**Database Management Systems Project Specification - Part 1**

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**What is the project idea/focus**

This project aims to develop a robust database system for an online food retailer, efficiently managing customer and product data to support operations such as inventory management, order processing, and marketing campaigns. Integrated with the database, a tree-based machine learning model predicts customer spending capacity, enabling segmentation into distinct groups.

**Why did you select this project idea**

We selected this project idea because it combines the strengths of a robust database system and machine learning to address both operational and strategic needs. The database ensures efficient management of customer and product data, supporting seamless operations, while the machine learning model enhances customer segmentation, enabling personalized marketing and improved user experiences, while customer segmentation enhances targeted marketing, optimizes promotions, and informs inventory and pricing strategies. High-value customers receive personalized recommendations, boosting revenue, while other segments benefit from tailored offers, improving engagement and retention.

**Proposed System**

Based on the content of our database related to online food retailing, the initial design of our database roughly contains the following modules：Customer, Product, Order, Cart, Internal Management System, and Market Campaign (if applicable). The details of each module are listed below.

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Customer** | Customer Profile | Stores essential and personal information about each customer | CustomerID, FirstName, LastName, Email, Phone, DateJoined, PreferredLanguage,etc.. |
| Address | Manages multiple addresses per customer for billing and shipping | AddressID, CustomerID, Street, City, State, ZipCode, Country, AddressType (billing/shipping) |
| Payment Method | Manages saved payment methods for quick and secure transactions. | PaymentMethodID, CustomerID, CardType, CardNumber, ExpiryDate, CardholderName, BillingAddressID |
| Order History | Tracks all past orders linked to the customer for easy reference and reorder functionality | OrderID, CustomerID, OrderDate, TotalAmount, Status |
| Customer Loyalty Program  (if applicable) | LoyaltyID, CustomerID, PointsAccrued, MembershipLevel, EnrollmentDate | Tracks participation in loyalty programs and rewards |

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Product** | Product | Represents each item for sale, including essential details and inventory status. | ProductID, SKU, Name, Description, Price, CategoryID, SupplierID |
| Category | Organizes products into hierarchical categories for easier management and navigation. | CategoryID, Name, Description |
| Product Review | Collects customer feedback on products | ReviewID, ProductID, CustomerID, Rating, Comment, ReviewDate |
| Supplier | Details about suppliers providing the products, useful for restocking and supplier management | SupplierID, Name, ContactInfo, AddressID |
| Product Specification | Stores detailed specifications for products | SpecificationID, ProductID, Ingredients, Weight,  ExpirationDate |
| Inventory | Manages stock levels across different warehouses | WarehouseID, ProductID, Quantity |

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Order** | Order | Manages the main details of each customer order | OrderID, CustomerID, OrderDate, TotalAmount, Status (e.g., pending, processing, shipped, delivered, cancelled), ExpectedDeliveryDate |
| Order Item | Tracks individual products within an order | OrderItemID, OrderID, ProductID, Quantity, UnitPrice |
| Payment | Details the payment transactions associated with orders | PaymentID, OrderID, Amount, PaymentMethod (e.g., credit card, PayPal), PaymentStatus (e.g., pending, completed, failed), PaymentDate |
| Shipping Information | Manages the shipping details for each order | ShippingID, OrderID, ShippingType (e.g., standard, express), ShippingCost, ShippingStatus (e.g., in transit, delivered), TrackingNumber |
| Discount | Manages discounts applied to orders, such as promotional discounts or customer loyalty reductions | DiscountID, OrderID, Product\_id, DiscountAmount, DiscountDescription |
| Order Source | Tracks the source of orders effectively | SourceID, OrderID, SourceType (e.g., social media, email campaign, direct traffic, referral, etc.), AccessDate |
| Return and Refund | Manages product returns and refunds associated with orders | ReturnID, OrderID, ProductID, Reason, ReturnStatus (e.g., received, processing, refunded), RefundAmount |
| Order Feedback | Collects feedback specific to the order experience | FeedbackID, OrderID, CustomerID, Rating, Comments, Date |

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Cart** | Cart | Holds the active shopping session for a customer, tracking items they are considering for purchase | CartID, CustomerID, CreatedDate |
| CartItem | Tracks each product added to the cart, including the quantity and the price at the time of addition | CartItemID, CartID, ProductID, Quantity, UnitPrice, AddedDate |
| Cart Saved for Later | Allows customers to save items in their cart for future consideration without purchasing them immediately | SavedItemID, CartID, ProductID, SavedDate |
| Wishlist Item | Provides a separate entity for customers to store products they are interested in but are not yet ready to place in their shopping cart | WishlistID,  CustomerID,  ProductID, AddedDate |

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Internal Management Information** | Employee | Manages information about each employee, including personal details and employment status | EmployeeID, FirstName, LastName, Email, Phone, HireDate, DepartmentID, RoleID, Status (active, leave, terminated) |
| Department | Organizes the food retailer company into different departments, each with a specific function and a designated manager | DepartmentID, DepartmentName, ManagerIDDepartmentID, DepartmentName, ManagerID |
| Role | Defines the different roles within the organization and the responsibilities associated with each | RoleID, RoleName, Description |
| Employee Salary | Manages salary details for employees | SalaryID, EmployeeID, BaseSalary |

| **Module Name** | **Entity** | **Description** | **Attributes** |
| --- | --- | --- | --- |
| **Market Campaign** | Campaign | Manages details of marketing campaigns, including duration, and effectiveness | CampaignID, CampaignName, StartDate, EndDate, SourceType, |
| Customer Interaction | Tracks all interactions linked to marketing sources, providing insights into customer engagement paths | InteractionID, CustomerID, SourceID, InteractionType, InteractionDate |

**Who is the solution for：**

The solution is designed for a food retailer website, targeting both the business operators and their customers. For the retailer, the database and recommender system aim to streamline operations, manage inventory more effectively, and drive increased sales through advanced data analytics. For customers, it improves the shopping experience by ensuring their needs are better understood and addressed through tailored engagement strategies.

**When/Where is it used (use cases):**

1. **Personalized Shopping Experiences:**
   * When customers log into their accounts, the recommender system analyzes their past purchases and browsing history to suggest products that match their tastes and preferences. This makes the shopping experience more tailored and efficient.
2. **Inventory Management:**
   * The database helps manage stock levels by providing real-time data on inventory movements. This allows the retailer to make informed decisions about reordering products or offering promotions on slow-moving items.
3. **Marketing Campaigns:**
   * The system can be used to target specific customer segments with promotions and new products based on the analysis of customer data and buying patterns, which can be extracted from the database.
4. **Demand Forecasting:**
   * The retailer can use historical sales data stored in the database to forecast future demand for products, helping to optimize purchasing and logistic operations.