Department of Information Technology – University of the Punjab

Programming for AI – MPhil/PhD (AI) F22

Lab-12

Max Time: 1.5 hours Date: 05-04-2023

Instructions:

- Please provide your own solutions and DO NOT COPY the code from your colleagues or the web.
- You can discuss your problems only with the teachers.
- Submit .ipynb files and follow the following naming convention.

  RollNumber_Name_Lab#X i.e. MSAIF23M001_JohnDoe_Lab#12

Task # 01 - Linear Regression Model 50 Marks

Write a PyTorch code that creates a simple linear regression model using autograd for gradient computation. The model should have a single input feature and a single output target. The goal is to minimize the mean squared error loss using stochastic gradient descent.

Here are some additional requirements for the code:

- Define a custom PyTorch Dataset class that generates random samples of (x, y) pairs for the linear regression problem. The size of the dataset should be a configurable parameter.
- Use the nn.Linear module to define the linear regression model.
- Use the nn.MSELoss module to define the mean squared error loss.
- Use the torch.optim.SGD optimizer for stochastic gradient descent.
- Implement the training loop using a DataLoader to load batches of samples from the dataset.

Task # 02 - Gradients 20 Marks

1. Create a simple function that takes in a PyTorch tensor and returns its element-wise sine value. Then, compute the gradient of this function with respect to the input tensor using Autograd.
2. Create a custom activation function for a neural network and use Autograd to compute the gradients of the function with respect to the input tensor.