Market Basket Analysis with Python

Abstract:

Market Basket Analysis (MBA) is a pivotal technique in retail analytics, empowering businesses to unearth meaningful associations among items purchased together. In this project, we present an in-depth exploration of Market Basket Analysis using Python, aiming to extract actionable insights from transactional data. Leveraging popular libraries like pandas, scikit-learn, and mlxtend, our project unfolds in a systematic manner.

Commencing with data collection, we procure transactional data either from a retail database or utilize publicly available datasets such as the Online Retail dataset. Subsequent to data preprocessing, including cleaning and transformation, an exploratory data analysis phase ensues. Through this phase, we gain invaluable insights into transaction characteristics, such as item distributions and popular item combinations.

Introduction:

In the bustling world of retail, understanding customer behavior and preferences is paramount for businesses striving to stay competitive and relevant. Market Basket Analysis (MBA) emerges as a pivotal technique, offering retailers profound insights into the relationships among products purchased together by customers. By identifying patterns and associations within transactional data, Market Basket Analysis enables businesses to devise targeted marketing strategies, optimize product placements, and enhance customer experiences.

In this project, we embark on a journey to explore Market Basket Analysis using Python, a versatile and powerful programming language, along with a suite of robust libraries tailored for data analysis and mining. By delving into real-world transactional data, we aim to uncover hidden patterns and extract actionable insights that can propel retail businesses to new heights of success.

1.1 Research Background:

Market Basket Analysis (MBA) has emerged as a fundamental technique in retail analytics, offering valuable insights into consumer behavior and purchasing patterns. Originally introduced by Agrawal, Imielinski, and Swami in the early 1990s, MBA gained prominence as a method to uncover associations among items purchased together in transactions. The essence of MBA lies in the identification of frequent itemsets and the derivation of association rules that elucidate the relationships between items.

The proliferation of digital technologies and the advent of e-commerce platforms have catalyzed the importance of MBA in contemporary retail environments. With vast amounts of transactional data generated daily, retailers have a treasure trove of information at their disposal, ripe for analysis and interpretation. MBA enables retailers to extract actionable insights from this data, guiding strategic decisions related to product assortment, pricing strategies, and targeted marketing campaigns.

Technology and Development Environment:

In our Market Basket Analysis project, we leverage a combination of popular technologies and development environments to facilitate data preprocessing, analysis, visualization, and implementation of insights. The chosen technologies offer robust capabilities for handling large datasets, implementing machine learning algorithms, and creating interactive visualizations. Below are the key technologies and development environments utilized in our project:

1. **Python Programming Language:** Python serves as the primary programming language for our project due to its versatility, extensive libraries for data analysis, and ease of use. We leverage Python for data preprocessing, algorithm implementation, and visualization tasks.

System User Analysis:

In our Market Basket Analysis project, we identify and analyze the key stakeholders who interact with the system, their roles, and their requirements. Understanding the needs and perspectives of system users is crucial for designing an effective solution that addresses their concerns and delivers value. Here's an analysis of the system users:

1. **Retail Managers:**
    - *Roles:* Retail managers are responsible for overseeing store operations, optimizing sales performance, and devising marketing strategies.
    - *Requirements:* Retail managers require insights into customer purchasing behavior, popular product combinations, and trends in sales patterns. They need actionable recommendations for product placement, promotions, and inventory management to maximize profitability and enhance customer satisfaction.
2. **Marketing Analysts:**
    - *Roles:* Marketing analysts focus on analyzing market trends, consumer behavior, and the effectiveness of marketing campaigns.
    - *Requirements:* Marketing analysts seek insights into consumer preferences, cross-selling opportunities, and the impact of promotions on sales. They require detailed reports and visualizations to evaluate campaign performance, identify target demographics, and refine marketing strategies accordingly.
3. **Data Scientists/Analysts:**
    - *Roles:* Data scientists or analysts are responsible for performing in-depth analysis of transactional data, applying machine learning algorithms, and deriving actionable insights.
    - *Requirements:* Data scientists require access to clean, structured transactional data for conducting Market Basket Analysis. They need tools and libraries for implementing association rule mining algorithms, evaluating model performance, and interpreting the results. They may also explore advanced techniques such as customer segmentation and predictive modeling to enhance analysis outcomes.
4. **IT Administrators:**

- *Roles:* IT administrators manage the infrastructure, security, and maintenance of the system.
- *Requirements:* IT administrators ensure the reliability, scalability, and security of the system infrastructure. They oversee data storage, backup, and access control mechanisms to safeguard sensitive information. They may also deploy monitoring tools to track system performance and address any technical issues or bottlenecks promptly.

5. **Business Executives:**
    - *Roles:* Business executives provide strategic direction, make high-level decisions, and allocate resources based on performance metrics and insights.
    - *Requirements:* Business executives rely on concise summaries, dashboards, and key performance indicators (KPIs) to track business performance, assess the impact of strategic initiatives, and make data-driven decisions. They require timely updates and actionable recommendations to drive growth, profitability, and market competitiveness.

Steps to Implement:

1. **Data Collection**: Obtain transaction data from the retail store's database or use publicly available datasets such as the Online Retail dataset from the UCI Machine Learning Repository.
2. **Data Preprocessing**: Clean and preprocess the transaction data. This may involve removing duplicates, handling missing values, and transforming the data into a suitable format for analysis.
3. **Exploratory Data Analysis (EDA)**: Conduct exploratory data analysis to understand the characteristics of the dataset, such as the distribution of items, transaction frequency, and popular item combinations.
4. **Market Basket Analysis**: Use association rule mining algorithms, such as Apriori or FP-Growth, to perform Market Basket Analysis. These algorithms will identify frequent itemsets and generate association rules based on metrics like support, confidence, and lift.
5. **Rule Evaluation and Interpretation**: Evaluate the generated association rules and filter them based on predefined thresholds for support, confidence, and lift. Interpret the rules to extract actionable insights for the retail store, such as product recommendations or bundling strategies.
6. **Visualization**: Visualize the results of the Market Basket Analysis using plots and charts to communicate the findings effectively. You can use libraries like matplotlib or seaborn for visualization.
7. **Implementation of Recommendations**: Implement the insights gained from the analysis into the retail store's marketing strategies. This could involve optimizing product placements, designing targeted promotions, or creating recommendation systems.
8. **Performance Evaluation**: Measure the impact of the implemented recommendations on key performance metrics such as sales revenue, customer satisfaction, and basket size. Iterate on the analysis and recommendations based on feedback and performance evaluation results.

Additional Features to Consider:

- **Advanced Analysis Techniques**: Explore advanced techniques such as Sequential Pattern Mining for analyzing temporal patterns in transaction data.
- **Integration with Online Platforms**: Develop a web-based dashboard or application that provides interactive visualization of Market Basket Analysis results and allows stakeholders to explore insights in real-time.
- **Customer Segmentation**: Extend the analysis to perform customer segmentation based on purchasing behavior and demographics, and tailor marketing strategies for different customer segments.
- **Integration with Machine Learning Models**: Integrate Market Basket Analysis with machine learning models for personalized recommendations or demand forecasting.

software requirements:

The software requirements for conducting Market Basket Analysis typically include a combination of programming languages, libraries, and tools specifically designed for data analysis and mining. Here's a comprehensive list of software requirements for Market Basket Analysis:

1. **Python:** Python serves as the primary programming language for data analysis tasks due to its versatility, ease of use, and extensive ecosystem of libraries. Ensure that Python is installed on your system.
2. **Integrated Development Environment (IDE):** While not strictly necessary, an IDE can greatly enhance productivity and facilitate code development. Popular choices include:
    - Jupyter Notebook: Interactive notebook environment ideal for data exploration and experimentation.
    - PyCharm: Powerful IDE with advanced features for Python development.
    - Visual Studio Code (VSCode): Lightweight and customizable IDE with Python support.
3. **Libraries:** Install the following Python libraries using pip or conda package manager:
    - Pandas: Data manipulation and analysis library, essential for handling transactional data.
    - NumPy: Fundamental package for numerical computing, often used for array operations and mathematical functions.
    - Scikit-learn: Machine learning library with implementations of algorithms for association rule mining (e.g., Apriori, FP-Growth).
    - mlxtend: Extension package for machine learning in Python, includes implementations of advanced association rule mining algorithms.
    - Matplotlib: Comprehensive plotting library for creating static, interactive, and animated visualizations.
    - Seaborn: Statistical data visualization library built on top of Matplotlib, provides high-level interface for creating attractive plots.
4. **Database (Optional):** Depending on the size and complexity of your dataset, you may need a database management system for efficient storage and retrieval of data. Common choices include:
    - SQLite: Lightweight, serverless database engine suitable for small to medium-sized datasets.
    - MySQL or PostgreSQL: Relational database management systems capable of handling large datasets and complex queries.

- MongoDB: NoSQL database for storing unstructured or semi-structured data.

5. **Version Control:** While not directly related to Market Basket Analysis, version control is crucial for managing code changes, collaborating with team members, and tracking project history. Git is the most widely used version control system.
6. **Visualization Tools (Optional):** In addition to Matplotlib and Seaborn, you may explore other visualization tools for creating interactive or web-based visualizations:
    - Plotly: Python graphing library for creating interactive plots and dashboards.
    - Bokeh: Interactive visualization library that generates JavaScript-based plots suitable for web applications.
    - Tableau or Power BI: Business intelligence tools with intuitive interfaces for creating interactive dashboards and reports.

Hardware requirements:

The hardware requirements for Market Basket Analysis can vary depending on the size of the dataset, complexity of the analysis, and computational resources required by the algorithms used. Here's a general guideline for hardware requirements:

1. **Processor (CPU):** A multi-core processor is recommended for faster computation, especially when dealing with large datasets and complex algorithms. While Market Basket Analysis doesn't typically require high-end processors, having at least a mid-range CPU (e.g., Intel Core i5 or AMD Ryzen 5) will ensure smooth performance.
2. **Memory (RAM):** Adequate RAM is crucial for handling large datasets efficiently, especially when loading data into memory for analysis. A minimum of 8GB RAM is recommended for basic Market Basket Analysis tasks. However, for more extensive analyses or when working with substantial datasets, consider upgrading to 16GB or higher to avoid memory constraints.
3. **Storage (Hard Drive or SSD):** Storage plays a role in data storage and retrieval, as well as in the performance of disk-intensive operations such as reading and writing data. While traditional hard disk drives (HDDs) are suitable for most Market Basket Analysis tasks, solid-state drives (SSDs) offer significantly faster read/write speeds, which can enhance overall system performance, especially when working with large datasets.
4. **Graphics Card (GPU, Optional):** While not strictly necessary for Market Basket Analysis, a dedicated graphics processing unit (GPU) can accelerate certain machine learning algorithms and computations, particularly those that utilize GPU-accelerated libraries such as TensorFlow or PyTorch. If you plan to leverage GPU-accelerated algorithms, consider investing in a mid-range or higher GPU with CUDA support (NVIDIA GPUs) or ROCm support (AMD GPUs).
5. **Operating System:** Market Basket Analysis can be performed on various operating systems, including Windows, macOS, and Linux distributions. Choose an operating system that best suits your preferences and requirements.
6. **Internet Connection:** A stable internet connection may be necessary for accessing online resources, downloading datasets, and collaborating with team members or accessing cloud-based services.

Technologies :

In the context of Market Basket Analysis, various technologies are employed to preprocess data, analyze patterns, visualize insights, and deploy solutions. Here's a breakdown of key technologies used in different stages of the Market Basket Analysis process:

1. **Data Preprocessing:**
   - **Python:** A versatile programming language widely used for data preprocessing tasks.
   - **Pandas:** A powerful library for data manipulation and analysis in Python, commonly used for cleaning, transforming, and aggregating transactional data.
   - **NumPy:** Fundamental package for numerical computing in Python, often used for array operations and mathematical functions.
   - **SQLite, MySQL, PostgreSQL:** Database management systems for storing and retrieving transactional data, if needed.
2. **Market Basket Analysis:**
   - **Scikit-learn:** A comprehensive library for machine learning in Python, featuring implementations of algorithms for association rule mining such as Apriori and FP-Growth.
   - **mlxtend:** A Python library specializing in machine learning extensions, including implementations of advanced association rule mining algorithms.
   - **RapidMiner:** An integrated data science platform that provides tools for association rule mining and predictive modeling, suitable for both beginners and advanced users.
3. **Visualization:**
   - **Matplotlib:** A plotting library for creating static, interactive, and animated visualizations in Python.
   - **Seaborn:** A statistical data visualization library built on top of Matplotlib, providing a high-level interface for creating attractive plots.
   - **Plotly:** A graphing library for creating interactive plots and dashboards in Python, suitable for web-based visualizations.
   - **Tableau, Power BI:** Business intelligence tools with intuitive interfaces for creating interactive dashboards and reports.
4. **Deployment and Integration:**
   - **Jupyter Notebooks:** An interactive development environment ideal for prototyping and sharing code, results, and visualizations.
   - **Docker, Kubernetes:** Containerization and orchestration tools for deploying Market Basket Analysis solutions in scalable and reproducible environments.
   - **AWS, Azure, Google Cloud:** Cloud computing platforms offering scalable resources and services for hosting and deploying Market Basket Analysis solutions.
   - **RESTful APIs:** Application programming interfaces for integrating Market Basket Analysis models into web applications, mobile apps, or other systems.
5. **Version Control and Collaboration:**
   - **Git:** A distributed version control system for tracking changes in code, collaborating with team members, and managing project history.
   - **GitHub, GitLab, Bitbucket:** Online platforms for hosting Git repositories and facilitating collaboration among developers and data scientists.

Existing system :

The existing system for Market Basket Analysis (MBA) typically involves a combination of software tools, databases, and analytics platforms tailored to handle transactional data and derive meaningful insights. Here's an overview of components commonly found in an existing MBA system:

1. **Data Sources:**
   - **Transactional Data:** The primary source of data for MBA, typically obtained from point-of-sale (POS) systems, e-commerce platforms, or other transactional systems. This data includes information about individual transactions, such as items purchased, quantities, prices, timestamps, and customer identifiers.
2. **Data Storage and Management:**
   - **Databases:** Transactional data is often stored in relational databases (e.g., MySQL, PostgreSQL) or NoSQL databases (e.g., MongoDB) for efficient storage and retrieval.
   - **Data Warehouses:** In some cases, transactional data is integrated into data warehouses for centralized storage, analysis, and reporting.
3. **Data Preprocessing:**
   - **Data Cleaning:** Preprocessing steps involve cleaning and filtering the transactional data to remove duplicates, handle missing values, and address inconsistencies.
   - **Data Transformation:** Transactional data may be transformed into a suitable format for analysis, such as transaction-item matrices or basket-item matrices.
4. **Market Basket Analysis Algorithms:**
   - **Apriori Algorithm:** One of the most commonly used algorithms for MBA, Apriori identifies frequent itemsets and generates association rules based on support, confidence, and lift metrics.
   - **FP-Growth Algorithm:** An alternative to Apriori, FP-Growth uses a tree-based data structure to efficiently mine frequent itemsets without generating candidate itemsets.
5. **Analytics and Visualization:**
   - **Statistical Analysis:** Descriptive statistics and exploratory data analysis techniques are used to gain insights into transactional data, such as item frequency, basket size distributions, and association patterns.
   - **Visualization Tools:** Charts, graphs, and heatmaps are used to visualize association rules, item co-occurrences, and other patterns discovered through MBA.
6. **Reporting and Insights:**
   - **Dashboards:** Interactive dashboards and reports provide stakeholders with a visual representation of MBA results, allowing them to explore patterns, trends, and actionable insights.
   - **Key Performance Indicators (KPIs):** Metrics such as average basket size, cross-sell and upsell rates, and revenue per customer are used to measure the effectiveness of MBA strategies.
7. **Integration and Deployment:**
   - **Integration with Business Systems:** MBA insights may be integrated into business systems such as inventory management, marketing automation, and customer relationship management (CRM) platforms.

- **Deployment Options:** MBA models and insights can be deployed on-premises or in the cloud, depending on the organization's infrastructure and requirements.

8. **Scalability and Performance:**
    - **Scalable Architecture:** The existing system should be designed to handle large volumes of transactional data and scale seamlessly as data volumes grow.
    - **Performance Optimization:** Techniques such as parallel processing, distributed computing, and database indexing are used to optimize the performance of MBA algorithms and analytics processes.

Proposed system:

The proposed system for Market Basket Analysis (MBA) aims to enhance the capabilities of the existing system, leveraging modern technologies and methodologies to improve efficiency, scalability, and actionable insights. Here's an outline of the proposed system:

1. **Data Integration and Streamlining:**
    - **Real-time Data Processing:** Implement streaming capabilities to process transactional data in real-time, allowing for quicker response to changing patterns and trends.
    - **Data Integration:** Explore ways to integrate data from various sources, including online and offline sales channels, loyalty programs, and customer interactions, for a more comprehensive analysis.
2. **Advanced Analytics Algorithms:**
    - **Machine Learning Integration:** Integrate advanced machine learning algorithms, such as deep learning or ensemble methods, to enhance the accuracy and depth of insights derived from MBA.
    - **Sequential Pattern Mining:** Extend analysis to include sequential pattern mining algorithms to capture temporal patterns in customer transactions.
3. **Scalable Cloud Infrastructure:**
    - **Cloud-Based Solution:** Transition to a cloud-based infrastructure (e.g., AWS, Azure, Google Cloud) to ensure scalability, flexibility, and cost-effectiveness in handling large volumes of transactional data.
    - **Serverless Architecture:** Explore serverless computing for automatic scaling and reduced operational overhead.
4. **Interactive and Dynamic Visualization:**
    - **Interactive Dashboards:** Develop dynamic dashboards with interactive features, enabling stakeholders to explore MBA results in real-time and customize views based on specific criteria.
    - **Geospatial Visualization:** Implement geospatial visualizations to analyze regional variations in customer behavior and tailor strategies accordingly.
5. **Automated Insights and Reporting:**
    - **Automated Reporting:** Implement automated reporting functionalities to regularly deliver MBA insights to stakeholders through scheduled reports or notifications.
    - **Natural Language Processing (NLP):** Integrate NLP techniques for automated summarization and extraction of key insights from MBA results.
6. **Predictive Analytics and Personalization:**

- **Predictive Modeling:** Leverage predictive analytics to forecast future trends, anticipate customer behavior, and optimize inventory management.
- **Personalization:** Implement personalized recommendations for customers based on their historical transactions and preferences.

7. **Enhanced Security and Compliance:**
   - **Data Encryption:** Strengthen data security with end-to-end encryption to protect sensitive transactional data.
   - **Compliance Management:** Ensure compliance with data protection regulations and industry standards to maintain trust and legal adherence.
8. **User Collaboration and Feedback:**
   - **Collaborative Features:** Introduce collaboration features within the system, allowing different user roles (analysts, data scientists, business stakeholders) to share insights and collaborate seamlessly.
   - **User Feedback Mechanisms:** Implement mechanisms for users to provide feedback on insights and suggestions for improvement, fostering continuous refinement.
9. **Continuous Monitoring and Optimization:**
   - **Monitoring Tools:** Utilize monitoring tools and analytics to continuously track system performance, detect anomalies, and optimize algorithms.
   - **Feedback Loops:** Establish feedback loops from business operations to the analytics system, ensuring that MBA strategies align with evolving business goals.
10. **Machine Learning Operations (MLOps):**
    - **Model Deployment and Management:** Implement MLOps practices for efficient model deployment, version control, and ongoing model management.
    - **Automated Model Retraining:** Integrate automated retraining of MBA models to adapt to changing customer behaviors and market dynamics.

Methodology:

The methodology for conducting Market Basket Analysis (MBA) involves a systematic approach encompassing data collection, preprocessing, analysis, interpretation, and implementation of insights. Here's a structured methodology for performing MBA:

1. **Define Objectives:**
   - Clearly define the objectives of the Market Basket Analysis, such as identifying frequently co-occurring items, understanding customer purchasing behavior, optimizing product placement, or designing targeted marketing strategies.
2. **Data Collection:**
   - Gather transactional data from sources such as point-of-sale (POS) systems, e-commerce platforms, or customer databases. Ensure that the data includes relevant attributes such as item IDs, transaction IDs, timestamps, and customer IDs.
3. **Data Preprocessing:**
   - Clean the transactional data to remove duplicates, handle missing values, and address inconsistencies.
   - Transform the data into a suitable format for analysis, such as transaction-item matrices or basket-item matrices.
4. **Exploratory Data Analysis (EDA):**

- Conduct exploratory data analysis to gain insights into the characteristics of the transactional data.
- Explore item distributions, transaction frequencies, and common item combinations.

5. **Market Basket Analysis:**
   - Apply association rule mining algorithms such as Apriori or FP-Growth to identify frequent itemsets and generate association rules.
   - Calculate support, confidence, and lift metrics to evaluate the strength of association rules.
6. **Rule Interpretation:**
   - Interpret the generated association rules to extract actionable insights.
   - Identify meaningful patterns, correlations, and cross-selling opportunities.
7. **Visualization:**
   - Visualize the results of Market Basket Analysis using charts, graphs, and heatmaps.
   - Create visual representations of association rules and item co-occurrences to facilitate understanding and communication of insights.
8. **Implementation of Insights:**
   - Translate the insights derived from Market Basket Analysis into actionable strategies and recommendations.
   - Implement changes such as optimizing product placements, designing targeted promotions, or adjusting pricing strategies.
9. **Performance Evaluation:**
   - Measure the impact of implemented strategies on key performance indicators (KPIs) such as sales revenue, basket size, and customer satisfaction.
   - Iterate on the analysis and recommendations based on feedback and performance evaluation results.
10. **Documentation and Communication:**
    - Document the methodology, findings, and recommendations in a clear and concise manner.
    - Communicate the insights to stakeholders through reports, presentations, or interactive dashboards.
11. **Continuous Improvement:**
    - Continuously monitor and refine the Market Basket Analysis process based on feedback, new data, and evolving business requirements.
    - Explore advanced techniques and methodologies to enhance the accuracy and effectiveness of MBA.

Code to implement:

```
import pandas as pd
import numpy as np
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules
transactions_df = pd.read_csv("transactions.csv")
items_df = pd.read_csv("itemsset.csv")

# Merge transactions and items datasets
df = pd.merge(transactions_df, items_df, on='ItemID')
```

```
# Convert dataset into one-hot encoded format
basket = (df.groupby(['TransactionID', 'Item'])['Item']
          .count().unstack().reset_index().fillna(0)
          .set_index('TransactionID'))

# Convert item counts to binary values (1 if item bought in
transaction, 0 otherwise)
basket_sets = basket.applymap(lambda x: 1 if x > 0 else 0)

# Perform Apriori algorithm to find frequent itemsets
frequent_itemsets = apriori(basket_sets, min_support=0.5,
use_colnames=True)

# Generate association rules
rules = association_rules(frequent_itemsets, metric='lift',
min_threshold=1)

# Display frequent itemsets and association rules
print("Frequent Itemsets:")
print(frequent_itemsets)
print("\nAssociation Rules:")
print(rules)
```

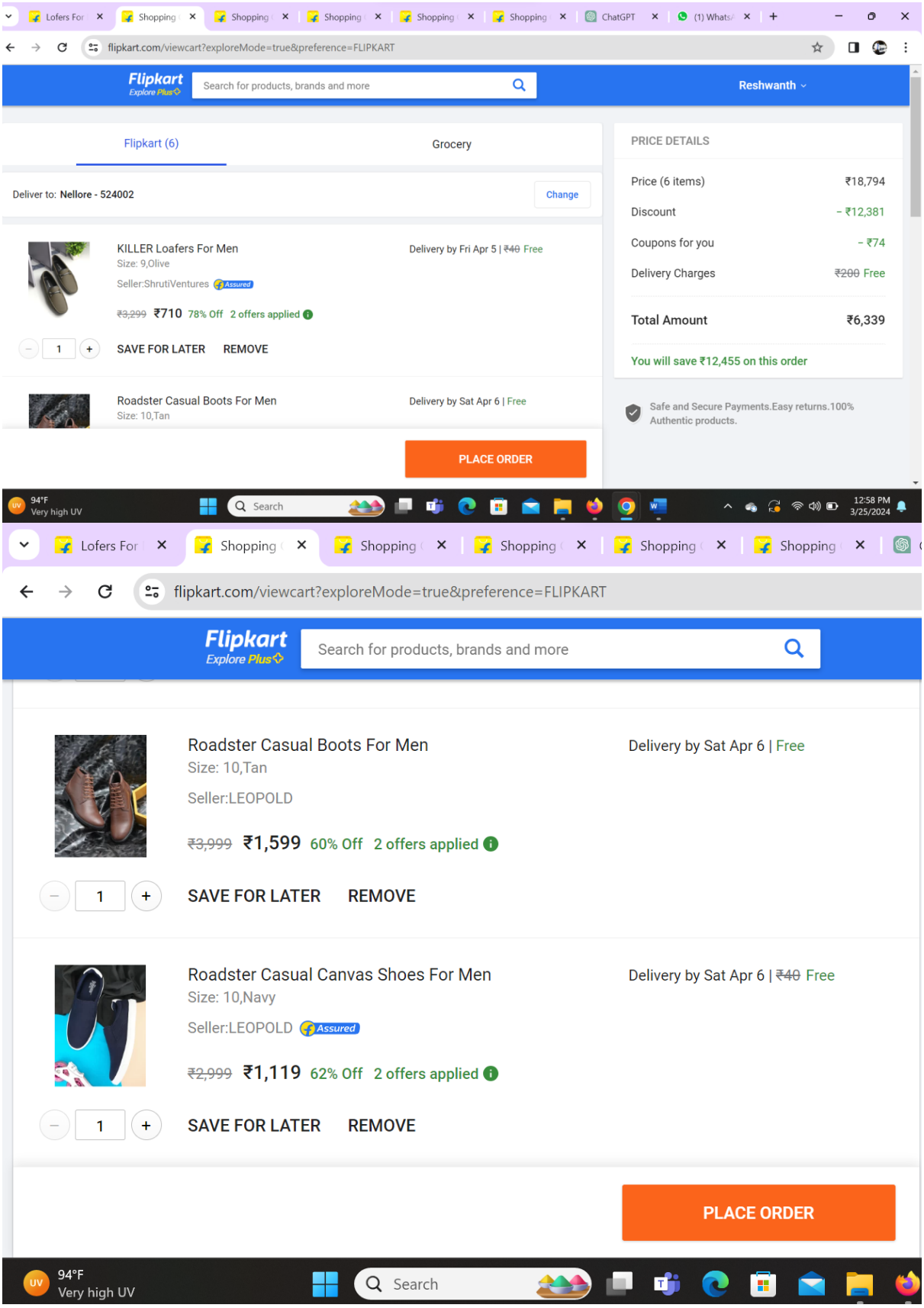
OUTPUT:

```
Frequent Itemsets:
   support             itemsets
0     0.50              (boots)
1     0.50            (casuals)
2     0.75            (loafers)
3     0.50           (sneakers)
4     0.50  (loafers, sneakers)

Association Rules:
  antecedents consequents  antecedent support  consequent support
support  \
0   (loafers)  (sneakers)                0.75                0.50
0.5
1  (sneakers)   (loafers)                0.50                0.75
0.5

   confidence      lift  leverage  conviction  zhangs_metric
0    0.666667  1.333333     0.125         1.5            1.0
1    1.000000  1.333333     0.125         inf            0
```

Photos :


flipkart.com/viewcart?exploreMode=true&preference=FLIPKART
Flipkart
Explore Plus
Search for products, brands and more
Reshwanth
Flipkart (6)
Grocery
Deliver to: Nellore - 524002
Change
KILLER Loafers For Men
Size: 9,Olive
Seller:ShrutiVentures
Assured
₹3,299 ₹710 78% Off 2 offers applied
Delivery by Fri Apr 5 | ₹40 Free
1
SAVE FOR LATER
REMOVE
Roadster Casual Boots For Men
Size: 10,Tan
Delivery by Sat Apr 6 | Free
PRICE DETAILS
Price (6 items) ₹18,794
Discount - ₹12,381
Coupons for you - ₹74
Delivery Charges ₹200 Free
Total Amount ₹6,339
You will save ₹12,455 on this order
Safe and Secure Payments.Easy returns.100% Authentic products.
PLACE ORDER
94°F
Very high UV
Search
12:58 PM
3/25/2024
Lofers For
Shopping
flipkart.com/viewcart?exploreMode=true&preference=FLIPKART
Flipkart
Explore Plus
Search for products, brands and more
Roadster Casual Boots For Men
Size: 10,Tan
Seller:LEOPOLD
₹3,999 ₹1,599 60% Off 2 offers applied
Delivery by Sat Apr 6 | Free
1
SAVE FOR LATER
REMOVE
Roadster Casual Canvas Shoes For Men
Size: 10,Navy
Seller:LEOPOLD
Assured
₹2,999 ₹1,119 62% Off 2 offers applied
Delivery by Sat Apr 6 | ₹40 Free
1
SAVE FOR LATER
REMOVE
PLACE ORDER
94°F
Very high UV
Search

Conclusion:

In conclusion, market basket analysis provides valuable insights into customer behavior and preferences within the shoe retail sector. By understanding association patterns, retailers can optimize inventory, refine marketing strategies, and enhance the overall shopping experience, ultimately driving sales and fostering customer satisfaction.