload it to 'Google Drive'.
- Here, I made the CoE202 folder in my 'Google Drive'.
- Inside CoE202 folder, I made a data folder and uploaded a .mat data file.



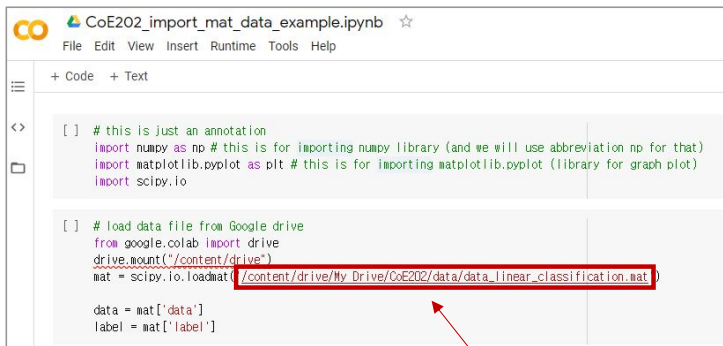
# Import .mat data file on Colab

- Click the 'New' button and make a new 'Google Colaboratory' file.



# Import .mat data file on Colab

- Write your data path inside the scipy.io.loadmat function.
- Run cells and then you will get URL.
- Click URL.



```
CoE202_import_mat_data_example.ipynb ☆
File Edit View Insert Runtime Tools Help

+ Code + Text

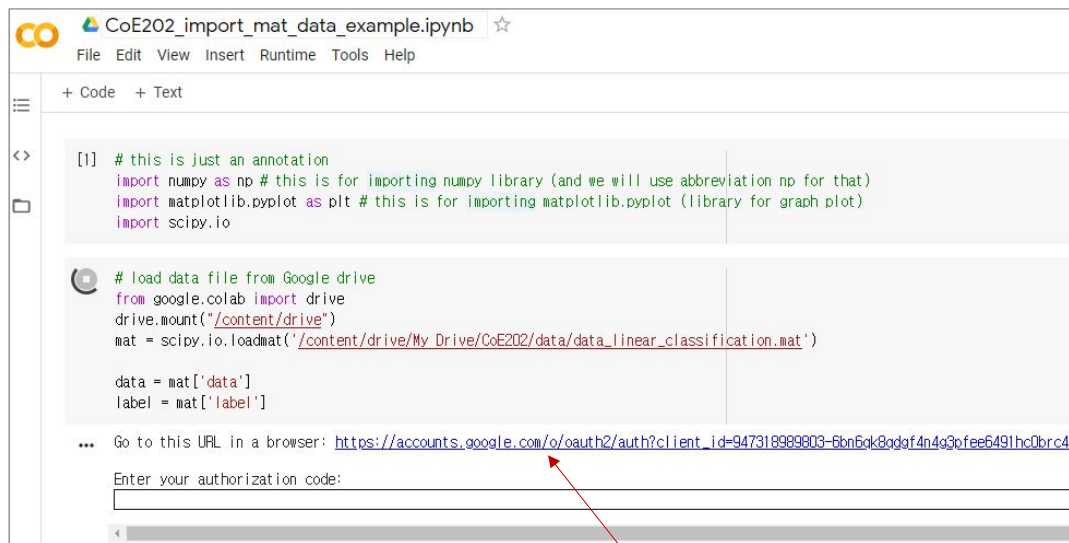
[ ] # this is just an annotation
import numpy as np # this is for importing numpy library (and we will use abbreviation np for that)
import matplotlib.pyplot as plt # this is for importing matplotlib.pyplot (library for graph plot)
import scipy.io

[ ] # load data file from Google drive
from google.colab import drive
drive.mount("/content/drive")
mat = scipy.io.loadmat('/content/drive/My Drive/CoE202/data/data_linear_classification.mat')

data = mat['data']
label = mat['label']
```

A red box highlights the file path in the code, with a red arrow pointing to the text "Write data path" below it.

Write data path



```
CoE202_import_mat_data_example.ipynb ☆
File Edit View Insert Runtime Tools Help

+ Code + Text

[ ] # this is just an annotation
import numpy as np # this is for importing numpy library (and we will use abbreviation np for that)
import matplotlib.pyplot as plt # this is for importing matplotlib.pyplot (library for graph plot)
import scipy.io

# load data file from Google drive
from google.colab import drive
drive.mount("/content/drive")
mat = scipy.io.loadmat('/content/drive/My Drive/CoE202/data/data_linear_classification.mat')

data = mat['data']
label = mat['label']

... Go to this URL in a browser: https://accounts.google.com/o/oauth2/auth?client\_id=947318989803-6bn6ok8ogof4n4a3pfee6491hc0brc4i
Enter your authorization code:

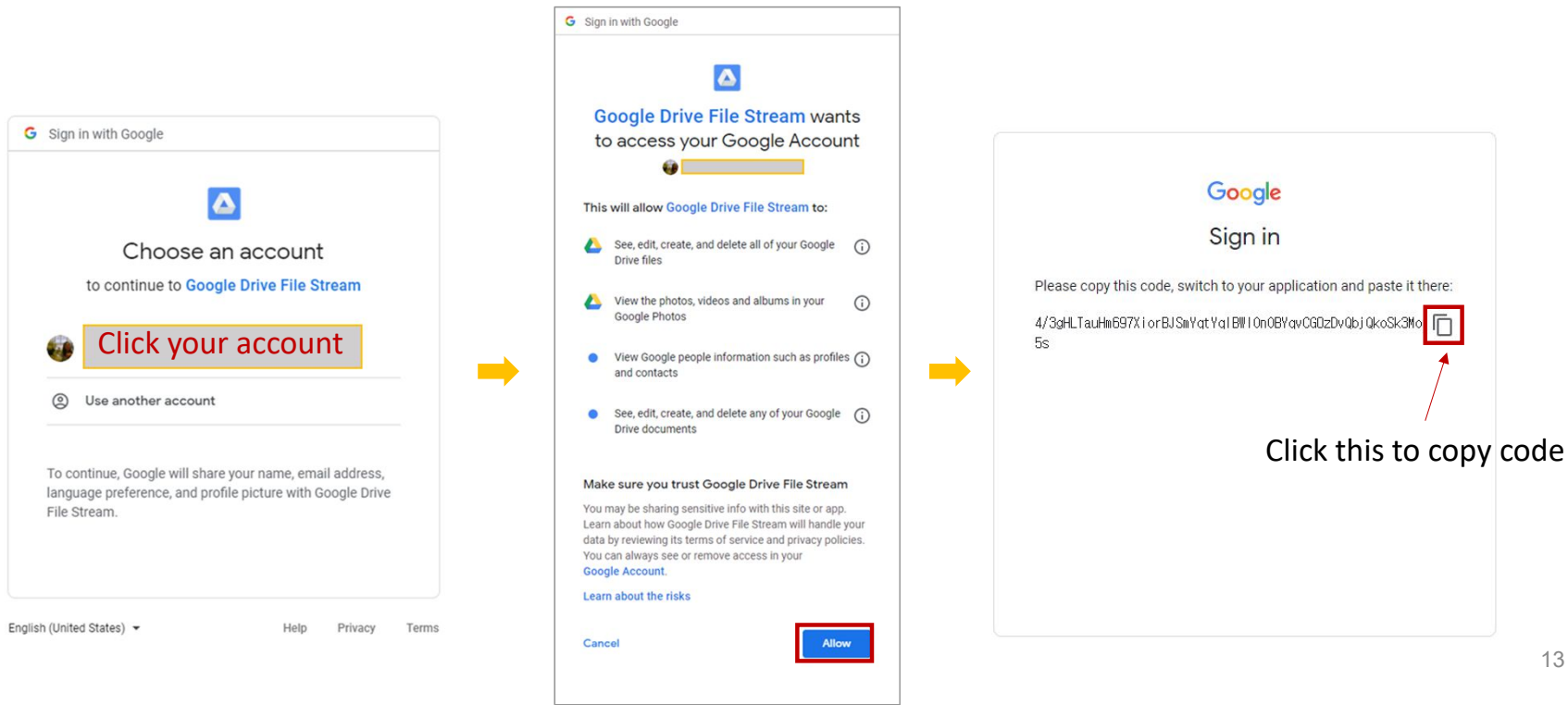
```

A red arrow points from the URL to the text "Click" below it.

Click

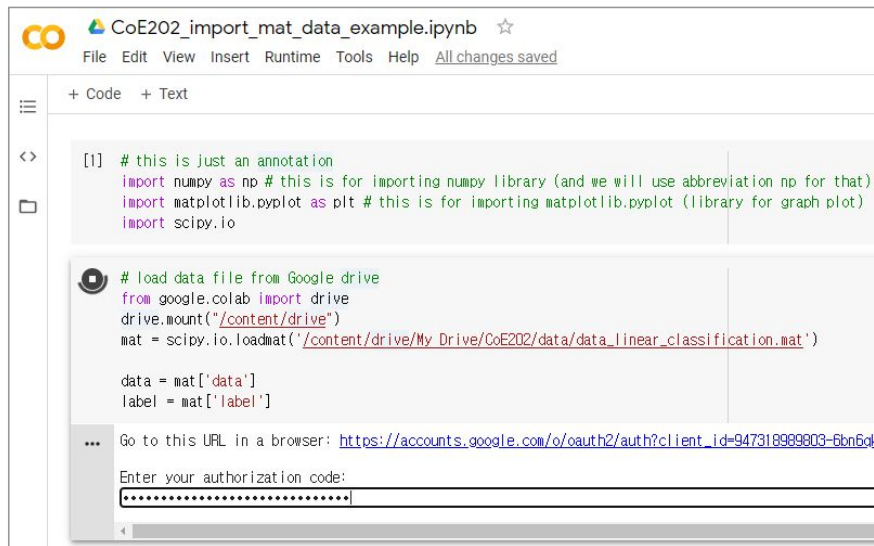
# Import .mat data file on Colab

- Click your account → Click Allow → Copy code



# Import .mat data file on Colab

- Go back to the Colab notebook.
- Paste the code and then click Enter.
- You will get 'Mounted at /content/drive' message.



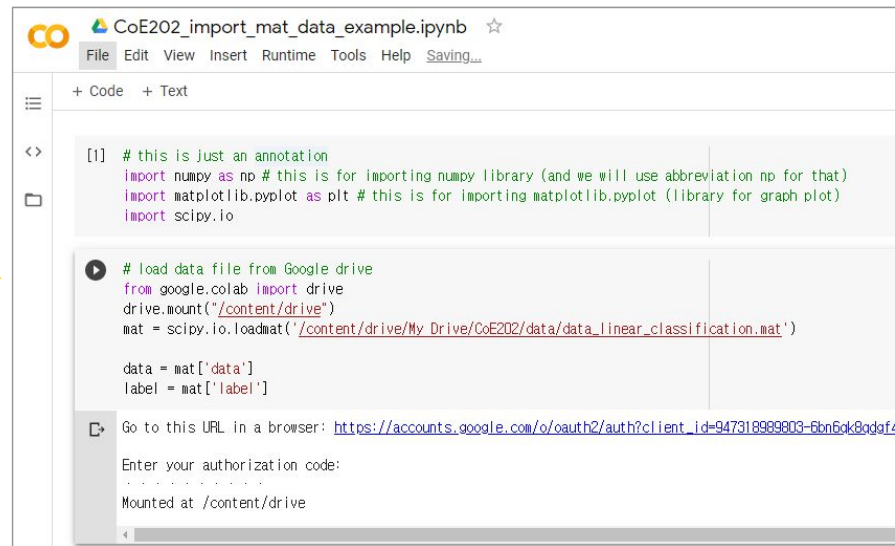
The screenshot shows a Colab notebook titled 'CoE202\_import\_mat\_data\_example.ipynb'. The code cell contains the following Python code:

```
[1] # this is just an annotation
import numpy as np # this is for importing numpy library (and we will use abbreviation np for that)
import matplotlib.pyplot as plt # this is for importing matplotlib.pyplot (library for graph plot)
import scipy.io

# load data file from Google drive
from google.colab import drive
drive.mount("/content/drive")
mat = scipy.io.loadmat('/content/drive/My Drive/CoE202/data/data_linear_classification.mat')

data = mat['data']
label = mat['label']
```

Below the code cell, there is a message: "Go to this URL in a browser: [https://accounts.google.com/o/oauth2/auth?client\\_id=947318989803-6bn6ok8gdf4](https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6bn6ok8gdf4)". A text input field labeled "Enter your authorization code:" is shown with a series of dots for input.



The screenshot shows the same Colab notebook after successful authentication. The code cell is the same as in the previous image. Below the code cell, the message now reads: "Mounted at /content/drive".

# Import .mat data file on Colab

- Now, you can use the data in the Colab as follows.

```
[2] from google.colab import drive
drive.mount("/content/drive")
mat = scipy.io.loadmat('/content/drive/My Drive/CoE202/data/data_linear_classification.mat')

data = mat['data']
label = mat['label']
```

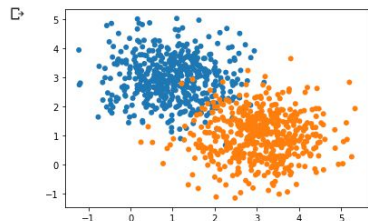
Go to this URL in a browser: [https://accounts.google.com/o/oauth2/auth?client\\_id=947318989803-6n6ok8ojd74n4g3ofee6491hc0brcd1.apps.googleusercontent.com&redirect\\_uri=https://colab.research.google.com/&response\\_type=code](https://accounts.google.com/o/oauth2/auth?client_id=947318989803-6n6ok8ojd74n4g3ofee6491hc0brcd1.apps.googleusercontent.com&redirect_uri=https://colab.research.google.com/&response_type=code)

Enter your authorization code:  
.....

Mounted at /content/drive

```
[3] # define a function to plot data
def show_data_binary_class(data, label):
    fig, ax = plt.subplots()
    ind = 0
    for color in ['tab:blue', 'tab:orange']:
        current_ind = np.where(label==ind)[0]
        x = data[0,current_ind]
        y = data[1,current_ind]
        ax.scatter(x, y, c=color, edgecolors='none')
        ind += 1
```

```
[4] # show data
show_data_binary_class(data, label)
```



# Summary

- iPython (interactive Python)
- Google Colab is a free, easy-to-use online platform for using iPython
- Google Colab can be used with Google Drive



# References

- Jupyter Notebook
  - <https://ipython.org/notebook.html>
- Google Colab
  - <https://colab.research.google.com/>