CS 559: Machine Learning: Fundamentals and Applications

1 Neural Network Backward Propagation [50 pts]

Consider neural networks with one hidden layer, as discussed during the lecture. The forward propagation prediction was implemented. Complete the backward propagation codes. Using the generated data, predict y.

x, y = make_regression(n_samples=100, n_features=5, noise=10, random_state=42)

a. (15 pts) Perform the backward propagation from the output layer to the hidden layer. Compute δ_2 and $\frac{dE}{dW_2}$. Then update W_2. Use the learning rate $\eta = 1 \times 10^{-4}$.

b. (15 pts) Perform the backward Propagation from the hidden layer to the input layer. Compute δ_1 and $\frac{dE}{dW_1}$. Then, update W_1. Use the learning rate $\eta = 1 \times 10^{-4}$.

c. (15 pts) Put the forward and backward propagation codes together in a for-loop to observe the error convergence.

d. (5 pts) Use Scikit-learn Neural Network to predict the target variable.