
Product Affinity Management- E-Commerce Sector

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Overview

This report covers the product affinity analysis conducted to discover meaningful associations between products in customer transactions. This analysis led to actionable insights such as product bundling opportunities, personalized recommendations, and revenue optimization strategies.

Objective

The primary objective of today's tasks was to identify strong product associations in customer transactions, generate relevant product bundling offers, and create personalized product recommendations. The goal was also to explore potential revenue improvements through A/B testing these strategies.

Assigned Task(s)

Product Affinity Analysis- E-Commerce Sector

Task Details

- Task 29: Perform product affinity analysis to uncover associations between frequently purchased products. Use the Apriori algorithm to discover frequent item sets and generate association rules.
- Status: Completed
- Details:
 - Data Preparation: A basket matrix was created to represent customer purchases in terms of products and their quantities.
 - Frequent Itemset Generation: The Apriori algorithm was applied to identify frequently occurring product combinations.
 - Association Rule Mining: Strong association rules were generated with metrics like support, confidence, and lift to measure the strength of product associations.
 - Insights: Visualization through a Support vs. Lift plot helped assess the strength of the rules and identify potential product bundling opportunities.
 - Actions Derived: Product bundling offers and personalized recommendations were created based on strong rules.

Progress

- Accomplishments:
 - Generated frequent itemsets with support and identified key product associations.
 - Created a list of strong association rules based on confidence, lift, and support metrics.
 - Developed product bundling offers based on rule insights, aimed at improving customer experience and boosting sales.
 - Implemented a framework for personalized product recommendations based on purchase history.
 - Set up a foundation for A/B testing to evaluate the effectiveness of product bundles in increasing revenue.
- Metrics:
 - Frequent Itemsets: 19 frequent item sets were identified, with support values ranging from 0.057 to 0.095.
 - Strong Association Rules: Four strong association rules were generated with confidence ranging from 0.104 to 0.119, and lift values above 1, indicating positive associations between products.
 - Expected Revenue Increase: An initial simulation predicted a small revenue increase of \$0.10 per transaction due to bundling, though further A/B testing is required for more precise results.

Challenges and Solutions

- Challenge Faced :
 - Low Support Values: Many product combinations had low support, making identifying highly frequent itemsets with significant business impact difficult.
 - Weak Lift Values: Some association rules had lift values only slightly above 1, indicating weak product relationships.
 - Scalability: Handling large datasets efficiently while running association rule algorithms was a computational challenge.
- Solutions Implemented :
 - Support Threshold Adjustment: To address low support values, the support threshold was adjusted iteratively, allowing the identification of moderately frequent itemsets with meaningful insights.
 - Focused on Strong Rules: Instead of using weak rules, the focus was shifted to product pairs with reasonable support and higher confidence and lift values.
 - Memory Optimization: Optimized dataset processing using efficient data handling techniques, such as reducing memory usage by converting specific columns to categorical data types.

Next Step

- Upcoming Task: Explore further association rules with demographic segmentation to identify affinities for different customer groups.
- Goals: Create a presentation and present it using actionable insights.

Conclusion

- **Summary**: Today's analysis provided valuable insights into customer purchasing behavior, highlighting opportunities for product bundling and personalized recommendations. Through the use of association rule mining, we identified key product relationships that can be leveraged to enhance customer experience and boost sales. Upcoming tasks include implementing these strategies and evaluating their impact through A/B testing.
- **Acknowledgment**: Thank you for your time and attention.

