HEALTH RISK CLASSIFICATION

A PROJECT REPORT

Submitted by

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Of

Bachelor of CSE(AI)

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Introduction:

Problem Statement:

Health risk classification is a vital process in modern healthcare that involves categorizing individuals based on their potential vulnerabilities to various health conditions. This classification system enhances the ability to identify individuals who may be at higher risk for chronic illnesses, allowing healthcare professionals to implement preventive measures. Accurate risk assessment leads to tailored treatment plans that can significantly improve patient outcomes. Furthermore, early identification of at-risk individuals can contribute to reduced healthcare costs and better resource allocation. The integration of advanced data analytics and machine learning techniques into this classification can optimize accuracy and efficiency. By harnessing these technologies, healthcare providers can transform patient management strategies and promote healthier populations. Thus, the focus on health risk classification is essential for advancing public health initiatives and improving individual wellness.

Methodology:

- Data Collection:
    - Gather data from reliable healthcare databases and surveys.
- Data Preprocessing:
    - Clean data by handling missing values, outliers, and normalization.
- Model Selection:
    - Choose algorithms suitable for classification, such as logistic regression, decision trees, or neural networks.
- Training and Testing:
    - Split the data into training and testing sets to validate the model's performance.
- Evaluation Metrics:
    - Use metrics like accuracy, precision, recall, and F1-score to assess model performance.

Code

```
# Import necessary libraries

import pandas as pd

from sklearn.model_selection import train_test_split

from sklearn.ensemble import RandomForestClassifier

from sklearn.preprocessing import LabelEncoder

from sklearn.metrics import classification_report, confusion_matrix

import seaborn as sns

import matplotlib.pyplot as plt

# Load the dataset from CSV file

df = pd.read_csv('/content/health_risk.csv')

# Display the first few rows to understand the structure (optional)

print(df.head())

# Encode the categorical target column 'risk_level' to numeric values

le = LabelEncoder()

df['risk_level_encoded'] = le.fit_transform(df['risk_level'])

# Separate the features (independent variables) and target (dependent variable)
```

```
X = df[['bmi', 'exercise_hours', 'junk_food_freq']]  # Features

y = df['risk_level_encoded']                         # Target

# Split the data into training and test sets (80% training, 20% testing)

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Initialize the Random Forest Classifier with 100 decision trees

model = RandomForestClassifier(n_estimators=100, random_state=42)

# Train the model on the training data

model.fit(X_train, y_train)

# Use the trained model to make predictions on the test set

y_pred = model.predict(X_test)

# Print a classification report to evaluate precision, recall, F1-score

print("Classification Report:\n", classification_report(y_test, y_pred, target_names=le.classes_))

# Print the confusion matrix to see how well the model predicted each class

print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))

# Plot the importance of each feature used in the model

feature_importance = pd.Series(model.feature_importances_, index=X.columns)

sns.barplot(x=feature_importance.values, y=feature_importance.index)

plt.title('Feature Importance')
```

```
plt.xlabel('Importance Score')

plt.ylabel('Feature')

plt.tight_layout()

plt.show()
```

Output/Result:

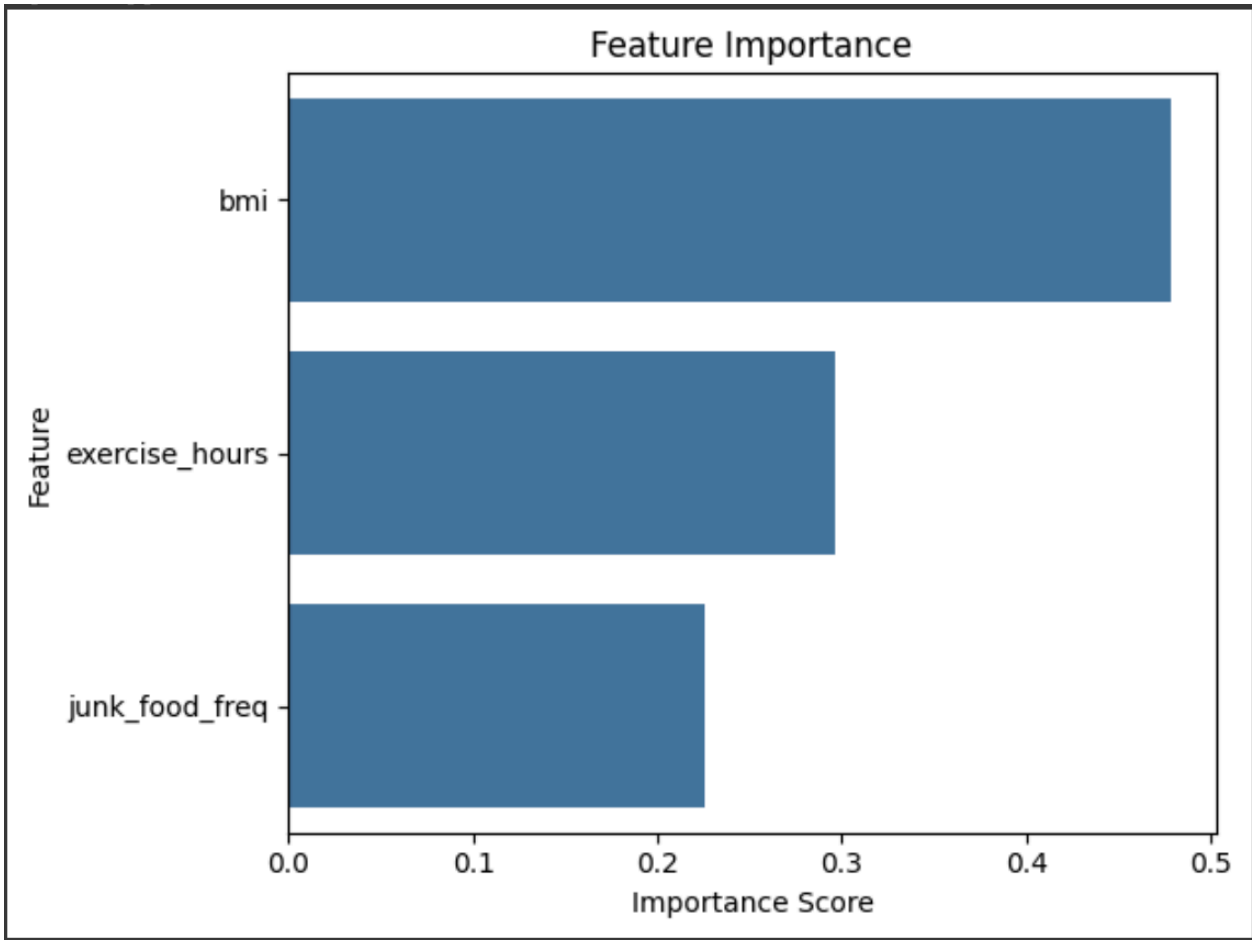
- Screenshot:

```
         bmi  exercise_hours  junk_food_freq risk_level
0  28.730279              13               1       high
1  31.301442              12               4     medium
2  32.549043               9               0     medium
3  30.463670               2               1     medium
4  28.431755               2               1        low
Classification Report:
              precision    recall  f1-score   support

        high       0.20      0.20      0.20         5
         low       0.14      0.20      0.17         5
      medium       0.62      0.50      0.56        10

    accuracy                           0.35        20
   macro avg       0.32      0.30      0.31        20
weighted avg       0.40      0.35      0.37        20

Confusion Matrix:
 [[1 3 1]
 [2 1 2]
 [2 3 5]]
```

- 
Feature Importance
bmi
exercise_hours
junk_food_freq
Feature
0.0
0.1
0.2
0.3
0.4
0.5
Importance Score

References/Credits

- Properly credit datasets(Health risk_CSV), research articles.
- References:
    - World Health Organization (WHO) guidelines on BMI.
    - Dietary Guidelines for Indians.
    - "Health Risk Assessment: A Practical Guide" by S. Margret
        - Covers methodologies for conducting health risk assessments comprehensively.
    - "Environmental Health Risk Assessment" by Paul A. Locke
        - Focuses on environmental factors and their impact on health risk assessment.
    - "Fundamentals of Health Risk Assessment" by P. Eric and S. Lee
        - Provides an introduction to the concept and practices of health risk assessment.
    - "Quantitative Risk Assessment in Fire Safety" by David Flewelling
        - Focuses on quantitative methods in risk assessment, particularly in fire safety applications.
    - "Risk Assessment: Theory, Methods, and Applications" by Daniel A. E.
        - Discusses various methods and theoretical frameworks surrounding risk assessment.