Task 3: Association Rules and Lift Analysis

Part 1: Research Question

1. Which products are customers more likely to buy based on their purchase history?

2. The goal of the analysis is to determine which items are more likely to sell together. Knowing which items have historically been bought by the same customers is essential to improving the profitability of the company's retail division. This knowledge allows for product recommendations that align with customers' needs.

Part 2: Market Basket Justification

1. Market Basket Analysis finds correlation relationships between transaction records that can help decision-making. It does this by creating association rules. Association rules predict the occurrence of an item based on the other items in the transaction. They are made up of antecedents (if item bought) and consequents (then purchase item). There are three expected outcomes. Support determines how often a product is purchased. Confidence measures how frequently the consequent occurs, given the antecedent is present. Lift tells how likely the antecedent and consequent occur together. (Pips, 2020)

2. One transaction lists the following items: Apple Lightning to Digital AV Adapter, TP-Link AC1750 Smart Wi-Fi Router, Apple Pencil.

3. One assumption of market basket analysis is that the occurrence of two or more products together implies that the products are complements of each other. In other words, the purchase of one always leads to the purchase of the other. (Kamakura, 2012)

Part 3: Data Preparation and Analysis

1. Prepared data attached as: association\_rules\_prepared\_data.xlsx

2. Screenshots of Apriori algorithm:

Graphical user interface, text, application, email

Description automatically generated

3. The item with the highest support was Dust-Off Compressed Gas 2 pack at 0.238368. This support value means that this item was 23.8% of the transactions. The rule with the highest lift was   
{ SanDisk 128GB Ultra microSDXC card → SanDisk Ultra 64GB card} with a score of 3.291994. The likelihood of purchasing the SanDisk Ultra 64GB card is 3.29 times with the SanDisk 128GB Ultra microSDXC card than buying the item alone. The rule with the highest confidence was {Apple Pencil, SanDiskUltra 64GB card → Dust-Off Compressed Gas 2 pack}. The score of 0.50667 suggests that 51% of the time, Apple Pencil and SanDiskUltra 64GB card appear in a transaction, Dust-Off Compressed Gas 2 pack does as well.

4. The top three rules generated by the Apriori algorithm:

Graphical user interface, application

Description automatically generated

Part 4: Data Summary and Implications

1. The support values of the top three rules are minimal, 2.3% to 4.1%, which means that this combination of items does not sell very often. The confidence and lift scores are slightly better. The third rule has the highest confidence score at 45.6%. This score is still not optimal, but it does show an association between the 10ft iPhone Charger and the Compressed Gas 2 pack. The highest lift score is also in the third rule at 1.91. Lift is the most substantial result of all three metrics. It shows that if a customer purchases the 10ft iPhone charger, they are twice as likely to buy the Compressed Gas 2 pack.

2. The practical significance of the finding would be that the consequent of the top three rules is the Dust-Off Compressed Gas 2 pack. This item also had the highest single item support score at 23.8%.

3. The recommended course of action would be to place the four items from the association rules near each other in the store. It seems impractical to put the gas canisters in multiple locations in the store. A better option might be to place all items in a central location. A second recommendation is to suggest gas canisters during online purchases. Maybe a popup before checking out or near the description of the antecedent.

# Works Cited

Kamakura, W. A. (2012, May 22). *Sequential Market Basket Analysis*. Retrieved December 2021, from http://wak2.web.rice.edu/bio/My%20Reprints/Sequential%20Market%20Basket%20Analysist.pdf

Pips, G. (2020, September 22). *A Tutorial About Market Basket Analysis in Python*. Retrieved December 2021, from Start it up: https://medium.com/swlh/a-tutorial-about-market-basket-analysis-in-python-predictive-hacks-497dc6e06b27