Project Proposal Report

Title: Customer Purchase Behavior Analysis using Association Rule Mining

1. Introduction

Retail businesses continuously strive to understand customer purchase behavior to optimize their inventory, enhance marketing strategies, and improve overall customer satisfaction. Analyzing transaction data to discover hidden patterns and associations between items can provide valuable insights. This project aims to use association rule mining to analyze customer transaction data, uncovering frequent itemsets and strong association rules that can be leveraged for better decision-making.

2. Objectives

- To analyze customer transaction data to identify patterns and associations between purchased items.

- To optimize inventory management based on discovered patterns.

- To plan targeted marketing campaigns by understanding customer purchase behavior.

3. Methodology

Data Collection:

- Gather transaction data from a retail store, including transaction IDs and items purchased in each transaction.

Data Preprocessing:

- Convert the transaction data into a suitable format, such as a binary matrix where each row represents a transaction, and each column represents an item.

Frequent Itemset Mining:

- Apply the Apriori algorithm to identify frequent itemsets that meet a minimum support threshold.

Association Rule Mining:

- Generate association rules from the frequent itemsets.

- Evaluate the rules using support, confidence, and lift metrics to identify the most significant associations.

Analysis:

- Analyze the discovered association rules to understand customer purchase behavior.

- Identify strong rules that can be used to optimize inventory and plan targeted marketing campaigns.

4. Tools and Technologies

- **Programming Languages**: Python or R

- **Libraries**:

    o   For Python: pandas, mlxtend

    o   For R: arules

- **Data Visualization**: Matplotlib, Seaborn (Python) or ggplot2 (R)

5. Expected Outcomes

- Identification of frequent itemsets in the transaction data.

- Generation of strong association rules that highlight relationships between items.

- Insights into customer purchase behavior to aid in inventory management and targeted marketing.

- A comprehensive report detailing the findings and actionable recommendations for the retail business.

6. Timeline

- **Week 1-2**: Data collection and preprocessing.

- **Week 3-4**: Implementation of the Apriori algorithm for frequent itemset mining.

- **Week 5-6**: Generation and evaluation of association rules.

- **Week 7-8**: Analysis of results and preparation of the final report.

7. References

- Frequent Itemset and Association Rule Mining documentation and lecture notes.

8. Conclusion

This project will leverage association rule mining to analyze customer transaction data, providing valuable insights into purchase behavior. The findings will help in optimizing inventory management and planning targeted marketing campaigns, ultimately enhancing customer satisfaction and business performance.