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January 23, 2025

[ ]:
```
import numpy as np
import torch
import torch.nn as nn
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, confusion_matrix,␣
↪ConfusionMatrixDisplay
```

[ ]:
```
#load Datasets
iris=load_iris()
X=iris.data
y=iris.target #documentation from iris dataset
#removing all features that belong to category 2
X=X[y!=2] #conditional slicing
y=y[y!=2]
```

[ ]:
```
X.shape
y.shape #reshaping
# y=y.reshape(100,1)
#y = y[:, np.newaxis] # adding new axis
```

[ ]:
```
(100,)
```

[ ]:
```
#spliting test and train using library train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y, test_size=0.2)
```

[ ]:
```
X_train_tensor=torch.tensor(X_train, dtype=torch.float32) #is float cause
X_test_tensor=torch.tensor(X_test, dtype=torch.float32) #is int cause

y_train_tensor=torch.tensor(y_train, dtype=int)
y_test_tensor=torch.tensor(y_test, dtype=int)
```

[ ]:
```
'''class ClassificationModel(nn.Module):
  def __init__(self):
    super(ClassificationModel, self).__init__()
    self.linear=nn.Linear(4,2) #4 features 1 target
```

```
    #self.linear=nn.Linear(4,2)-> auto  uses sigmod activation

    def forward(self, x):
      return (self.linear(x))
      # return torch.sigmod()
      #here we need to use sigmod activation to change any continuous value␣
 ↪between 0 and 1'''
```

[ ]:
```
'class ClassificationModel(nn.Module):\n  def __init__(self):\n
super(ClassificationModel, self).__init__()\n    self.linear=nn.Linear(4,2) #4
features 1 target\n    #self.linear=nn.Linear(4,2)-> auto  uses sigmod
activation\n\n    def forward(self, x):\n      return (self.linear(x))\n      #
return torch.sigmod()\n      #here we need to use sigmod activation to change
any continuous value between 0 and 1'
```

[ ]:
```
class ClassificationModel(nn.Module):
  def __init__(self):
    super(ClassificationModel,self).__init__()
    self.linear=nn.Linear(4,2)  #(target,features)

  def forward(self,x):
    return (self.linear(x))
```

[ ]:
```
#loss function -> cross entropy loss
model = ClassificationModel() #obect creation
loss=nn.CrossEntropyLoss()
criteria=torch.optim.SGD(model.parameters(),lr=0.01)
```

[ ]:
```
num_epochs=1000
train_loss=[]
test_loss=[]
train_accuracy=[]
test_accuracy=[]
```

[ ]:
```
for ep in range(num_epochs):
  model.train()
  predicted_y= model(X_train_tensor)
  losses=loss(predicted_y, y_train_tensor)
  print(losses)

  criteria.zero_grad()
  losses.backward()
  criteria.step()

  train_loss.append(losses.item())
  model.eval()
  with torch.no_grad():
```

```
    predicted_test_y=model(X_test_tensor)
    loss_test=loss(predicted_test_y,y_test_tensor)
    test_loss.append(loss_test.item())
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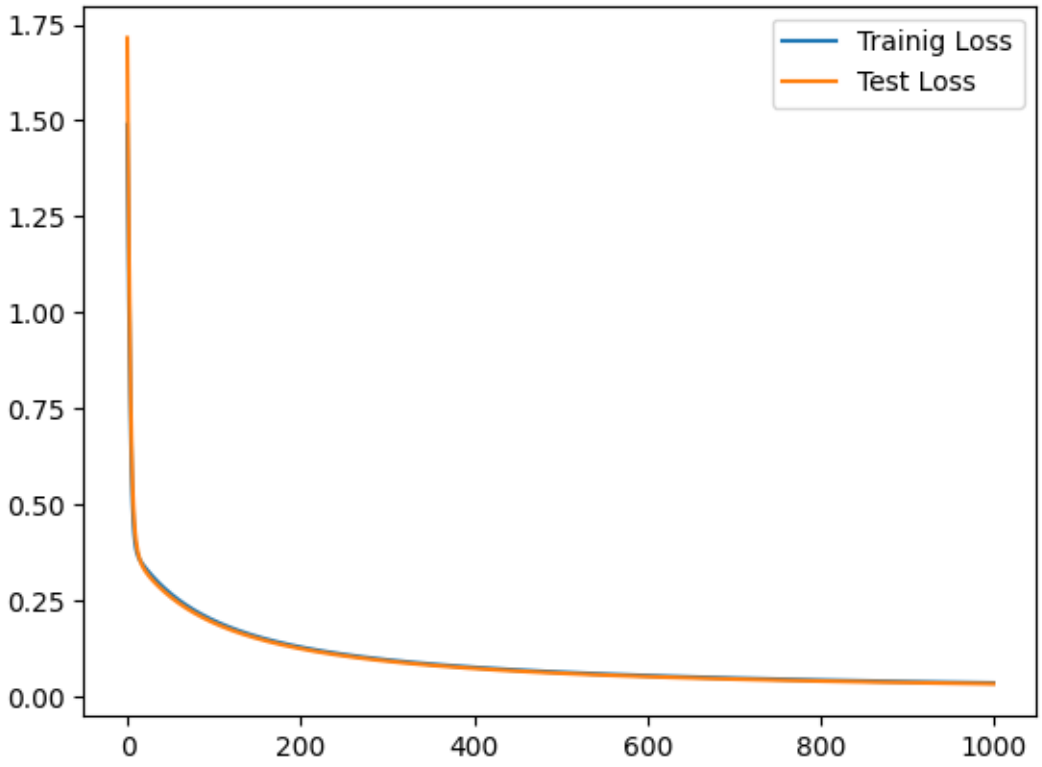
[ ]:
```
plt.plot(train_loss, label="Trainig Loss")
plt.plot(test_loss, label='Test Loss')
plt.legend()
plt.show()
```



[ ]:
```
# confusion matrix
y_pred=model(X_test_tensor)
conf_matirx=confusion_matrix(y_test_tensor.numpy(),y_pred.numpy())
disp=ConfusionMatrixDisplay(confusion_matrix=conf_matrix, display_labels=[0,1])

disp.plot()
```