In this assignment, you will learn how to create an app using Dash in Python. You will learn how to load data and display it as an interactive web-based application using Python. The dataset that will be used for part of this LAB is CONVENIENT_global_confirmed_cases.csv". You will need to develop a one python file that creates multiple Taps (one tap for each question) in this assignment.

Create a dashboard with multiple tabs that each tap accommodates each question in this LAB. The final python file needs to be deployed through Google cloud (GCP) [15 pts] and a working link must be provided in the report for grading. Place the link to the GCP at the beginning of the report on the Top of the first page.

Some of the packages that may be used in this LAB are shown below:

```
From dash import Dash
import dash as html
import dash as dcc
from dash.dependencies import Input, Output
import plotly.express as px
import pandas as pd
```

1. Using Dash in python develop an app that plot the COVID global confirmed cased (the dataset "CONVENIENT_global_confirmed_cases" can be found on the course GitHub) for the following countries: [20pts]
   a. US
   b. Brazil
   c. United Kingdom_sun
   d. China_sum
   e. India
   f. Italy
   g. Germany

Hint: You need to develop a dropdown menu with the list of countries that multiple counties can be selected. Make sure to add a title to your app. Use the external style sheet as follows. Add the title to the drop dropdown menu as: "Pick the country Name".

```
external_stylesheets = ['https://codepen.io/chriddyp/pen/bWLwgP.css']
```

2. Create an app using Dash that plots the quadratic function $f(x) = ax^2 + bx + c$ for x between -2, 2 with one thousand samples. The a, b and c must be an input with a slider component with

the range of -10 to 10 and step size of 0.5. Add an appropriate title and label to each section of your app. Use the same external style sheet as question 1. [10pts]

3. Create a calculator app using Dash that performs the following basic math operations: [10pts]
   a. Addition (a + b)
   b. Subtraction (a – b)
   c. Multiplication (a*b)
   d. Division (a/b) puts a condition that b cannot be zero.
   e. Log : log(a) with the base b : a must be a positive real number and positive. b must be positive number more than one.
   f. b^{th} root of a. if a negative then b must be odd. a not equal to zero. b a positive integer.

   Hint: The arithmetic operation must be inside a dropdown menu. The input a and input b must be entered through an input field. Add an appropriate title and label to each section of your app. Use the same external style sheet as question 1.

   ### Calculator

   Please enter the first number

   Input: 4

   | + | x ▾ |

   Please enter the second number

   Input: 12

   The output value is 16

4. Develop an interactive web-based app using Dash in python that plots polynomial function by entering the order of the polynomial through an input field. For example, if the input entered number to input field is two, then the function $f(x) = x^2$ must be plotted. If the entered number to the input field is three, then the function $f(x) = x^3$ must be plotted. The range of x is -2, 2 with one thousand samples in between. [10pts]

Please enter the polynomail order
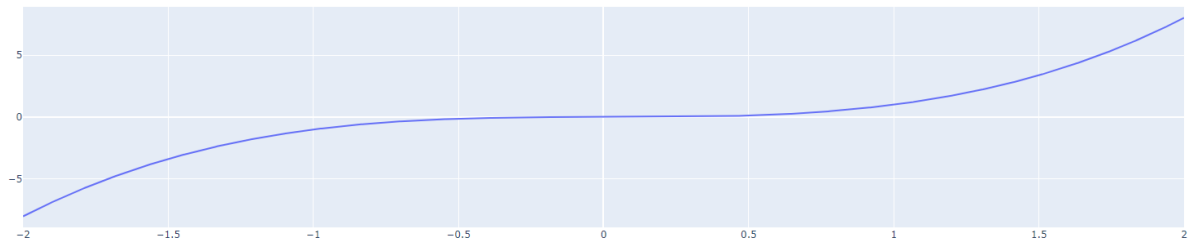
5. Using Dash creates an app that the user can input the following:
   a. Number of cycles of sinusoidal.
   b. Mean of the white noise.
   c. Standard deviation of the white noise.
   d. Number of samples.

Then generates the data accordingly (f(x) = sin(x) + noise). Plot the function f(x) and the Fast Fourier Transform (FFT) of the generated data. The range of the x axis is -pi to pi. For tr FFT, you can use: [15pts]

```
from scipy.fft import fft
```
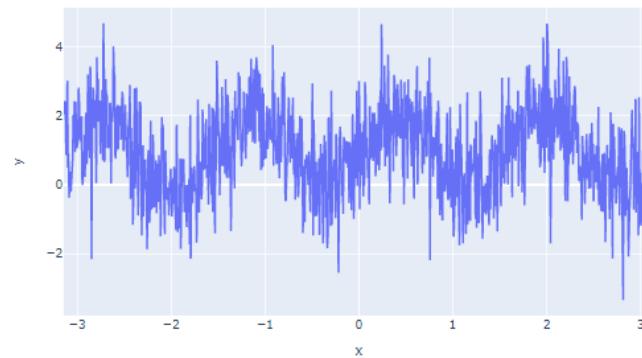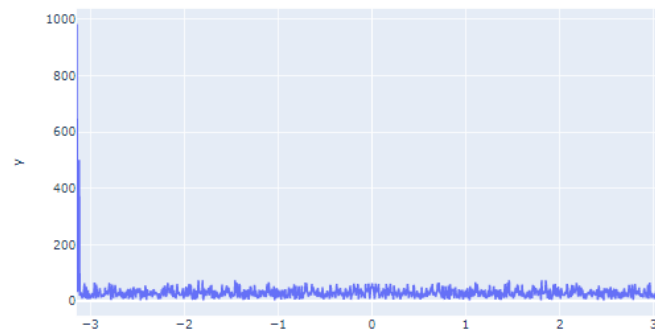
Please enter the number of sinusoidal cycle

`4`

Please enter the mean of the white noise

`1`

Please enter the standard deviation of the white noise

`1`

Please enter the number of samples

`1000`

The fast fourier transform of above generated data

6. Create a dashboard app using python that implements the two-layered neural network as shown below. You need to create a slider for each parameter with the range [-10,10] with the step size of 0.001. Then plot the output a^2 versus the input p with range [-5,5] and one thousand samples. Add the figure (take a screen shot of the network diagram and create an image file to be used in your app) of the two-layered neural networks to your app using html.Img(). There are a total of seven parameters that can be adjusted for this problem and each parameter should own its own slider. The final appearance of the app is shown below. The html.Div()-→ [20pts]
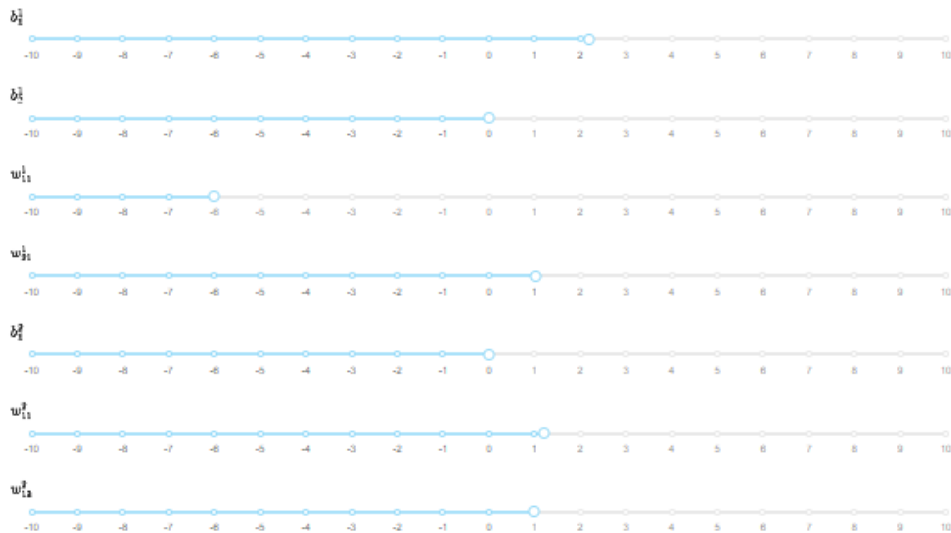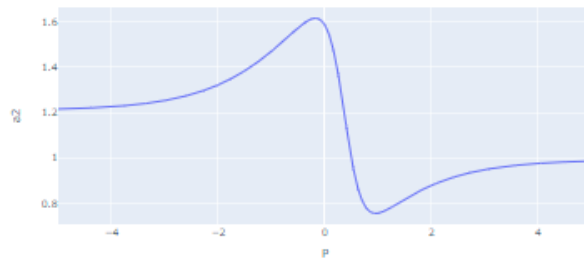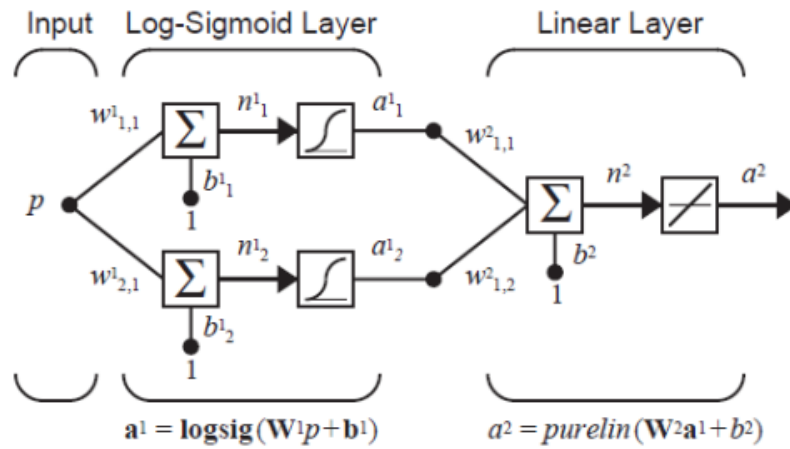
```
style={'width': '30%', 'display': 'inline-block', 'vertical-align':
'middle'}
```

$$a_1^1 = \psi(p \times w_{1,1}^1 + b_1^1)$$
$$a_2^1 = \psi(p \times w_{2,1}^1 + b_2^1)$$
$$a^2 = w_{1,1}^2 \times a_1^1 + w_{1,2}^2 \times a_2^1 + b_1^2$$
$$\psi(x) = \frac{1}{1 + e^{-x}}$$

al = logsig(W¹p+b¹)   a² = purelin(W²a¹+b²)

Upload the **formal report (as a single pdf, the soft copy of the developed code**) plus **single python file** (that creates multiple taps) through BB by the deadline.