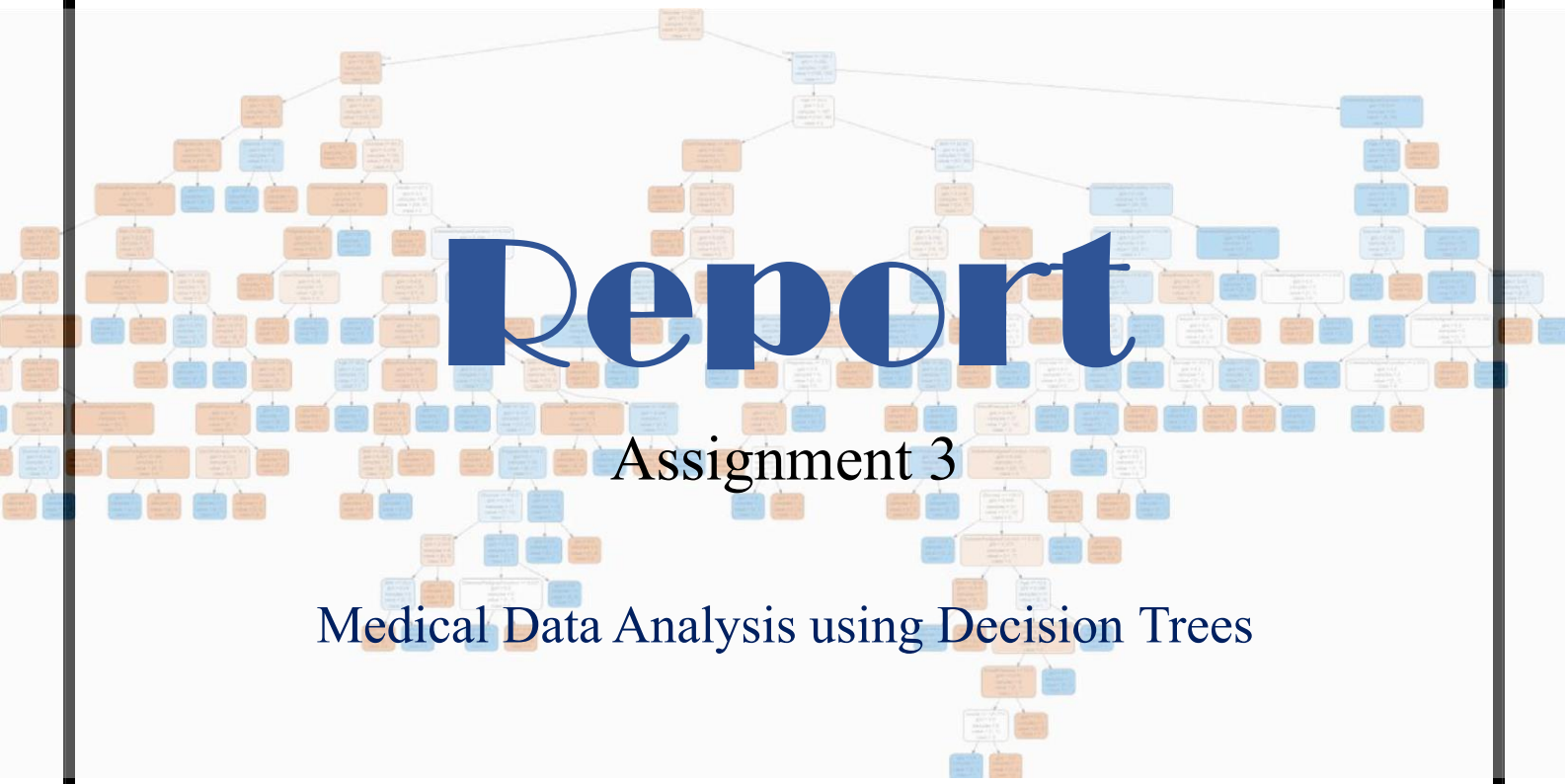

Report

Assignment 3

Medical Data Analysis using Decision Trees

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Dataset Description :

In this code, we have analyzed the diabetes dataset using a decision tree classifier. The dataset contains information about patients and whether they have diabetes or not. There are eight input features and one output feature. The input features are Pregnancies, Glucose, BloodPressure, SkinThickness, Insulin,
BMI, DiabetesPedigreeFunction, and Age. The output feature is Outcome, which has two classes: 0 and 1.

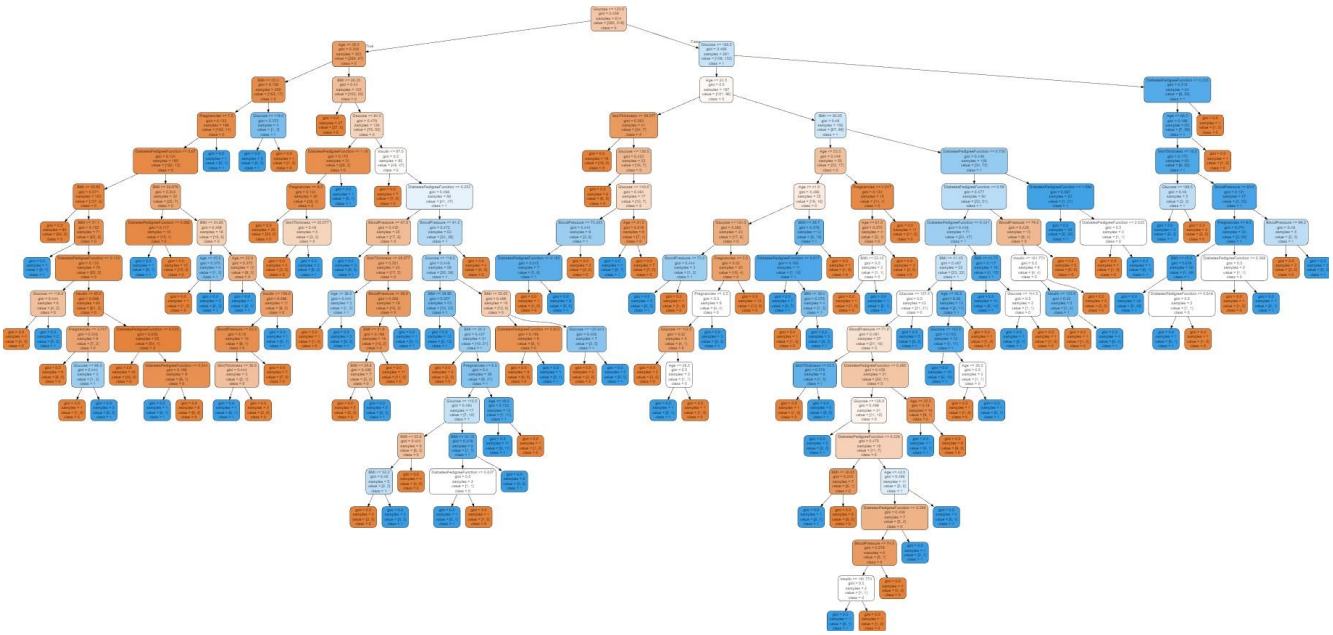
Code :

First, we read the dataset using pandas and replaced the missing values with the mean of the corresponding column. Then, we split the dataset into training and testing sets using three different ratios: 90/10, 80/20, and 70/30. For each split, we trained a decision tree classifier and evaluated its performance using accuracy, precision, recall, and F1 score metrics.

Assignment3.ipynb

Decision Tree Visualization :

We also visualized the decision tree using the graphviz library. The visualization shows the decision rules used by the classifier to predict the outcome of a patient.



Diabetes-Tree.dot

Furthermore, we analyzed the information gain of the split node features using the entropy criterion. The information gain represents the amount of information obtained by splitting the dataset based on a particular feature. The results showed that Glucose was the most informative feature,

followed by BMI, Age, and DiabetesPedigreeFunction.

Finally, we compared the performance of the classifiers trained on different splits and selected the one with the highest accuracy. We then used the selected classifier to analyze the information gain of the split node features.

Insights and observations :

- The accuracy, precision, recall, and F1 score metrics were higher for the 80/20 split compared to the other splits .

- The Glucose feature was the most informative feature for predicting the outcome of a patient with diabetes. This confirms the importance of glucose monitoring for diabetes management.

- The BMI and Age features were also informative, which suggests that maintaining a healthy weight and aging gracefully are essential factors for diabetes prevention and management.

- The decision tree visualization provided a clear and intuitive representation of the decision rules used by the classifier. This can help healthcare professionals understand the factors that contribute to diabetes and develop personalized treatment plans for their patients.

```
90/10:
 [0 0 1 0 1 0 1 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 1 1 0 0 1
 0 1 0 1 0 1 1 1 0 0 0 0 0 1 1 0 0 1 0 0 1 0 1 0 0 0 0 0 1 0 1 1 0 0 0 1
 1 0 0]
Accuarcy: 0.7272727272727273
Precision: 0.5769230769230769
Recall: 0.6
F1 score: 0.5882352941176471
---------------------------------
80/20:
 [0 0 1 0 1 1 0 1 1 1 0 1 0 0 0 0 0 0 0 1 0 0 1 0 1 0 0 0 0 0 0 1 1 0 0 0
 1 1 0 0 0 1 0 0 1 1 0 0 1 0 0 0 1 0 1 0 1 0 0 1 0 0 0 0 1 1 0 0 1 0 0 1 0
 0 0 1 1 0 1 0 1 0 1 0 0 0 1 1 1 1 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 1
 0 0 0 1 1 1 0 0 1 0 1 0 0 1 0 0 0 1 0 1 1 0 0 0 1 0 0 1 1 0 0 0 0 0 1 0 1
 1 0 0 0 0 1 0]
Accuarcy: 0.6753246753246753
Precision: 0.4642857142857143
Recall: 0.5652173913043478
F1 score: 0.5098039215686274
---------------------------------
70/30:
 [1 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 1 1 1 0 1 1 0 1 0 0 0 0 0 1 1 0 0
 0 0 0 1 1 0 0 0 0 0 0 1 0 0 1 0 1 0 1 0 1 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 1
 0 0 0 1 0 1 1 0 0 0 0 1 1 0 1 1 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0
 0 1 1 0 0 1 1 1 1 1 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 1 1 1 0 0 0 0 0 0 0 0 1
 0 1 0 0 1 1 1 0 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1
 0 0 1 1 0 0 0 0 0 0 1 1 0 0 0 0 1 0 1 0 0 0 1 0 1 0 1 0 0 1 0 1 1 0 0 1 0
 0 0 0 0 0 0 1 1 0]
Accuarcy: 0.658008658008658
Precision: 0.547945205479452
Recall: 0.46511627906976744
F1 score: 0.5031446540880503
---------------------------------
Information Gain for Split Node Features:
Pregnancies: 0.0562
Glucose: 0.2807
BloodPressure: 0.0800
SkinThickness: 0.0502
Insulin: 0.0802
BMI: 0.1696
DiabetesPedigreeFunction: 0.1261
Age: 0.1570
```