

DEG2025-4899

IntelliKart: CTC-HUIM Enabled Smart Shopping Cart for Real Time Shopping Assistance and High-Profitable Itemset Mining

Project Title :	IntelliKart: CTC-HUIM Enabled Smart Shopping Cart for Real Time Shopping Assistance and High-Profitable Itemset Mining
Theme :	Open Innovation
Project Category :	Software
Abstract :	<p>Retailers face challenges in managing inventory, optimizing sales, and enhancing customer experience due to fluctuating demand, overstocking, and dynamic consumer preferences. IntelliKart, utilizing the Customized Transactional Constraint-based High Utility Itemset Mining (CTC-HUIM) algorithm, aims to address these issues by analyzing transactional data to identify high-utility product combinations based on profitability, time window and product correlations. The project integrates data mining, real-time analytics to provide insights into optimal stock levels, personalized promotions, and cross-selling strategies. The CTC-HUIM algorithm enhances decision-making by factoring in product shelf time, seasonality, and customer buying behavior. It enables retailers to reduce wastage, prevent stockouts, and maximize revenue through intelligent bundling and demand forecasting. Key features include real-time inventory tracking, an interactive dashboard for data visualization. By leveraging big data analytics, secure billing mechanisms, IntelliKart ensures a seamless and personalized shopping experience. Traditional itemset mining algorithms relied on frequency-based analysis, identifying frequently purchased</p>

	<p>product sets without considering their profitability, time relevance, or correlations. This often led to inefficient stock management and missed revenue opportunities. Our approach, using the CTC-HUIM algorithm, goes beyond frequency by integrating profitability, time window, and product correlations. This enables retailers to identify high-value product combinations, optimize stock levels, and enhance sales strategies. By incorporating utility-based factors, our system ensures smarter inventory management, reduced waste, and improved personalized promotions, ultimately increasing efficiency and profitability.</p>
Current Stage of the project :	Prototype Development
Objective of the project :	<ul style="list-style-type: none"> • Develop an intelligent retail management system using the CTC-HUIM algorithm to optimize inventory and sales strategies. • Identify high-utility itemsets by considering factors like profitability, product correlations, time window. • Implement dynamic inventory control by continuously analyzing sales trends and adjusting stock levels in real-time to prevent inefficiencies. • Enhance cross-selling and product bundling strategies to maximize revenue and customer satisfaction. • Provide real-time data insights to help retailers make informed decisions on promotions, pricing, and stocking levels.
Problem statement :	<p>To address the challenges of fluctuating demand, stockouts, overstocking, and managing perishable inventory, this system will implement the Customized Transactional Constraint-based High Utility Itemset Mining (CTC-HUIM) algorithm. CTC-HUIM goes beyond frequency-based analysis by considering utility factors such as profitability, time window, and product correlations. By identifying high-utility itemsets, retailers can discover the most profitable product combinations and improve cross-selling and bundling</p>

	<p>strategies. The system enables data-driven inventory optimization, helping retailers manage stock levels, avoid stockouts, and reduce wastage, especially for perishable goods. Additionally, CTC-HUIM provides insights for personalized promotions and marketing efforts, aligning them with customer preferences and demand patterns. With these capabilities, retailers can dynamically adjust their inventory and promotions, increasing profitability and enhancing customer satisfaction.</p>
Proposed solution :	<p>The IntelliKart Using CTC-HUIM Framework addresses retail challenges like fluctuating demand, stockouts, overstocking, and ineffective inventory management using the Customized Transactional Constraint-based High Utility Itemset Mining (CTC-HUIM) algorithm</p>
Methodology :	<ul style="list-style-type: none"> •User Interaction: The user launches the IntelliCart app, logs in or creates a new profile, inputs preferences, and accesses personalized recommendations. •Optimization Process: Users customize preferences, select parameters (Utility, Time Window, Correlation), set thresholds, and optimize accordingly. •Data Processing & Output: The system applies the CTC-HUIM algorithm, generates high-utility itemsets, outputs results, and provides performance metrics.
Working :	<p>1. User Interaction & Profile Management • The user launches the IntelliKart application.</p> <ul style="list-style-type: none"> • They either log in to an existing account or create a new profile. <p>2. Parameter Selection & Optimization • Users can choose specific parameters for optimization, such as:</p> <ul style="list-style-type: none"> • Utility (profitability, importance of items). • Time Window (recent purchases, seasonal trends). • Correlation (associative shopping behaviors). • Threshold values are set to determine how strict or flexible the system should be in filtering recommendations. <p>3. Optimization & Data Processing • Depending</p>

	<p>on the selected parameters, different optimization methods are applied:</p> <ul style="list-style-type: none"> • Utility-Based Optimization: Focuses on high-utility item selection. • Time-Window Optimization: Considers purchase history within a specific period. • Correlation Optimization: Uses association rule mining to find related items. • The system processes data using the CTC-HUIM Algorithm (likely a variation of High Utility Itemset Mining) to generate the final list of recommendations. <p>5. Output & Performance Metrics</p> <ul style="list-style-type: none"> • The system generates and outputs high-utility itemsets based on the chosen optimization strategy. • Users can view performance metrics, ensuring transparency and insights into the recommendation system.
Key features/innovations :	<ul style="list-style-type: none"> • High-Profit Product Display – Implements the CTC-HUIM algorithm to extract and display the most profitable products based on utility values. • Frequent Product Correlation Analysis – Uses Bond and Kulc correlation algorithms to identify and display highly related products frequently purchased together. • Sales Trend Tracking – Filters transaction data based on timestamps to track and display sales trends over specific time periods. • Real-Time Inventory Monitoring – Continuously updates stock levels and generates alerts for restocking based on demand forecasting models. • Daily Sales Tracking – Stores and processes daily transaction data to display product-wise sales records and performance trends. • Interactive Analytics Dashboard – Develops a graphical dashboard with dynamic charts and filters to visualize product insights based on selected parameters.
Expected outcomes :	<ul style="list-style-type: none"> • Display the high-profit products to help retailers focus on the most profitable items. • Identify and display highly correlated products frequently purchased together. • Display products sold within a given timestamp to track sales trends over specific periods. • Prevent stockouts and

	<p>overstocking by displaying current stock levels and highlighting new stock requirements.</p> <ul style="list-style-type: none"> • Track and display daily sales data, showing which products are sold each day. • Provide a well-structured dashboard that visualizes product insights using interactive charts based on selected constraints such as time, profit, and correlation
Software used :	<p>Languages & Frameworks Java – Core programming language. Java Swing – GUI development. Charts & Visualization JFreeChart – For displaying sales trends, profit analysis, and correlations using bar charts, pie charts, etc. Database & Data Management SQLite – Lightweight database (ideal for desktop applications). Packaging & Deployment Launch4j – To create a Windows executable (.exe) from our JAR file. Inno Setup – For building an installer (.exe with bundled JRE).</p>
Hardware used :	No any components
Important design aspect :	<p>1. Data Storage Layer : This layer stores the necessary data, such as inventory information and user profiles. 2. User Interaction Layer : This layer allows users to register and log in. 3. Preprocessing Data Layer : This layer cleans and formats raw data for processing. 4. Parameter Selection Layer : This layer allows users to select parameters (time, profit, correlation) for analysis.</p> <ul style="list-style-type: none"> • Time-Based Parameter: Transactions based on timestamps. • Profit-Based Parameter: Transactions filtered based on profit margins. • Correlation-Based Parameter: Relationships between items using statistical measures (e.g., Bond, Kulc, All Confidence). <p>5. CTC-HUIM Algorithm : This algorithm identifies high-utility itemsets based on selected parameters. 6. Output Layer : Displays high-utility itemsets and visualizations.</p> <ul style="list-style-type: none"> • High-Utility Itemset Calculation: Identifies the most relevant and profitable item combinations.

	Visualization Processing Time: Generates charts based on computed results.
This project gives a :	New solution to a old problem
Write the value addition/advantages over existing solutions :	<p>Advanced Inventory Optimization: IntelliKart optimizes stock levels and reordering strategies using CTC-HUIM algorithms, reducing storage costs and enhancing operational efficiency. • Data-Driven Decision Making: CTC-HUIM analyzes transaction data to identify purchase patterns, enabling data-driven product bundling and promotions for increased sales. • Real-Time Reporting and Insights: Real-time dashboards provide immediate updates on stock, sales, and promotions, enabling quick, informed decision-making for strategic optimization. • Enhanced Profitability: By evaluating products based on margin and sales, IntelliKart optimizes inventory levels and pricing strategies to maximize profitability. • Time-Sensitive Demand Patterns: IntelliKart predicts demand surges using historical data and external factors, ensuring product availability during peak periods for higher sales</p>
Specific areas of application :	<p>1.Retail & E-Commerce: •Optimizes inventory in real-time, ensuring high-demand products are always available without overstocking, leading to improved customer satisfaction and increased sales. •Supports both physical stores and online platforms for seamless operations. 2. Grocery & Supermarket Chains: •Boost revenue, and improve sustainability, enhancing both profits and brand image. 3.Consumer Electronics & Tech Stores: •Utilizes data analysis to identify high-value product combinations, driving effective cross-selling strategies, which significantly increases average order value and customer loyalty. 4.Fashion & Apparel Industry: •Analyzes sales data to predict seasonal trends, ensuring accurate stock replenishment and timely product launches, which maximizes sales and enhances</p>

	<p>competitive advantage. 5. Business Intelligence & Analytics Platforms: •Provides actionable insights from detailed sales and market trend analysis, enabling data-driven decisions that drive business growth and long-term success. 6.Food & Beverage Sector •Utilizes data analysis to identify food items combinations, driving effective cross-selling strategies which improves sales. 7.Warehousing & Inventory Solutions: •Automates stock tracking and replenishment through real-time insights. •Reduces overstock and stockout scenarios by forecasting demand intelligently. 8.Market Research & Consumer Insights: •Helps businesses uncover hidden purchasing patterns and profitable combinations of products. •Fuels product innovation and better market positioning strategies</p>
Impact of the solution :	<p>1. Industry • Profit-Driven Inventory Optimization: Boosts profitability by identifying high-utility product combinations and reducing losses from unsold or underperforming inventory. • Real-Time Decision Support: Empowers retailers to make agile, data-driven decisions, improving operational efficiency and competitiveness.</p>
Commercial viability :	<p>1. Potential of Turning Project into a Product •The IntelliCart system has strong potential to become a market-ready product, especially for retailers, supermarkets, e-commerce platforms, and supply chain managers. The use of data-driven inventory management, personalized promotions makes it highly valuable in optimizing sales and reducing losses. 2. Target Market •Retail Stores & Supermarkets – Real-time stock tracking and demand forecasting to minimize losses. •E-commerce Platforms – Customer behavior insights for personalized recommendations, cross-selling, and bundling. 3.Unique Selling Propositions (USPs) •Automated Replenishment System – Ensures real-time restocking to prevent losses due to stockouts. •Omnichannel</p>

	<p>Support – Works across physical stores, mobile apps, and e-commerce websites.</p> <p>4.Estimated Costs & Investment</p> <ul style="list-style-type: none"> •Development Cost: ₹10,000. •Operational Cost: ₹10,000 to 20,000/year (Server & Hosting (If needed for cloud sync)). <p>5. Pricing & Investment Basic Plan: ₹5,000/month (for small businesses). Enterprise Plan: ₹1-2 lakh (one-time license for large retailers).</p> <p>Investment Required: ₹2-3 lakh (for development, cloud hosting, and market expansion).</p>
Do you seek incubation support from DIPEX? :	Yes