Name - Pranav Pathe

Roll No. - 47

Batch - D4

Deep Learning Practical 2

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split, GridSearchCV
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix, ConfusionMatrixDisplay
from sklearn.linear_model import Perceptron as sklearn_pt

```

```
titanic_df = pd.read_csv('tan.csv')
```

Data Analysis

```
titanic_df.head()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	F
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2
1	2	1	1	Cumings, Mrs. John Bradley (Florence	female	38.0	1	0	PC 17599	71.2

```
titanic_df.columns
```

```
Index(['PassengerId', 'Survived', 'Pclass', 'Name', 'Sex', 'Age', 'SibSp',
       'Parch', 'Ticket', 'Fare', 'Cabin', 'Embarked'],
      dtype='object')
```

```
titanic_df.shape
```

```
(891, 12)
```

```
titanic_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

```
titanic_df.drop(labels=['Name', 'Cabin', 'Parch', 'SibSp', 'Embarked', 'Ticket'], axis=1, inplace=True)
```

```
titanic_df.head()
```

	PassengerId	Survived	Pclass	Sex	Age	Fare
0	1	0	3	male	22.0	7.2500
1	2	1	1	female	38.0	71.2833
2	3	1	3	female	26.0	7.9250
3	4	1	1	female	35.0	53.1000
4	5	0	3	male	35.0	8.0500

```
titanic_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 6 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Sex          891 non-null    object 
 4   Age          714 non-null    float64
 5   Fare         891 non-null    float64
dtypes: float64(2), int64(3), object(1)
memory usage: 41.9+ KB
```

```
survived = titanic_df['Survived']
```

```
titanic_df.drop(['Survived'], axis=1, inplace=True)
```

```
titanic_df.head()
```

	PassengerId	Pclass	Sex	Age	Fare
0	1	3	male	22.0	7.2500
1	2	1	female	38.0	71.2833
2	3	3	female	26.0	7.9250
3	4	1	female	35.0	53.1000
4	5	3	male	35.0	8.0500

```
titanic_df['Age'].fillna(titanic_df['Age'].mean(), inplace=True)
```

```
titanic_df.head()
```

	PassengerId	Pclass	Sex	Age	Fare
0	1	3	male	22.0	7.2500
1	2	1	female	38.0	71.2833
2	3	3	female	26.0	7.9250
3	4	1	female	35.0	53.1000
4	5	3	male	35.0	8.0500

```
titanic_df = pd.get_dummies(titanic_df, columns=['Sex'], prefix='Sex')
```

```
titanic_df['Pclass'] = titanic_df['Pclass'].round().astype(int)
titanic_df['Age'] = titanic_df['Age'].round().astype(int)
```

```
titanic_df.drop(['Fare'], inplace=True, axis=1)
```

```
titanic_df.head()
```

	PassengerId	Pclass	Age	Sex_female	Sex_male
0	1	3	22	0	1
1	2	1	38	1	0
2	3	3	26	1	0
3	4	1	35	1	0
4	5	3	35	0	1

Building a model

```
X_train, X_test, y_train, y_test = train_test_split(titanic_df, survived, test_size=0.30, random_state=42)
```

```
class Perceptron:

    def __init__(self, learning_rate, epochs):
        self.weights = None
        self.bias = None
        self.learning_rate = learning_rate
        self.epochs = epochs

    def activation_func(self, z):
        return np.heaviside(z, 0)

    def fit(self, X, y):
        n_samples, n_features = X.shape
        self.weights = np.zeros(n_features)
        self.bias = 0

        for i in range(self.epochs):
            for j in range(n_samples):
                z = np.dot(X.iloc[j], self.weights) + self.bias
                y_pred = self.activation_func(z)
                loss = (y.iloc[j]-y_pred)

                self.weights += self.learning_rate*loss*X.iloc[j]
                self.bias += self.learning_rate*loss

    def predict(self, X):
        pred = []
        n_samples, n_features = X.shape
        for i in range(n_samples):
            z = np.dot(X.iloc[i], self.weights) + self.bias
            pred.append(self.activation_func(z))
        return pred
```

```
model = Perceptron(0.001, 30)
model.fit(X_train, y_train)
```

```
y_pred = model.predict(X_test)
```

```
print(accuracy_score(y_test, y_pred))
```

```
0.4216417910447761
```

```
report = classification_report(y_test, y_pred)
print(report)
```

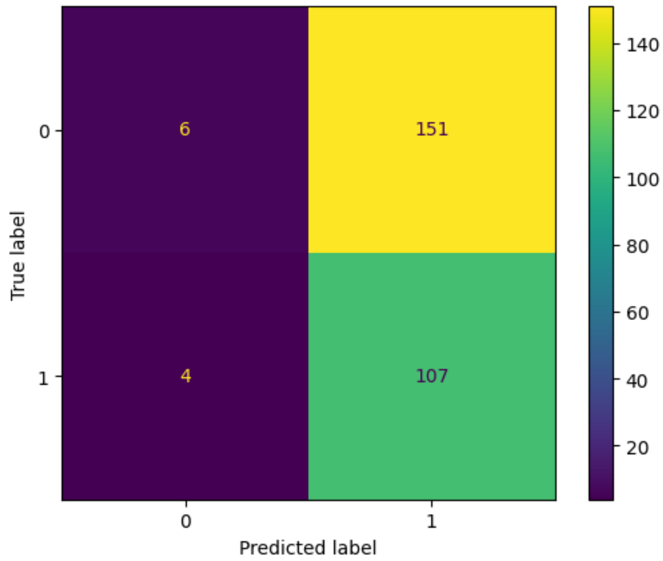
```
              precision    recall  f1-score   support

           0       0.60      0.04      0.07       157
           1       0.41      0.96      0.58       111

    accuracy                           0.42       268
   macro avg       0.51      0.50      0.33       268
weighted avg       0.52      0.42      0.28       268
```

```
conf_mat = confusion_matrix(y_test, y_pred)
ConfusionMatrixDisplay(conf_mat).plot()
```

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7e0d968b6fb0>
```



GridSearchCV

```
param_grid = {'alpha': [0.0001, 0.001, 0.01, 0.1, 1.0],
              'max_iter': [10, 50, 100, 200, 500]}

grid_search = GridSearchCV(cv=5, estimator=sklearn_pt(),
             param_grid={'alpha': [0.0001, 0.001, 0.01, 0.1, 1.0],
                         'max_iter': [10, 50, 100, 200, 500]},
             scoring='accuracy')
best_params = grid_search.fit(X_train, y_train)
print("Best Parameters:", best_params.best_params_)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/linear_model/_stochastic_gradient.py:702: ConvergenceWarning: Maximum number of iter
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/sklearn/linear_model/_stochastic_gradient.py:702: ConvergenceWarning: Maximum number of iter
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/usr/local/lib/python3.10/dist-packages/sklearn/linear_model/_stochastic_gradient.py:702: ConvergenceWarning: Maximum number of iter
  warnings.warn(
Best Parameters: {'alpha': 0.0001, 'max_iter': 50}
```

```
sklearn_model = sklearn_pt(alpha=0.0001, max_iter=50)
sklearn_model.fit(X_train, y_train)
```

```
▾ Perceptron
Perceptron(max_iter=50)
```

```
pred_sk = sklearn_model.predict(X_test)
report = classification_report(y_test, pred_sk)
print(report)
```

```
              precision    recall  f1-score   support

           0       0.63      0.17      0.26       157
           1       0.42      0.86      0.57       111

    accuracy                           0.46       268
   macro avg       0.53      0.52      0.42       268
weighted avg       0.55      0.46      0.39       268
```

```
model = Perceptron(0.0001, 50)
model.fit(X_train, y_train)
```

```
y_pred = model.predict(X_test)
report = classification_report(y_test, y_pred)
print(report)
```

```
              precision    recall  f1-score   support

           0       0.58      0.04      0.08       157
           1       0.41      0.95      0.58       111

    accuracy                           0.42       268
   macro avg       0.50      0.50      0.33       268
weighted avg       0.51      0.42      0.29       268
```

Iris

```
iris = pd.read_csv('/content/Iris.csv')
```

```
iris.dropna(inplace=True)
```

```
iris['Species'].value_counts()
```

```
Iris-setosa        50
Iris-versicolor    50
Iris-virginica     50
Name: Species, dtype: int64
```

```
y = iris['Species'].replace({'Iris-setosa': 0, 'Iris-versicolor': 1, 'Iris-virginica': 2})
```

```
X = iris.drop(columns=['Species', 'Id'], axis=1)
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.30, random_state=42)
```

```
param_grid = {'alpha': [0.0001, 0.001, 0.01, 0.1, 1.0],
              'max_iter': [10, 50, 100, 200, 500]}

grid_search = GridSearchCV(cv=5, estimator=sklearn_pt(),
             param_grid={'alpha': [0.0001, 0.001, 0.01, 0.1, 1.0],
                         'max_iter': [10, 50, 100, 200, 500]},
             scoring='accuracy')
best_params = grid_search.fit(X_train, y_train)
print("Best Parameters:", best_params.best_params_)
```

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```

```
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```

```
sklearn_model = sklearn_pt(alpha=0.0001, max_iter=50)
sklearn_model.fit(X_train, y_train)

pred_sk = sklearn_model.predict(X_test)
report = classification_report(y_test, pred_sk)
print(report)
```

```
                  precision    recall  f1-score   support

               0       1.00      1.00      1.00        19
               1       1.00      0.31      0.47        13
               2       0.59      1.00      0.74        13

        accuracy                           0.80        45
       macro avg       0.86      0.77      0.74        45
    weighted avg       0.88      0.80      0.77        45
```

```
model = Perceptron(0.0001, 50)
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
report = classification_report(y_test, y_pred)
print(report)
```

```
                  precision    recall  f1-score   support

               0       0.00      0.00      0.00        19
               1       0.29      1.00      0.45        13
               2       0.00      0.00      0.00        13

        accuracy                           0.29        45
       macro avg       0.10      0.33      0.15        45
    weighted avg       0.08      0.29      0.13        45

/usr/local/lib/python3.10/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are i
  _warn_prf(average, modifier, msg_start, len(result))
/usr/local/lib/python3.10/dist-packages/sklearn/metrics/_classification.py:1344: UndefinedMetricWarning: Precision and F-score are i
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  _warn_prf(average, modifier, msg_start, len(result))
```

```
1
```