MARKET BASKET INSIGHTS

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PHASE: 04

PERFORMING ASSOCIATION ANALYSIS AND GENERATING INSIGHTS

```python
# Import necessary libraries
import pandas as pd
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules

# Load the dataset (replace 'dataset.csv' with your dataset)
data = pd.read_csv('assignment1_data.csv')

# Data preprocessing
basket = (data.groupby(['CustomerID', 'Itemname'])['Itemname']
    .count().unstack().reset_index().fillna(0)
    .set_index('CustomerID'))

# Convert to a binary format (0/1 encoding)
def encode_units(x):
    if x <= 0:
        return 0
    if x >= 1:
        return 1

basket_sets = basket.applymap(encode_units)

# Generate frequent itemsets using Apriori
frequent_itemsets = apriori(basket_sets, min_support=0.05, use_colnames=True)

# Generate association rules
association_rules = association_rules(frequent_itemsets, metric="lift",
min_threshold=1.0)

# Display the association rules
print("Association Rules:")
print(association_rules)

# Generating Insights
# You can analyze the association rules and provide insights based on high-confidence
rules and lift values
confidence_threshold = 0.7
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```python
lift_threshold = 1.0

meaningful_rules = association_rules[
    (association_rules['confidence'] > confidence_threshold) &
    (association_rules['lift'] > lift_threshold)
]

# Display meaningful association rules
print("Meaningful Association Rules:")
print(meaningful_rules)
```

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Association Rules:
                               antecedents  \
0     (SET OF 6 SPICE TINS PANTRY DESIGN)
1      (SET OF 3 CAKE TINS PANTRY DESIGN)
2               (JAM MAKING SET PRINTED)
3              (JAM MAKING SET WITH JARS)
4      (SET OF 3 CAKE TINS PANTRY DESIGN)
5              (JAM MAKING SET WITH JARS)
6      (SET OF 3 CAKE TINS PANTRY DESIGN)
7       (RECIPE BOX PANTRY YELLOW DESIGN)
8    (WHITE HANGING HEART T-LIGHT HOLDER)
9       (RED HANGING HEART T-LIGHT HOLDER)
10   (WHITE HANGING HEART T-LIGHT HOLDER)
11      (CANDLEHOLDER PINK HANGING HEART)
12   (WHITE HANGING HEART T-LIGHT HOLDER)
13                 (HEART OF WICKER SMALL)
14                 (HEART OF WICKER LARGE)
15   (WHITE HANGING HEART T-LIGHT HOLDER)
16                 (HEART OF WICKER LARGE)
17                 (HEART OF WICKER SMALL)

                               consequents  antecedent support  \
0      (SET OF 3 CAKE TINS PANTRY DESIGN)            0.092129
1     (SET OF 6 SPICE TINS PANTRY DESIGN)            0.143990
2              (JAM MAKING SET WITH JARS)            0.127517
3               (JAM MAKING SET PRINTED)            0.109823
4              (JAM MAKING SET WITH JARS)            0.143990
5      (SET OF 3 CAKE TINS PANTRY DESIGN)            0.109823
6       (RECIPE BOX PANTRY YELLOW DESIGN)            0.143990
7      (SET OF 3 CAKE TINS PANTRY DESIGN)            0.087858
8       (RED HANGING HEART T-LIGHT HOLDER)            0.198292
9    (WHITE HANGING HEART T-LIGHT HOLDER)            0.104942
10      (CANDLEHOLDER PINK HANGING HEART)            0.198292
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9    (WHITE HANGING HEART T-LIGHT HOLDER)            0.104942
10      (CANDLEHOLDER PINK HANGING HEART)            0.198292
11   (WHITE HANGING HEART T-LIGHT HOLDER)            0.056132
12                 (HEART OF WICKER SMALL)            0.198292
13   (WHITE HANGING HEART T-LIGHT HOLDER)            0.148871
14   (WHITE HANGING HEART T-LIGHT HOLDER)            0.128127
15                 (HEART OF WICKER LARGE)            0.198292
16                 (HEART OF WICKER SMALL)            0.128127
17                 (HEART OF WICKER LARGE)            0.148871

    consequent support   support  confidence      lift  leverage  conviction  \
0             0.143990  0.070775    0.768212  5.335167  0.057509    3.693071
1             0.092129  0.070775    0.491525  5.335167  0.057509    1.785479
2             0.109823  0.056132    0.440191  4.008187  0.042128    1.590145
3             0.127517  0.056132    0.511111  4.008187  0.042128    1.784625
4             0.109823  0.051861    0.360169  3.279543  0.036047    1.391270
5             0.143990  0.051861    0.472222  3.279543  0.036047    1.621913
6             0.087858  0.051861    0.360169  4.099429  0.039210    1.425599
7             0.143990  0.051861    0.590278  4.099429  0.039210    2.089244
8             0.104942  0.072605    0.366154  3.489106  0.051796    1.412106
9             0.198292  0.072605    0.691860  3.489106  0.051796    2.601771
10            0.056132  0.050031    0.252308  4.494916  0.038900    1.262375
11            0.198292  0.050031    0.891304  4.494916  0.038900    7.375717
12            0.148871  0.067114    0.338462  2.273518  0.037594    1.286590
13            0.198292  0.067114    0.450820  2.273518  0.037594    1.459827
14            0.198292  0.064674    0.504762  2.545553  0.039267    1.618834
15            0.128127  0.064674    0.326154  2.545553  0.039267    1.293876
16            0.148871  0.089689    0.700000  4.702049  0.070614    2.837096
17            0.128127  0.089689    0.602459  4.702049  0.070614    2.193165

    zhangs metric
                _____
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17          0.128127  0.089689  0.602459  4.702049  0.070614  2.193165

     zhangs_metric
0        0.895022
1        0.949247
2        0.860201
3        0.843103
4        0.811999
5        0.780833
6        0.883242
7        0.828888
8        0.889842
9        0.797036
10       0.969837
11       0.823766
12       0.698699
13       0.658130
14       0.696384
15       0.757330
16       0.903029
17       0.925038
Meaningful Association Rules:
                          antecedents                            consequents  \
0   (SET OF 6 SPICE TINS PANTRY DESIGN)    (SET OF 3 CAKE TINS PANTRY DESIGN)
11    (CANDLEHOLDER PINK HANGING HEART)  (WHITE HANGING HEART T-LIGHT HOLDER)

    antecedent support  consequent support   support  confidence      lift  \
0             0.092129            0.143990  0.070775    0.768212  5.335167
11            0.056132            0.198292  0.050031    0.891304  4.494916

    leverage  conviction  zhangs_metric
0   0.057509    3.693071       0.895022
11  0.038900    7.375717       0.823766
```