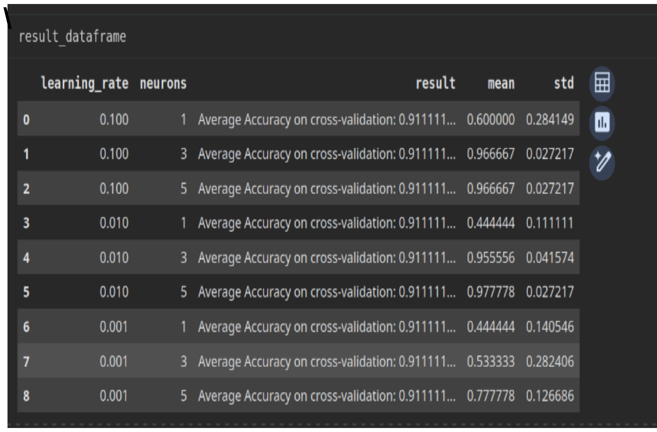
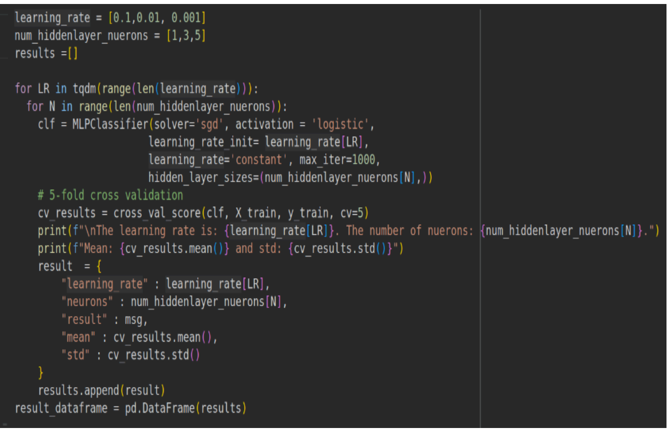
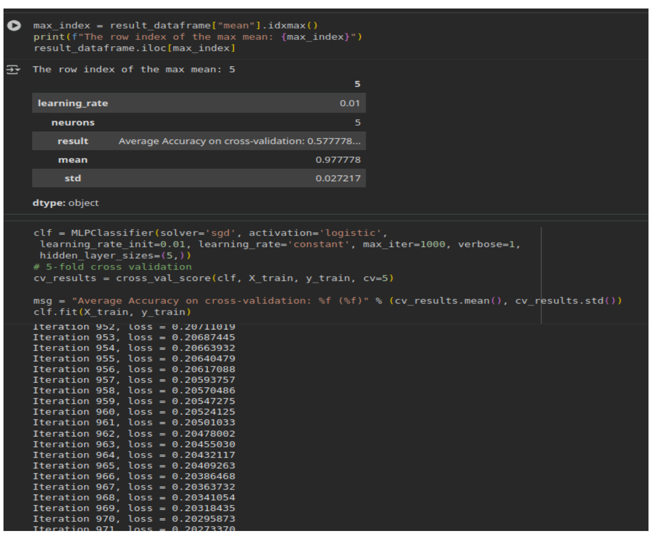
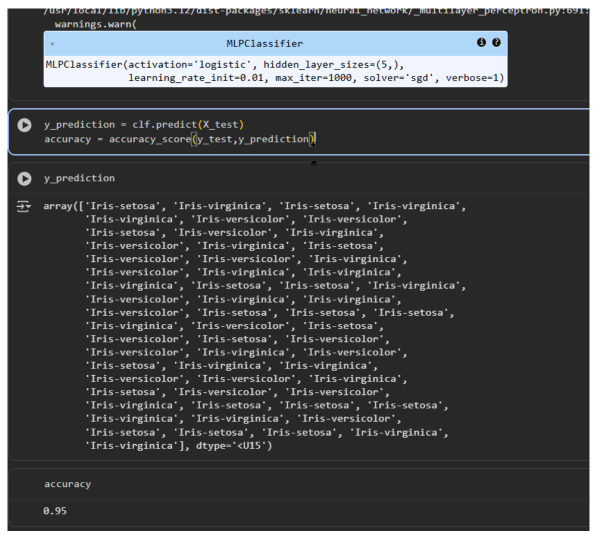
PART3 and PART 4





(1) (2)





(3) (4)

I tested all nine combinations of hyperparameters and created a Pandas DataFrame to record the results (see Figure 1 and 2). Based on the analysis, the optimal configuration was a learning rate of **0.01** and **5 neurons** in the hidden layer (see Figure 3). With these parameters, the model achieved an accuracy of **95%** on the test dataset (see Figure 4).

PART 5

5.1

$$y = 1x_1 + 2x_2 + 0 \Rightarrow 1(0.1) + 2(0.2) + 0 = 0.1 + 0.4 = 0.5$$

$$\text{Sigmoid} = \frac{1}{1+e^{-0.5}} = 0.622$$

5.2

$$\Delta W_i = -\underset{0.1}{\alpha} \cdot (\underset{0}{\text{target}} - \underset{0.776}{\text{out}}) \times \underset{0.776}{\text{out}} \times (1 - \underset{0.776}{\text{out}}) \times \underset{0.622}{x_i}$$

$$\Delta W_i = -(0.1) \times (0 - 0.776) \times (0.776) \times (1 - 0.776) \times (0.6221) = 8.39 \times 10^{-3}$$

$$W_{01} = 2 - (8.39 \times 10^{-3}) = 1.99 \Rightarrow \Delta W_{01} = 8.39 \times 10^{-3}$$

This is the new weight.