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CSE(DS) RollNo:64 DL Exp 3 Code:

```
import numpy as np
import pandas as pd
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
# Load dataset
data = load_iris()


# Get features and target
X=data.data
y=data.target
# Get dummy variable
y = pd.get_dummies(y).values

y[:3]
#Split data into train and test data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=20,
random_state=4)
# Initialize variables
learning_rate = 0.1
iterations = 5000
N = y_train.size


# number of input features
input_size = 4


# number of hidden layers neurons
hidden_size = 2


# number of neurons at the output layer
output_size = 3


results = pd.DataFrame(columns=["mse", "accuracy"])
```

```
# Initialize weights
np.random.seed(10)


# initializing weight for the hidden layer
```

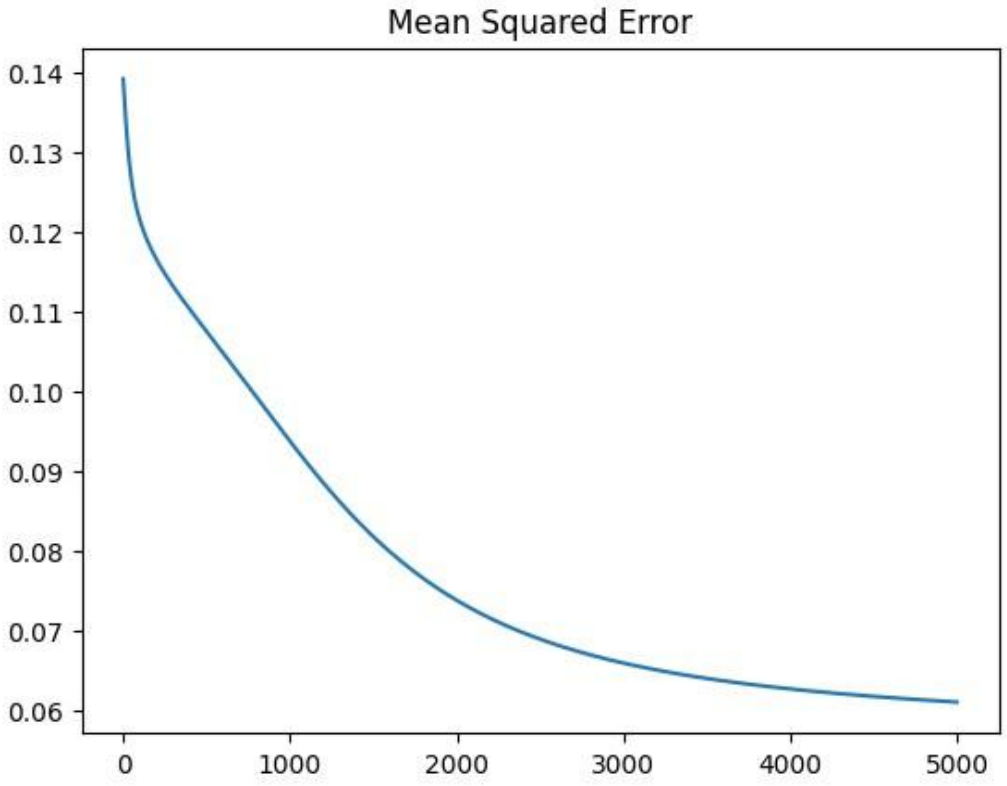
```
W1 = np.random.normal(scale=0.5, size=(input_size, hidden_size))


# initializing weight for the output layer

W2 = np.random.normal(scale=0.5, size=(hidden_size , output_size))
def sigmoid(x):

    return 1 / (1 + np.exp(-x))


def mean_squared_error(y_pred, y_true):

    return ((y_pred - y_true)**2).sum() / (2*y_pred.size)


def accuracy(y_pred, y_true):
    acc = y_pred.argmax(axis=1) == y_true.argmax(axis=1)

    return acc.mean()

#backpropagation neural network

for itr in range(iterations):


    # feedforward propagation

    # on hidden layer
    Z1 = np.dot(X_train, W1)

    A1 = sigmoid(Z1)


    # on output layer

    Z2 = np.dot(A1, W2)

    A2 = sigmoid(Z2)
```

```
    # Calculating error
    mse = mean_squared_error(A2, y_train)
    acc = accuracy(A2, y_train)
    results=results.append({"mse":mse, "accuracy":acc},ignore_index=True )

    # backpropagation
    E1 = A2 - y_train
    dW1 = E1 * A2 * (1 - A2)

    E2 = np.dot(dW1, W2.T)
    dW2 = E2 * A1 * (1 - A1)

    # weight updates
    W2_update = np.dot(A1.T, dW1) / N
    W1_update = np.dot(X_train.T, dW2) / N

    W2 = W2 - learning_rate * W2_update
    W1 = W1 - learning_rate * W1_update
results.mse.plot(title="Mean Squared Error")
results.accuracy.plot(title="Accuracy")
# feedforward
Z1 = np.dot(X_test, W1)
A1 = sigmoid(Z1)

Z2 = np.dot(A1, W2)
A2 = sigmoid(Z2)
```

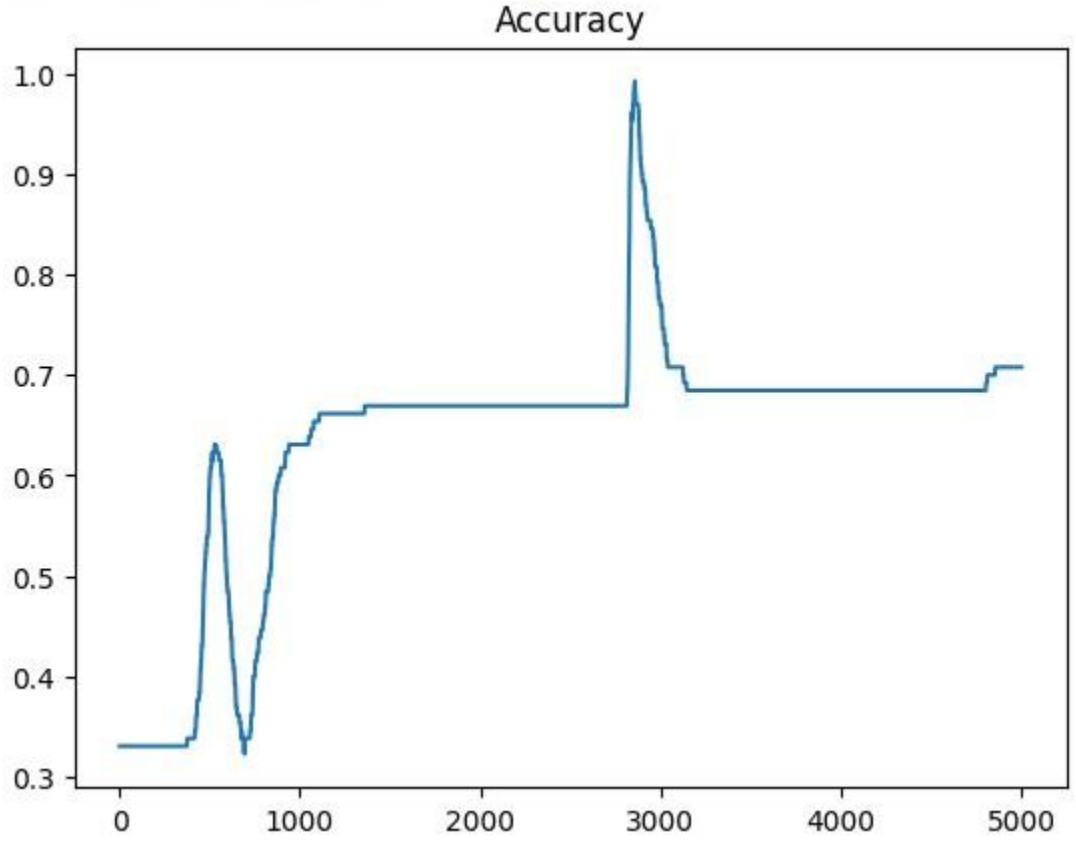
```
acc = accuracy(A2, y_test)
print("Accuracy: {}".format(acc))
```

Output:

```
<Axes: title={'center': 'Mean Squared Error'}>
```



```
<Axes: title={'center': 'Accuracy'}>
```




```
Accuracy: 0.8
```