Assessment Report

on

"Predict Heart Disease"

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

SESSION 2024-25

In

Artificial Intelligence and Machine Learning

By

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18 April, 2025

Introduction:

In this project, we tackle the problem of clustering aisle names in a dataset. The dataset contains textual descriptions of aisles, and the task is to group similar aisle names together. This is done through the following steps:

- **Text Vectorization**: The aisle names are first converted into numerical vectors using the TF-IDF technique, which helps capture the importance of words within the aisle names relative to the entire corpus.

- **Clustering**: The K Means clustering algorithm is applied to the vectorized data to group the aisle names into clusters based on their similarity.

- **Dimensionality Reduction**: PCA is used to reduce the high-dimensional vectorized data to two dimensions, which allows for easier visualization of the clusters.

- **Evaluation**: The project also includes a mock classification and confusion matrix to simulate how the clustering labels would behave if there were true labels for comparison.

- **Applications**: Clustering aisle names can improve store layout, enhance product recommendations, and aid in inventory management.

- **Significance**: This project demonstrates applying machine learning to real-world retail data, offering practical benefits in organizing and analyzing data efficiently.

Methodology:

The following steps were used to solve the problem:

- **File Upload and Data Loading**: The data was uploaded from a CSV file, and the contents were previewed using pandas

- **Text Vectorization**: The aisle names were transformed into numerical vectors using the Tfidf Vectorizer from scikit-learn, which calculates the Term Frequency-Inverse Document Frequency of words in the aisle names.

- **Clustering:** The K Means clustering algorithm was applied to the vectorized data with a predefined number of clusters (k=5). This grouped the aisle names into clusters based on their similarity.

- **PCA for Visualization**: Principal Component Analysis (PCA) was performed to reduce the dimensionality of the data to 2D for visualization. The reduced components (PC1 and PC2) were plotted in a scatter plot to visualize the clusters.

- **Evaluation Metrics and Heatmap**: A mock classification was performed, and the predicted labels were compared with randomly generated true labels. The performance was evaluated using a confusion matrix and metrics like accuracy, precision, and recall

Code:

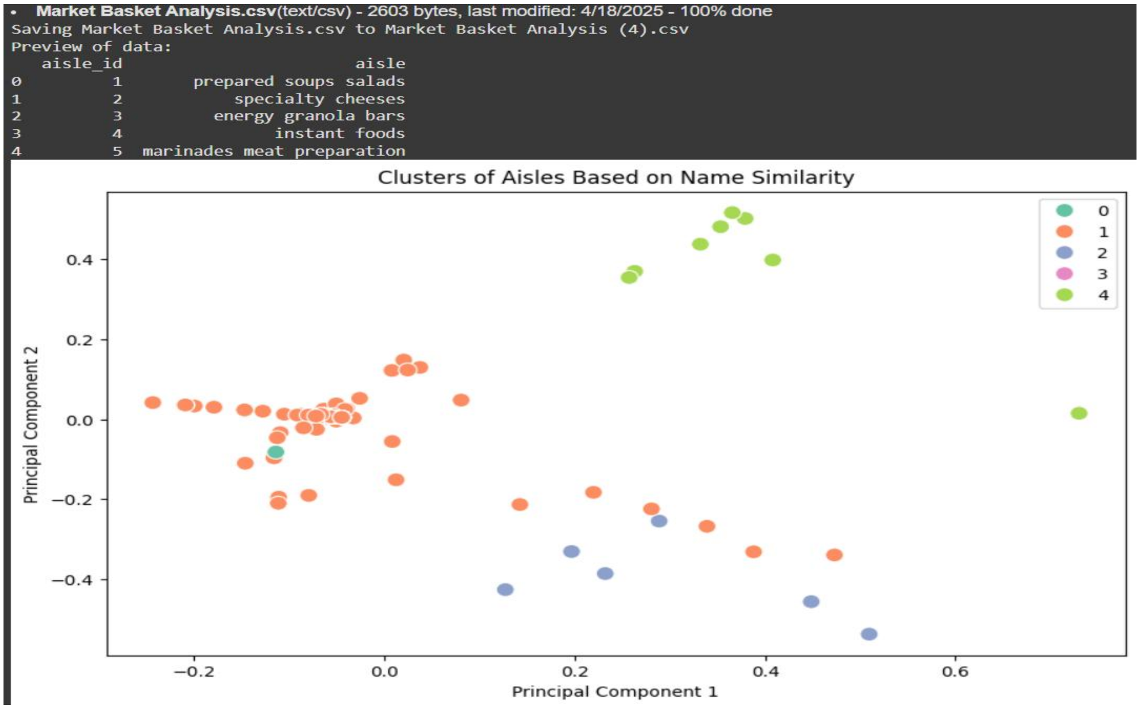
```
# STEP 1: Upload the file
from google.colab import files
uploaded = files.upload()

# STEP 2: Load the file
import pandas as pd
filename = list(uploaded.keys())[0]
df = pd.read_csv(filename)
print("Preview of data:")
print(df.head())

# STEP 3: Text vectorization of aisle names
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
import matplotlib.pyplot as plt
import seaborn as sns

# Vectorize the aisle names
vectorizer = TfidfVectorizer(stop_words='english')
X = vectorizer.fit_transform(df['aisle'])
```

```
# STEP 4: Clustering the aisle names
k = 5  # number of clusters
model = KMeans(n_clusters=k, random_state=42)
df['Cluster'] = model.fit_predict(X)

# STEP 5: PCA to reduce to 2D for plotting
pca = PCA(n_components=2)
components = pca.fit_transform(X.toarray())
df['PC1'] = components[:, 0]
df['PC2'] = components[:, 1]

# Plotting the clusters
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='PC1', y='PC2', hue='Cluster', palette='Set2', s=100)
plt.title("Clusters of Aisles Based on Name Similarity")
plt.xlabel("Principal Component 1")
plt.ylabel("Principal Component 2")
plt.legend()
plt.show()

# STEP 6: Mock classification and heatmap for fun
import numpy as np
```

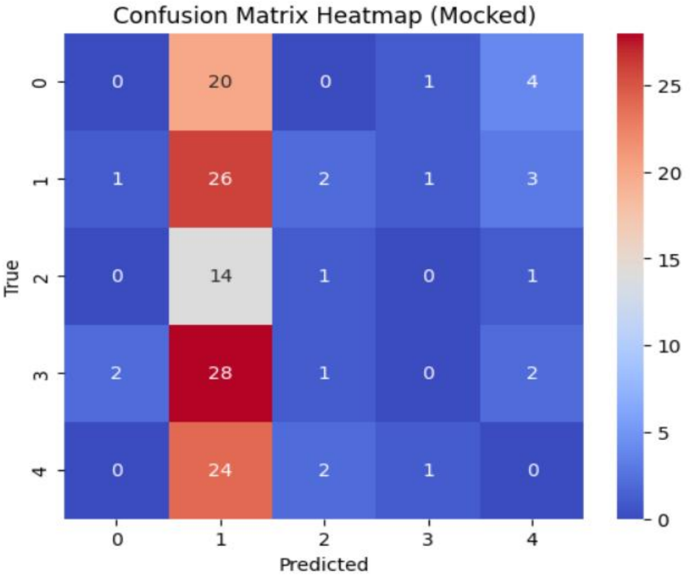
```
from sklearn.metrics import confusion_matrix, accuracy_score, precision_score, recall_score

# Create fake true labels (for illustration only)
true_labels = np.random.choice(range(k), size=len(df))
predicted_labels = df['Cluster']

# Confusion matrix
cm = confusion_matrix(true_labels, predicted_labels)
plt.figure(figsize=(6, 5))
sns.heatmap(cm, annot=True, fmt='d', cmap='coolwarm')
plt.title("Confusion Matrix Heatmap (Mocked)")
plt.xlabel("Predicted")
plt.ylabel("True")
plt.show()

# Evaluation metrics
print("Accuracy:", accuracy_score(true_labels, predicted_labels))
print("Precision (macro):", precision_score(true_labels, predicted_labels, average='macro'))
print("Recall (macro):", recall_score(true_labels, predicted_labels, average='macro'))
```

Output/Result:

The output of the code includes the visualization of the clustered aisle names in a scatter plot, which shows the clusters based on their similarity. Additionally, a confusion matrix heatmap is generated to simulate the evaluation of the clustering model, and metrics such as accuracy, precision, and recall are printed.



```
• Market Basket Analysis.csv(text/csv) - 2603 bytes, last modified: 4/18/2025 - 100% done
Saving Market Basket Analysis.csv to Market Basket Analysis (4).csv
Preview of data:
   aisle_id                       aisle
0         1       prepared soups salads
1         2           specialty cheeses
2         3         energy granola bars
3         4               instant foods
4         5  marinades meat preparation
```



	0	1	2	3	4
0	0	20	0	1	4
1	1	26	2	1	3
2	0	14	1	0	1
3	2	28	1	0	2
4	0	24	2	1	0

References/Credits:

- Dataset: [Provide the source of your dataset, if applicable]
- **Libraries Used:**

  pandas: for data manipulation
  scikit-learn: for machine learning models (KMeans, PCA, TfidfVectorizer)
  matplotlib & seaborn: for data visualization

- **Images**: The images used for visualizing the data (scatter plot and heatmap) were generated through the code provided.