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Final Year Project Proposal

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Smart-Shelf: AI-Powered Retail Optimization

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1. Introduction

1.1. Background of the Study

With the rapid evolution of the retail industry, many small and medium-sized store owners still rely on traditional methods for organizing and managing their product placements. Smart-Shelf addresses this gap by offering an AI-powered mobile solution that leverages data mining to optimize retail shelf organization.

1.2. Current Issues

- Lack of intelligent systems to understand consumer behavior.
- Ineffective shelf placement and product bundling.
- Missed sales opportunities due to poor data insights.

1.3. Problem Statement

Retail store owners often lack access to intelligent tools that help in understanding consumer buying behavior and optimizing product placement. As a result, they miss out on potential profits due to inefficient shelf organization and lack of product bundling strategies.

1.4. Proposed Solution

A mobile app-based platform where retail stores can register and upload product data and transaction histories. The system applies data mining algorithms (like Apriori) to generate product association rules and recommend placement strategies to improve sales and profitability.

2. Existing Systems / Related Work

Tool / Model	Year	Features	Strength	Limitation
Amazon Kinesis	Ongoing	Retail analytics pipeline	Scalable & real-time	Requires AWS ecosystem

Tool / Model	Year	Features	Strength	Limitation
Market Basket Analysis	Common	Association rule mining	Foundational method	Not optimized for mobile apps
POS Tools	Varied	Product tracking	Commercially available	Expensive, not smart

3. Proposed System

3.1. Scope

Smart-Shelf aims to enable retailers to manage their data and automatically receive recommendations about which products to place together on shelves for maximum sales.

3.2. System Modules

- **User Management:** Store registration and login.
- **Data Upload:** Upload product and transaction data.
- **Association Rule Mining:** Identify patterns using Apriori algorithm.
- **Recommendation Engine:** Suggest product bundling and shelf placement.
- **Analytics Dashboard:** Visual insights for store performance.

3.3. Advantages of the Proposed System

- Provides intelligent insights through AI.
- Enhances sales through optimized placement.
- Easy-to-use mobile interface.
- Applicable to various store types.

3.4. Limitations / Disadvantages

- Performance may vary with very large datasets.
- Initial setup requires data entry from store owners.

3.5. Application

- Supermarkets
- Grocery Stores
- Retail Chains
- Pharmacy Shops

3.6. SDG Goals

- Goal 8: Decent Work and Economic Growth
- Goal 9: Industry, Innovation and Infrastructure

4. Hardware / Software Requirements

4.1. Hardware

- Smartphones (Android/iOS)
- Cloud Hosting (Firebase/AWS)
- Optional: Desktop PC for web admin panel

4.2. Software

- React Native / Flutter
- Node.js or Django
- MongoDB / PostgreSQL
- Firebase Cloud Functions
- Python (for analytics)

4.3. Libraries / APIs

- mlxtend, scikit-learn, pandas
- Chart.js, D3.js
- Firebase Cloud Messaging (for notifications)

- Express.js / Django REST Framework

5. References

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4. Firebase Docs - https://firebase.google.com/docs
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