

# AT - Lesson 83 - Project\_Question Copy

March 21, 2023

## 0.0.1 Instructions

**Goal of the Project** This project is designed for you to practice and solve the activities that are based on the concepts covered in the lesson:

Support Vector Machines - Hyperplane Visualisation I

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**Problem Statement** In this project, you are going to revise the lesson by creating and visualizing mesh grid and contours.

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### Getting Started:

1. Click on START Project on the panel and follow the instructions given below.
  2. Create a duplicate copy of the Colab file as described below.
    - Click on the **File menu**. A new drop-down list will appear.
    - Click on the **Save a copy in Drive** option. A duplicate copy will get created. It will open up in the new tab on your web browser.
  3. After creating the duplicate copy of the notebook, please rename it in the **YYYY-MM-DD\_StudentName\_Project83** format.
  4. Now, write your code in the prescribed code cells.
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## 0.0.2 Activities

**Activity 1:** Create a Mesh Grid

**Activity 2:** Create a Contour Plot

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####Activity 1: Create a Mesh Grid

Create a mesh grid for two different one-dimensional arrays using the steps below:

1. Create a variable **x** for creating a NumPy array from range **-3.0** to **3.0** and step size as **0.50**.
2. Create a variable **y** for creating a NumPy array from range **-2.0** to **2.0** and step size as **0.50**.

3. Create a meshed grid using `meshgrid()` function from the two arrays `x` and `y` and two-dimensional output arrays in `xx_values` and `yy_values` variable.
4. Create a scatter plot for the two-dimensional arrays using the customization given below:
  - style: `seaborn`
  - marker: `o`, colour = green
  - grid lines: `major`, both axes, style = `dashed`, colour = `red`
5. Create annotations for the coordinates in the scatter plot.
6. Display the graph.

```
[ ]: # Create and visualize a mesh grid.

# Import the libraries

# Create one dimensional 'x' and 'y' arrays

# Create the mesh grid

# Create the graph plot

# Allot the style

# Create the scatter plot

# Create the annotations

# Display the graph
```

**Hint:** For customization of the graph, recall lesson **42: Air Quality Analysis - Customised matplotlib Plots**.

After this activity, a mesh grid plot should be created and annotated.

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#### ####Activity 2: Create a Contour Plot

Create a contour plot for two one dimensional arrays and using the equation for `z`:

1. Create a variable `x` for creating a NumPy array from range `-3.0` to `3.0` and step size as `0.025`.
2. Create a variable `y` for creating a NumPy array from range `-2.0` to `2.0` and step size as `0.025`.
3. Create a meshed grid using `meshgrid()` function from the two arrays `x` and `y` and two-dimensional output arrays in `xx_values` and `yy_values` variable.
4. Create the `zz_values` array for the z-axis using the 3 formulas below:

$$z_1 = e^{-xx^2-yy^2}$$

$$z_2 = e^{-(xx-1)^2-(yy-1)^2}$$

$$zz = (z_1 - z_2)^2$$

5. Create a contour plot with `xx_values`, `yy_values`, and `zz_values` arrays with the gaps filled with colour using the customization given below:

- style: `grayscale`
- colour map: `coolwarm_r`
- alpha: 1

6. Display the colour bar.

7. Display the graph.

```
[ ]: # Create and visualize a contour.

# Create one dimensional 'x' and 'y' arrays

# Create the mesh grid

# Create 'zz' array

# Create the graph plot

# Allot the style

# Create the contourf graph

# Display the colorbar

# Display the graph
```

After this activity, a contour plot should be created for the given equation.

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### 0.0.3 Submitting the Project

1. After finishing the project, click on the **Share** button on the top right corner of the notebook. A new dialog box will appear.
2. In the dialog box, make sure that '**Anyone on the Internet with this link can view**' option is selected and then click on the **Copy link** button.
3. The link of the duplicate copy (named as **YYYY-MM-DD\_StudentName\_Project83**) of the notebook will get copied.
4. Go to your dashboard and click on the **My Projects** option.
5. Click on the **View Project** button for the project you want to submit.
6. Click on the **Submit Project Here** button.

7. Paste the link to the project file named as **YYYY-MM-DD\_StudentName\_Project83** in the URL box and then click on the **Submit** button.
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