ECGR_4105_HW3_Problem_1

October 17, 2024

[23]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[12]:
```
file_url = 'https://raw.githubusercontent.com/lnguye782/ECGR-4105-Intro-to-ML/
 ↪refs/heads/main/HW3/diabetes.csv'
data = pd.read_csv(file_url)

data.head()
```

[12]:
```
   Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin   BMI  \
0            6      148             72             35        0  33.6
1            1       85             66             29        0  26.6
2            8      183             64              0        0  23.3
3            1       89             66             23       94  28.1
4            0      137             40             35      168  43.1

   DiabetesPedigreeFunction  Age  Outcome
0                     0.627   50        1
1                     0.351   31        0
2                     0.672   32        1
3                     0.167   21        0
4                     2.288   33        1
```

[13]:
```
# Separate features and target variable
X = data.drop(columns='Outcome')
Y = data['Outcome']
```

[14]:
```
# Split the data set into Training Data (80%) and Test Data (20%)
from sklearn.model_selection import train_test_split

X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2,␣
 ↪random_state=42)
```

[15]:
```
# Scale the data between 0 and 1 to get better accuracy
from sklearn.preprocessing import StandardScaler
```

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sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

[16]:

```
# Make an instance classifier of the object LogisticRegression
from sklearn.linear_model import LogisticRegression

classifier = LogisticRegression(max_iter=1000)
classifier.fit(X_train, Y_train)
```

[16]:

```
LogisticRegression(max_iter=1000)
```

[17]:

```
# Predict on the test data
Y_pred = classifier.predict(X_test)
```

[18]:

```
# Use confusion matrix to get accuracy of the model
from sklearn.metrics import confusion_matrix

cnf_matrix = confusion_matrix(Y_test, Y_pred)
```

[22]:

```
# Evaluate the model using model evaluation metrics: accuracy, precision,␣
 ↪recall, and F1 score
from sklearn import metrics

print("Accuracy:",metrics.accuracy_score(Y_test, Y_pred))
print("Precision:",metrics.precision_score(Y_test, Y_pred))
print("Recall:",metrics.recall_score(Y_test, Y_pred))
print("F1 Score:",metrics.f1_score(Y_test, Y_pred))
```

```
Accuracy: 0.7532467532467533
Precision: 0.6491228070175439
Recall: 0.6727272727272727
F1 Score: 0.6607142857142857
```

[28]:

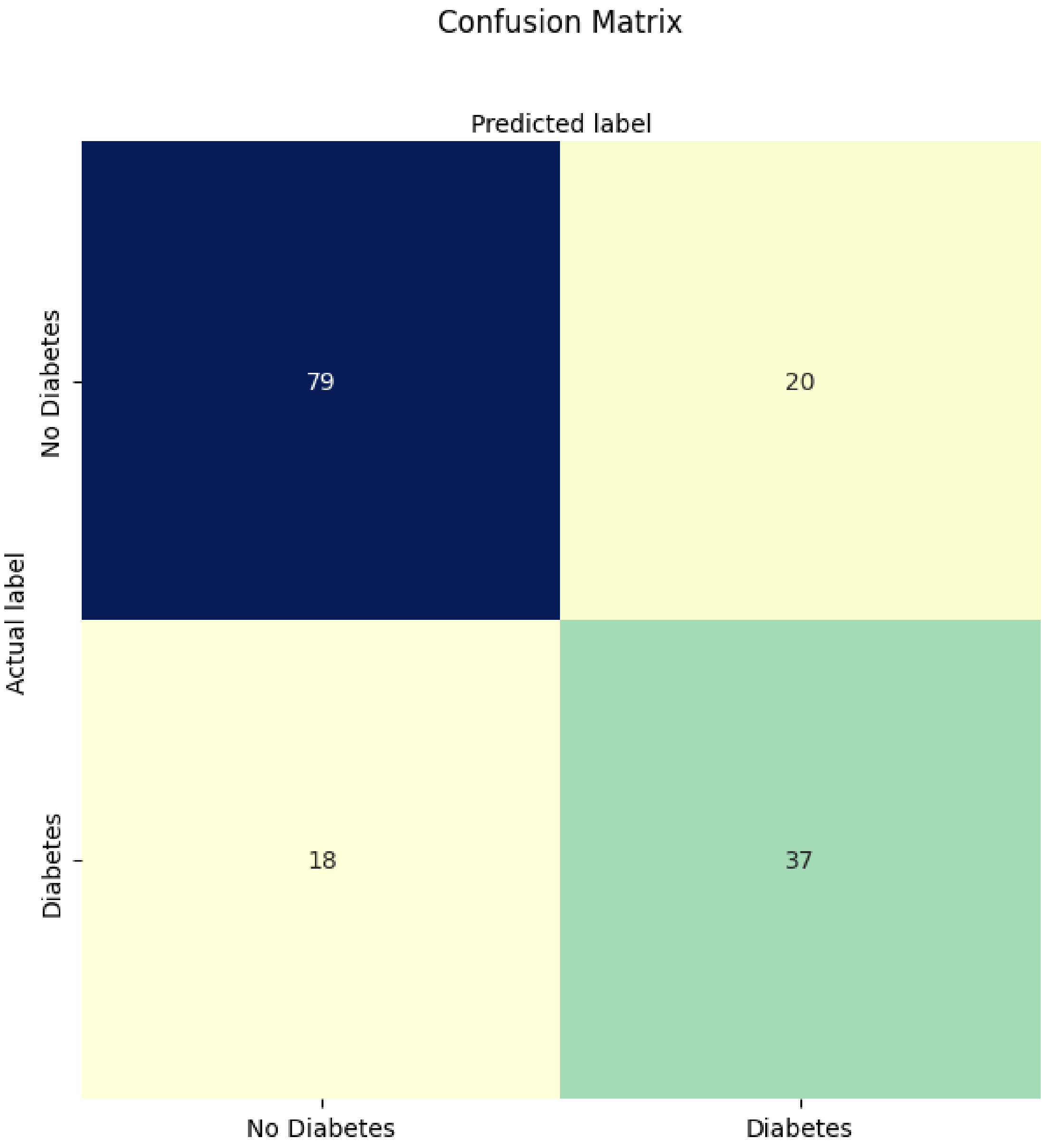
```
# Visualize the results of the model in the form of a confusion matrix using␣
 ↪matplotlib and seaborn
# Plot the confusion matrix using Heatmap
import seaborn as sns

plt.figure(figsize=(6, 6))
ax = plt.subplot()

# Create heatmap
sns.heatmap(pd.DataFrame(cnf_matrix), annot=True, fmt='d', cmap='YlGnBu',␣
 ↪cbar=False, xticklabels=['No Diabetes', 'Diabetes'], yticklabels=['No␣
 ↪Diabetes', 'Diabetes'])
```

```
ax.xaxis.set_label_position("top")
plt.tight_layout()
plt.title('Confusion Matrix', y=1.1)
plt.xlabel('Predicted label')
plt.ylabel('Actual label')
```

```
[28]: Text(45.72222222222221, 0.5, 'Actual label')
```



```
[34]: import warnings
      warnings.filterwarnings('ignore')
```

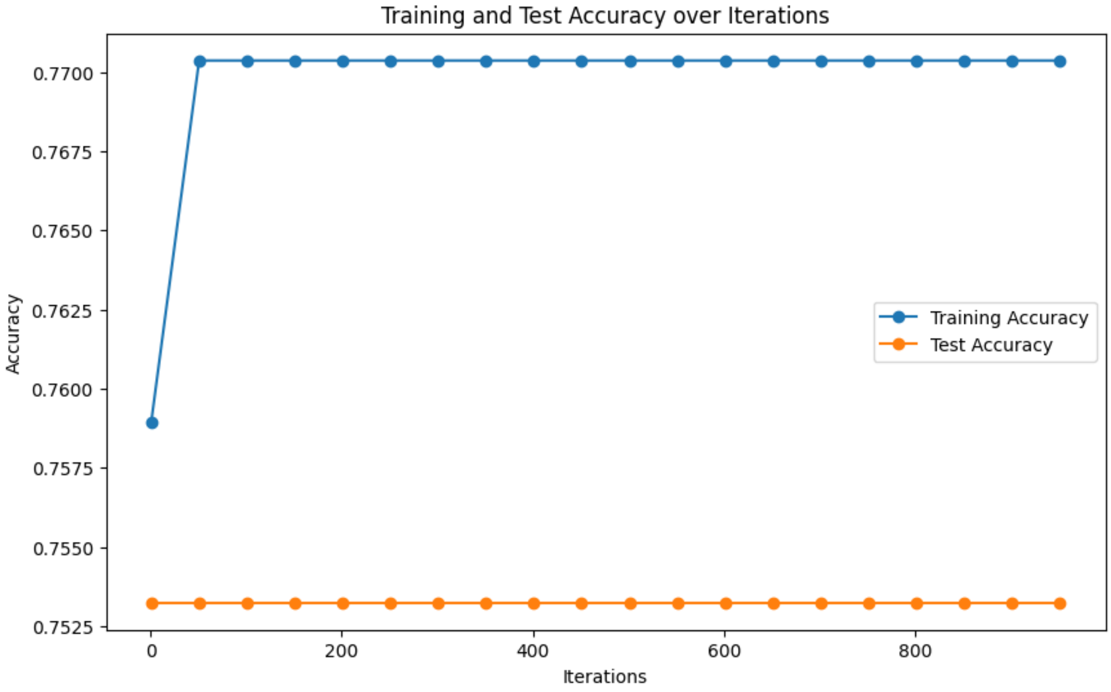
```python
train_accuracies = []
test_accuracies = []

for i in range(1, 1000, 50):
    # Create a logistic regression model with the current number of iterations
    model = LogisticRegression(max_iter=i, solver='liblinear')
    model.fit(X_train, Y_train)

    # Training accuracy
    train_accuracy = model.score(X_train, Y_train)
    train_accuracies.append(train_accuracy)

    # Test accuracy
    test_accuracy = model.score(X_test, Y_test)
    test_accuracies.append(test_accuracy)

# Plot the results
iterations = np.arange(1, 1000, 50)
plt.figure(figsize=(10, 6))
plt.plot(iterations, train_accuracies, label='Training Accuracy', marker='o')
plt.plot(iterations, test_accuracies, label='Test Accuracy', marker='o')
plt.title('Training and Test Accuracy over Iterations')
plt.xlabel('Iterations')
plt.ylabel('Accuracy')
plt.legend()
plt.show()
```


Training and Test Accuracy over Iterations
Accuracy
Iterations
Training Accuracy
Test Accuracy