Market Basket Analysis Report

# 1. Objective

The objective of this Market Basket Analysis project is to uncover patterns in customer purchasing behavior using the Apriori algorithm. By identifying frequently purchased itemsets and association rules, we aim to optimize product placement, design promotional bundles, and improve customer experience to ultimately increase sales.

# 2. Data Cleaning

Step-by-step data cleaning steps performed in Excel:

1. 1. Removed rows with missing values in essential columns such as Transaction ID and Product Name.
2. 2. Filtered out cancelled transactions and irrelevant entries.
3. 3. Removed rows with zero or negative quantity and price.
4. 4. Removed duplicates to avoid skewing the analysis.
5. 5. Standardized product names for consistency (e.g., removing extra spaces or special characters).
6. 6. Removed duplicate items within the same transaction using 'Transaction ID' and 'Product Name' columns.

# 3. Methodology

We applied the Apriori algorithm to identify frequent itemsets and generate strong association rules. The analysis is based on key metrics: support, confidence, and lift. The Apriori algorithm was chosen for its interpretability and effectiveness in market basket analysis.

# 4. Key Findings

## 4.1 Top 10 Itemsets by Support

The following itemsets were the most frequently purchased together, based on support. This helps in identifying products that are often bought in combination.

## 4.2 Top 10 Rules by Confidence

Rules with high confidence suggest that when the antecedent is purchased, the consequent is also very likely to be purchased. These rules are useful for recommendation engines and product bundling.

## 4.3 Top 10 Rules by Lift

Rules with high lift indicate a strong association between items, beyond mere coincidence. High-lift rules are crucial for discovering non-obvious, yet impactful product relationships.

# 5. Visual Insights

1. A scatter plot visualizing support vs confidence with bubble size representing lift.
2. A network graph showing associations between products with edges weighted by lift.
3. Bar charts for top 10 rules by support, confidence, and lift respectively.

# 6. Business Recommendations

- Use high-confidence rules to create product bundles and upselling opportunities.  
- Position frequently co-purchased items near each other in-store or online.  
- Personalize marketing campaigns based on customer purchase history using top rules.  
- Re-evaluate underperforming items that rarely appear in any rule.

# 7. Conclusion

The Apriori-based Market Basket Analysis provided actionable insights into customer buying behavior. The findings can be used to enhance customer satisfaction, streamline inventory, and increase overall revenue.