

DA312 Advanced Machine Learning Lab

Assignment 1

29 January, 2024

- You can write the code in Google Colab platform.
- Submit .ipynb or .py file to the Teams assignment. The code should be well commented.

Task A

(To do this task please DO NOT use in-built commands from any ML frameworks such as sklearn/PyTorch. Implement from scratch.)

Write code to fit a linear perceptron to the dataset given in this link.

Task B

(To do this task you can use in-built commands of a Deep Learning Framework, such as PyTorch)

Data Generation

1. Generate Synthetic Data: Create a dataset with 1000 data points. The dataset should have six input features $(x_1, x_2, x_3, x_4, x_5, x_6)$. These features are to be generated using a Gaussian distribution.
2. Further calculate three output values (y_1, y_2, y_3) using the following relationships:

$$\begin{aligned}y_1 &= 3x_1 + 4x_4 + 2x_5 + x_6 + 3 \\y_2 &= 2x_1 + 3x_2 + 5x_3 + 7x_4 + 4x_5 + 8x_6 \\y_3 &= x_2 + x_3 + 10\end{aligned}$$

3. Then store the generated data.

Neural Network Model

Construct a neural network with the following specifications:

1. Two hidden layers, each containing 10 neurons.
2. ReLU activation function for hidden layers.
3. An output layer with 3 neurons, corresponding to y_1, y_2 , and y_3 .

Training and Optimization

Train the model with the following specification using the generated data:

1. Use Mean Squared Error (MSE) as the loss function for the regression task.
2. Employ the Adam optimizer for updating the network weights.
3. Train the model for 100 epochs with a batch size of 64.

Note: These parameters can be modified for improved performance.

Test

1. Evaluate the model's performance on a test dataset.