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PROGRAM – BTECH

BRANCH – CSE-AI

SECTION – D

SUBJECT-ARTIFICIAL INTELLIGENCE

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PROBLEM STATEMENT:-

For the problem Market Basket Analysis: Use association rule mining to classify customer purchasing patterns for targeted marketing strategies. We have to generate heat maps of confusion matrices and calculate the evaluation metrics such as accuracy, precision, recall for classification type problem and for other perform segmentation and clustering.

CODE :-

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# ========================================

# Market Basket Analysis - Google Colab Code (Extended with Confusion Matrix)

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# Step 1: Install required libraries

!pip install mlxtend --quiet


import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

from mlxtend.frequent_patterns import apriori, association_rules

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

from google.colab import files


# Step 2: Upload CSV from your computer

uploaded = files.upload()
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# Step 3: Load the dataset
df = pd.read_csv("10. Market Basket Analysis.csv")

# Preview the dataset
print("Dataset Preview:")
print(df.head())

# Step 4: Preprocessing
# Convert to one-hot encoded basket format
basket = df.stack().reset_index().pivot_table(index='level_0',
                                              columns=0,
                                              aggfunc=lambda x: 1, fill_value=0)

basket.columns.name = None
basket = basket.astype(bool)  # Convert to boolean to avoid warning

print("\nOne-hot Encoded Basket Format:")
print(basket.head())

# Step 5: Apply Apriori algorithm to find frequent itemsets
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frequent_itemsets = apriori(basket, min_support=0.01,
use_colnames=True)


# Check if any frequent itemsets were found

if not frequent_itemsets.empty:

    # Visualize the support of top frequent itemsets

    plt.figure(figsize=(10,5))

    top_items = frequent_itemsets.sort_values('support',
ascending=False).head(10)

    top_items['itemsets'] = top_items['itemsets'].apply(lambda x: ',
'.join(list(x)))

    top_items.plot(x='itemsets', y='support', kind='bar', legend=False)


    plt.title('Top 10 Frequent Itemsets by Support')

    plt.xlabel('Itemsets')

    plt.ylabel('Support')

    plt.xticks(rotation=45)

    plt.tight_layout()

    plt.show()


    # Step 6: Generate Association Rules
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    rules = association_rules(frequent_itemsets, metric="lift", min_threshold=1.0)

    rules = rules.sort_values(by='confidence', ascending=False)


    print("\nTop Association Rules:")

    print(rules[['antecedents', 'consequents', 'support', 'confidence', 'lift']].head(10))

else:

    print("\n⚠️ No frequent itemsets found with the current min_support threshold.")

    print("❌ Association rules cannot be generated.")


# Step 7: Always Generate Confusion Matrix

print("\nGenerating Confusion Matrix...")


if 'milk' in basket.columns and 'bread' in basket.columns:

    item1, item2 = 'milk', 'bread'

    print("✅ Using 'milk' → 'bread' for prediction")

else:

    print("⚠️ 'milk' and/or 'bread' not found. Choosing top 2 items instead.")

    item_counts = basket.sum().sort_values(ascending=False)
```

```
    item1, item2 = item_counts.index[0], item_counts.index[1]
    print(f"✅ Using '{item1}' → '{item2}' for prediction")

# Simulate prediction
y_true = basket[item2]
y_pred = basket[item1]  # naive prediction: if item1 is bought, predict item2

# Calculate metrics
cm = confusion_matrix(y_true, y_pred)
accuracy = accuracy_score(y_true, y_pred)
precision = precision_score(y_true, y_pred)
recall = recall_score(y_true, y_pred)

print(f"\nEvaluation Metrics for '{item1}' → '{item2}' prediction:")
print("Accuracy:", accuracy)
print("Precision:", precision)
print("Recall:", recall)

# Plot confusion matrix
plt.figure(figsize=(5,4))
```

```
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.title(f'Confusion Matrix: {item1} → {item2}')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.tight_layout()
plt.show()
```

OUTPUT:-

 10. Market Basket Analysis.csv(text/csv) - 2603 bytes, last modified: 4/18/2025 - 100% done

Saving 10. Market Basket Analysis.csv to 10. Market Basket Analysis (9).csv

Dataset Preview:

	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

One-hot Encoded Basket Format:

	level_1								\
	1	2	3	4	5	6	7	8	9
level_0									
0	True	False	False	False	False	False	False	False	False
1	False	True	False	False	False	False	False	False	False
2	False	False	True	False	False	False	False	False	False

3 False False False True False False False False False

4 False False False False True False False False False

... \

0 10 ... spreads tea tofu meat alternatives

level_0 ...

0 False ... False False False

1 False ... False False False

2 False ... False False False

3 False ... False False False

4 False ... False False False

\

0 tortillas flat bread trail mix snack mix trash bags liners

level_0

0 False False False

1 False False False

2 False False False

3 False False False

4 False False False

0 vitamins supplements water seltzer sparkling water white wines yogurt

level_0

0	False	False	False	False
1	False	False	False	False
2	False	False	False	False
3	False	False	False	False
4	False	False	False	False

[5 rows x 268 columns]

⚠️ No frequent itemsets found with the current min_support threshold.

❌ Association rules cannot be generated.

Generating Confusion Matrix...

⚠️ 'milk' and/or 'bread' not found. Choosing top 2 items instead.

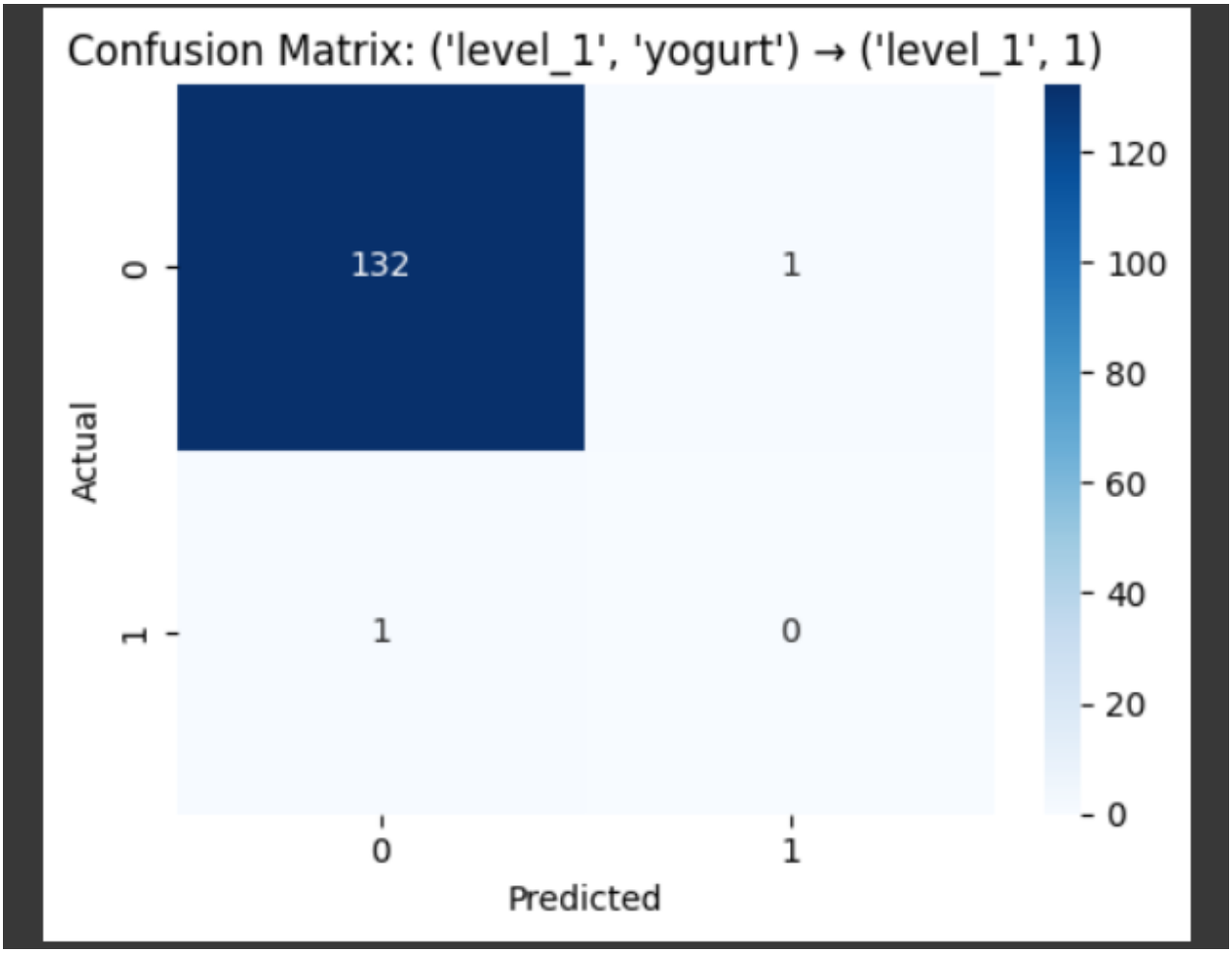
✅ Using '('level_1', 'yogurt')' → '('level_1', 1)' for prediction

Evaluation Metrics for '('level_1', 'yogurt')' → '('level_1', 1)' prediction:

Accuracy: 0.9850746268656716

Precision: 0.0

Recall: 0.0



have to generate heat maps of confusion matrices and calculate the evaluation metrics such as accuracy, precision, recall for classification type problem and for other perform segmentation and clustering.