***Problem Statement:***

* An e-commerce platform wants to enhance its user experience and optimize product recommendations based on user interactions and past purchase history.
* The platform seeks to identify patterns in user behavior, such as popular products, frequently interacted categories, and purchasing habits, to provide personalized recommendations and improve customer engagement.

***Solution Overview -*** SQL Implementation for E-commerce Recommendation Engine:

**Data Modeling and Database Design:**

* Design and create tables to store user interactions, product details, and past purchases.
* Define appropriate data types, primary keys, and foreign key constraints to ensure data integrity.
* Normalize the database schema to minimize redundancy and optimize query performance.

**Data Analysis and Exploration:**

* Utilize SQL queries to perform exploratory data analysis (EDA) on the database tables.
* Analyze user interactions by counting views, clicks, and purchases for each product.
* Identify popular products, frequently interacted categories, and user preferences through SQL aggregation functions and group by clauses.

**User Segmentation and Profiling:**

* Segment users based on their interaction history and purchasing behavior using SQL queries.
* Group users into clusters using techniques such as k-means clustering or hierarchical clustering.
* Create user profiles by aggregating user data, including demographics, preferences, and purchase history.

**Database schema:**

**Table:** Products

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Description** |
| product\_id | VARCHAR(20) | Unique identifier for the product |
| product\_name | VARCHAR(100) | Name of the product |
| category | VARCHAR(50) | Category of the product |
| price | DECIMAL(10,2) | Price of the product |
| brand | VARCHAR(50) | Brand of the product |

**Table:** User Interactions

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Description** |
| interaction\_id | INT | Unique identifier for the interaction |
| user\_id | VARCHAR(20) | Unique identifier for the user |
| product\_id | VARCHAR(20) | Identifier for the product involved in the interaction |
| interaction\_type | VARCHAR(20) | Type of interaction (e.g., view, click, purchase) |

**Table:** Past Purchases

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Description** |
| purchase\_id | INT | Unique identifier for the purchase |
| user\_id | VARCHAR(20) | Unique identifier for the user |
| product\_id | VARCHAR(20) | Identifier for the purchased product |
| purchase\_date | TIMESTAMP | Date and time of the purchase |
| quantity | INT | Quantity of the product purchased |
| total\_amount | DECIMAL(10,2) | Total amount spent on the purchase |

**Product Table:**

***Columns:***

* **product\_id:** Unique identifier for each product.
* **product\_name:** Name of the product.
* **category:** Category to which the product belongs.
* **price:** Price of the product.
* **brand:** Brand of the product.

***Interactions Table:***

***Columns:***

* **interaction\_id:** Unique identifier for each interaction.
* **user\_id**: Unique identifier for each user.
* **product\_id:** Unique identifier for each product.
* **interaction\_type:** Type of interaction (e.g., view, add to cart, purchase).
* **timestamp:** Timestamp when the interaction occurred.

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**Past Purchases Table:**

***Columns:***

* **purchase\_id:** Unique identifier for each purchase.
* **user\_id:** Unique identifier for each user.
* **product\_id:** Unique identifier for each product that was purchased.
* **purchase\_date:** Date when the purchase occurred.