
# Department of Computer Science & Engineering

**Course Title :** Artificial Intelligence and Expert Systems Lab

**Course Code :** CSE 404

**Lab Report :** 03

**Submission Date :** 24.04.25

**Submitted To:**

Noor Mairukh Khan Arnob

Lecturer,

Department of CSE, UAP

**Submitted By:**

Susmita Roy

Reg: 21201199

Sec: B2

## Problem Title:

Diabetes Prediction Using Machine Learning.

## Problem Description:

Diabetes is a serious health problem that needs early detection to avoid complications. This project aims to build a machine learning model that can predict whether a person has diabetes or not using health information like age, glucose level, blood pressure, BMI, and more.

The dataset used in this project is the “Pima Indians Diabetes Dataset”, which contains physiological data from female patients of at least 21 years old.

Using this dataset , the aim is to train a machine learning model , specifically- Logistic Regression, that can accurately  predict the possibility of diabetes in a patient.

## Tools and Languages Used:

- Programming Language: Python
- Tools: Colab Notebook

## Source Code:

```
# Import necessary libraries
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler
```

```
# Load Pima Indians Diabetes dataset from URL
df = pd.read_csv('https://raw.githubusercontent.com/jbrownlee/Datasets/master/pima-indians-diabetes.data.csv', header=None)
```

```
# Assign column names based on dataset documentation
df.columns = ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
              'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome']
```

```
# Display basic information about the dataset
print("Dataset Overview:")
print(df.head())
```

```
# Display basic information about the dataset
print("\nDataset Info:")
print(df.info())
```

```
# Split dataset into features (X) and target (y)
X = df.drop('Outcome', axis=1)
y = df['Outcome']

# Split data into training and test sets
X_train, X_test, y_train, y_test = train_test_split(
    X,
    y,
    test_size=0.2,  # 80% training, 20% testing
    random_state=42  # For reproducibility
)

print("\nData Split Summary:")
print(f"Training features shape: {X_train.shape}")
print(f"Test features shape: {X_test.shape}")
# Standardize the feature values
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)
```

```
# Create and train logistic regression model
model = LogisticRegression(random_state=42, max_iter=1000)
model.fit(X_train_scaled, y_train)

# Make predictions on test set
y_pred = model.predict(X_test_scaled)

# Calculate and display performance metrics
accuracy = accuracy_score(y_test, y_pred)
print("\nModel Performance Metrics:")
print(f"Accuracy: {accuracy:.3f}")
# Display detailed classification report
print("\nClassification Report:")
print(classification_report(y_test, y_pred))

# Create confusion matrix visualization
plt.figure(figsize=(10, 6))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True, fmt='d',
            xticklabels=['No Diabetes', 'Diabetes'],
            yticklabels=['No Diabetes', 'Diabetes'],
            cmap='Blues')
plt.title('Confusion Matrix - Diabetes Prediction')
plt.xlabel('Predicted Labels')
plt.ylabel('True Labels')
plt.show()
```

## Output:

```
Dataset Overview:
   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
```

```
Dataset Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
 0   Pregnancies               768 non-null    int64
 1   Glucose                   768 non-null    int64
 2   BloodPressure             768 non-null    int64
 3   SkinThickness             768 non-null    int64
 4   Insulin                   768 non-null    int64
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64
 8   Outcome                   768 non-null    int64
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
None
```

## Data Split Summary:

Training features shape: (614, 8)

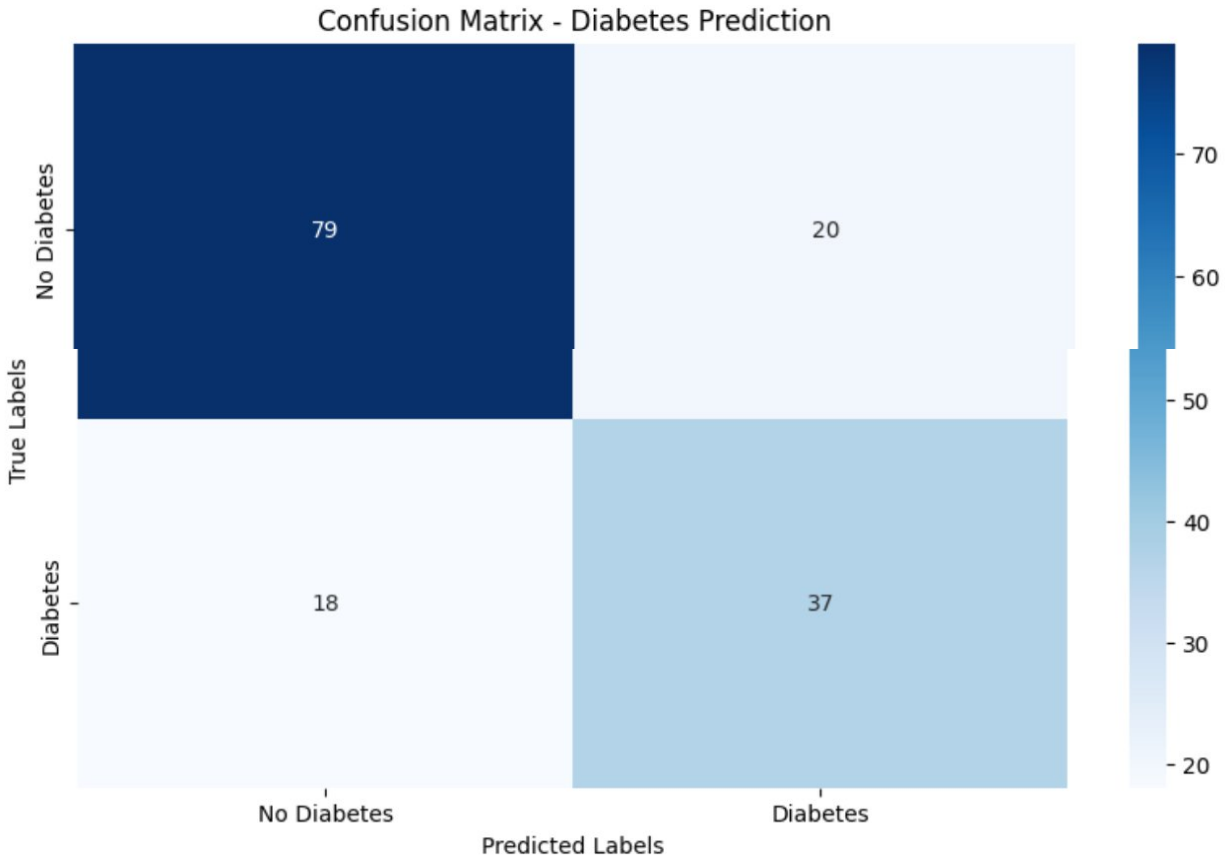
Test features shape: (154, 8)

## Model Performance Metrics:

Accuracy: 0.753

Classification Report:

| | precision | recall | f1-score | support |
|---|---|---|---|---|
| 0 | 0.81 | 0.80 | 0.81 | 99 |
| 1 | 0.65 | 0.67 | 0.66 | 55 |
| accuracy | | | 0.75 | 154 |
| macro avg | 0.73 | 0.74 | 0.73 | 154 |
| weighted avg | 0.76 | 0.75 | 0.75 | 154 |




## Conclusion:

This project’s logistic regression model does a good job of predicting diabetes using basic health information. Even though it's a simple model, it works well when the data is properly prepared. It can help doctors find people who might have diabetes, so they can get help earlier and manage the disease better.