Assessment Report

on

“Health Risk Classification”

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

SESSION 2024-25

in

CSE(AI)

By

Name : Mohammad Fahim

University Roll : 202401100300154

Section: C

Under the supervision of

“Mayank Sir”

KIET Group of Institutions, Ghaziabad

Introduction :

In today's world, predicting health risk is important to take precautions early. This project focuses on predicting whether a person is at low, medium, or high health risk by analyzing their Body Mass Index (BMI), exercise hours per week, and junk food consumption frequency. We used machine learning to build a model that can classify these risk levels automatically.

Methodology :

1. Dataset: We used a dataset containing health information like BMI, exercise hours, junk food frequency, and risk level.
2. Preprocessing: We converted the risk level (Low/Medium/High) into numeric values.
3. Model Used: We used the Random Forest Classifier from sklearn.
4. Train/Test Split: 80% of the data was used for training and 20% for testing.
5. Evaluation: We used metrics like accuracy, precision, recall, and a confusion matrix heatmap to check model performance.
6. Clustering: We also applied KMeans clustering to group people into health risk clusters without using labels.

Code :

```
# === STEP 1: Import Required Libraries ===
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import confusion_matrix, accuracy_score, precision_score, recall_score, classification_report

from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import silhouette_score

# === STEP 2: Upload and Load Dataset ===
from google.colab import files
uploaded = files.upload()

# Automatically pick the uploaded file
file_name = next(iter(uploaded))
df = pd.read_csv(file_name)
```

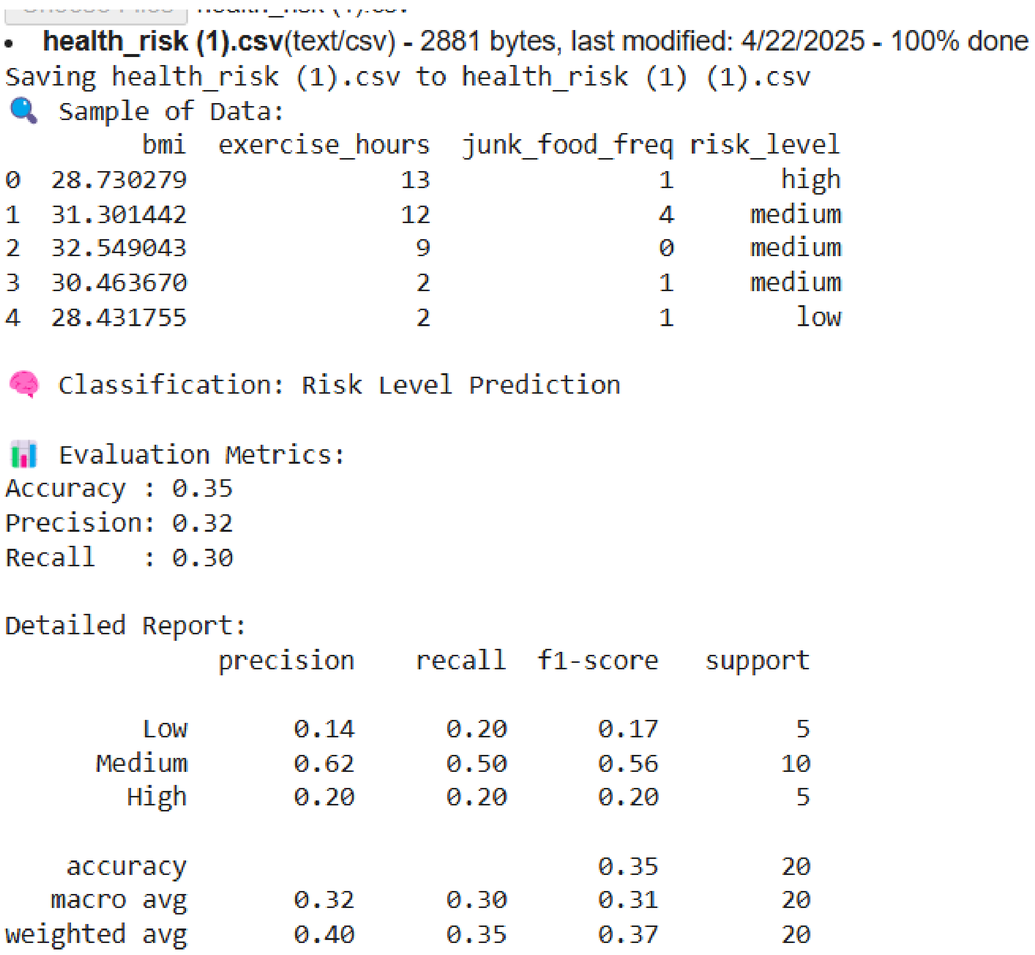
```
# === STEP 3: Show First Few Rows ===
print("🔍 Sample of Data:")
print(df.head())

# === STEP 4: Classification (Supervised Learning) ===
print("\n🧠 Classification: Risk Level Prediction")

# Convert risk_level to numerical: low=0, medium=1, high=2
df['risk_level'] = df['risk_level'].map({'low': 0, 'medium': 1, 'high': 2})

# Features and target
X = df[['bmi', 'exercise_hours', 'junk_food_freq']]
y = df['risk_level']

# Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Train classifier
clf = RandomForestClassifier(random_state=42)
clf.fit(X_train, y_train)
```

```
# Predict
y_pred = clf.predict(X_test)

# Evaluation Metrics
accuracy = accuracy_score(y_test, y_pred)
precision = precision_score(y_test, y_pred, average='macro', zero_division=0)
recall = recall_score(y_test, y_pred, average='macro', zero_division=0)

print("\n📊 Evaluation Metrics:")
print(f"Accuracy : {accuracy:.2f}")
print(f"Precision: {precision:.2f}")
print(f"Recall   : {recall:.2f}")
print("\nDetailed Report:")
print(classification_report(y_test, y_pred, target_names=["Low", "Medium", "High"]))

# Confusion Matrix Heatmap
cm = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(8, 6))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues',
            xticklabels=["Low", "Medium", "High"],
            yticklabels=["Low", "Medium", "High"])
```

```
plt.title("Confusion Matrix Heatmap")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()

# === STEP 5: Clustering (Unsupervised Learning) ===
print("\n🔍 Clustering (KMeans) for Health Profile Segmentation")

# Remove target column for clustering
X_cluster = df[['bmi', 'exercise_hours', 'junk_food_freq']]

# Scale the features
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X_cluster)

# Apply KMeans clustering (let's try 3 clusters)
kmeans = KMeans(n_clusters=3, random_state=42, n_init=10)
clusters = kmeans.fit_predict(X_scaled)

# Add cluster labels to dataframe
df['cluster'] = clusters

# Evaluate clustering
```

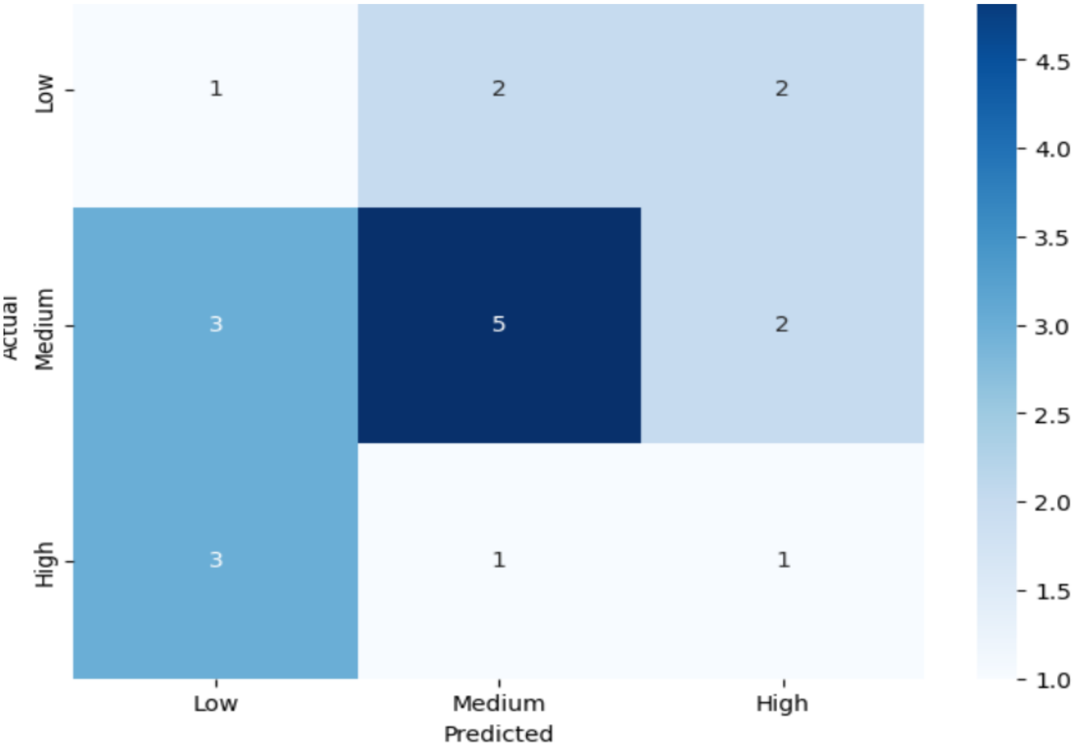
```
sil_score = silhouette_score(X_scaled, clusters)
print(f"\nSilhouette Score (Cluster Quality): {sil_score:.2f}")

# Visualize clusters
plt.figure(figsize=(8, 6))
sns.scatterplot(x=df['bmi'], y=df['exercise_hours'], hue=clusters, palette='Set1')
plt.title("KMeans Clustering: Health Segmentation")
plt.xlabel("BMI")
plt.ylabel("Exercise Hours/Week")
plt.legend(title="Cluster")
plt.show()
```

Screenshot of Output :

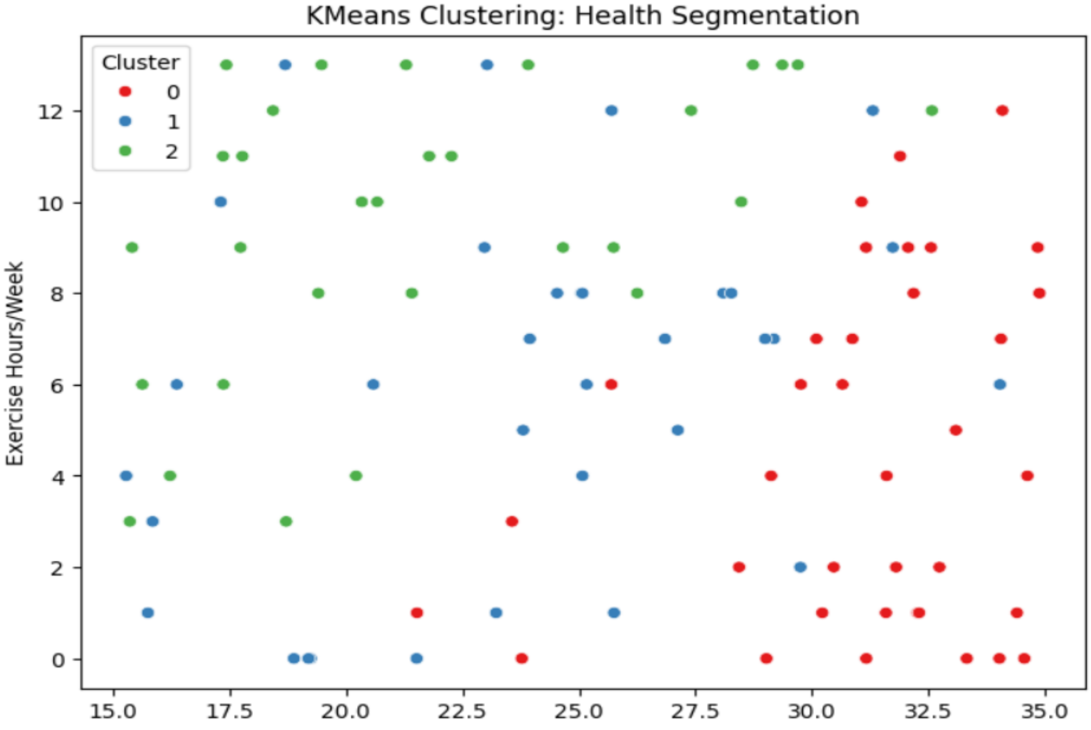


- **health_risk (1).csv**(text/csv) - 2881 bytes, last modified: 4/22/2025 - 100% done

```
Saving health_risk (1).csv to health_risk (1) (1).csv
🔍 Sample of Data:
         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: Risk Level Prediction

📊 Evaluation Metrics:
Accuracy : 0.35
Precision: 0.32
Recall   : 0.30

Detailed Report:
              precision    recall  f1-score   support

         Low       0.14      0.20      0.17         5
      Medium       0.62      0.50      0.56        10
        High       0.20      0.20      0.20         5

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



```
🔍 Clustering (KMeans) for Health Profile Segmentation

Silhouette Score (Cluster Quality): 0.28
```



References/Credits :

- Dataset: Provided by faculty / or custom-created
- Libraries: scikit-learn, pandas, matplotlib, seaborn
- Colab: Google Colab used for cloud-based execution
- Guide: Assistance provided by AI tools and online documentation