# Running the PSO + Neural Network Optimization Project on Google Colab

Google Colab (Colaboratory) is a cloud-based Jupyter notebook platform provided by Google. It enables users to write and execute Python code in a web-based environment, offering free access to GPUs and easy integration with Google Drive. It is particularly suitable for machine learning and deep learning projects due to its simplicity and accessibility.

## Why Use Google Colab?

- No local setup required—code runs in the browser.  
- Free access to GPUs/TPUs for acceleration.  
- Seamless integration with Google Drive.  
- User-friendly interface ideal for prototyping and experimentation.

## Prerequisites

- A Google Account.  
- Dataset file (e.g., database.sqlite) uploaded to Google Drive.  
- Final project code (modularized in three parts).

## Step-by-Step Instructions

1. Open Google Colab:

- Visit https://colab.research.google.com  
 - Click on 'File > New Notebook'  
 - Rename your notebook (e.g., PSO\_NeuralNet\_Project.ipynb)

2. Mount Google Drive:

Use the following code snippet to mount Google Drive:  
  
 from google.colab import drive  
 drive.mount('/content/drive')  
  
 Follow the link to authenticate and paste the code to grant access.

3. Verify Dataset Path:

Ensure your SQLite file is located in Google Drive and reference it using the correct path. For example:  
 conn = sqlite3.connect('/content/drive/MyDrive/database.sqlite')

4. Upload Project Code:

Copy the code into separate cells within the notebook, following the three-part structure:  
 - Part 1: Imports, constants, and class definitions  
 - Part 2: Data loading, preprocessing, and baseline model  
 - Part 3: PSO runs, evaluation, and visualizations

5. Install Required Libraries:

If necessary, install missing libraries using pip. Example:  
 !pip install psutil

6. Enable GPU Acceleration (Optional):

- Go to 'Runtime > Change runtime type'  
 - Select 'GPU' under Hardware Accelerator  
 - Click Save and reconnect

7. Execute the Code:

Run the notebook cells sequentially. You will see plots, metrics, confusion matrices, and runtime logs as output.

8. Save Outputs:

Save any visualizations manually using plt.savefig() if implemented, or download them directly from output cells.  
 Export the notebook via 'File > Download > .ipynb or .py' for local backup.

## Important Tips for Beginners

- Sessions may timeout after 12 hours.  
- Always save your progress and outputs periodically.  
- Avoid storing data locally on the Colab session—use Google Drive instead.

## Pros and Cons of Using Google Colab

Pros:  
- Free GPU access  
- Easy to use, browser-based interface  
- Good for beginners  
  
Cons:  
- Limited session duration (up to 12 hours)  
- May be slower for large datasets compared to dedicated platforms like Kaggle

## Final Notes

Google Colab is a highly effective platform for training and testing neural networks using PSO optimization. It provides an excellent balance of simplicity and capability, especially for small to medium-sized models. For large datasets or long-running experiments, consider switching to platforms with extended runtimes like Kaggle.