



Problem Statement Title: Personalized Product Recommendations
Team Name: 686157-U7D9TH06

Team members details

Team Name	686157-U7D9TH06		
Institute Name/Names	The LNM Institute of information technology		
Team Members >	1 (Leader)	2	3
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Batch	2025	-	-

Glossary

- * => Features not included in prototype
- # => Used in prototype

Use-Cases

- **L0-Personalized Product Recommendations:** Users can log in, view products, and receive personalized product recommendations based on their interactions, including searches, cart items, wish-list items and advertisement interactions*. This helps users discover products that match their preferences.
- **L1-Location-Based Recommendations*:** Users' locations are stored, allowing the app to collect data in order to provide location-based recommendations or relevant products based on regional preferences and trends.
- **L2-Tag-Based Product Exploration:** Instead of browsing through conventional categories like "Clothes" or "Shoes," users explore products based on tags.

Overall Problem: Develop a Personalized Product Ranking System

1. Define User Profiles and Preferences:

1. Create user profiles with attributes like demographics, Cart and wish-list history ,ad interactions on third party platforms, browsing behavior, and preferences.
2. Assign weights to different attributes based on their importance.

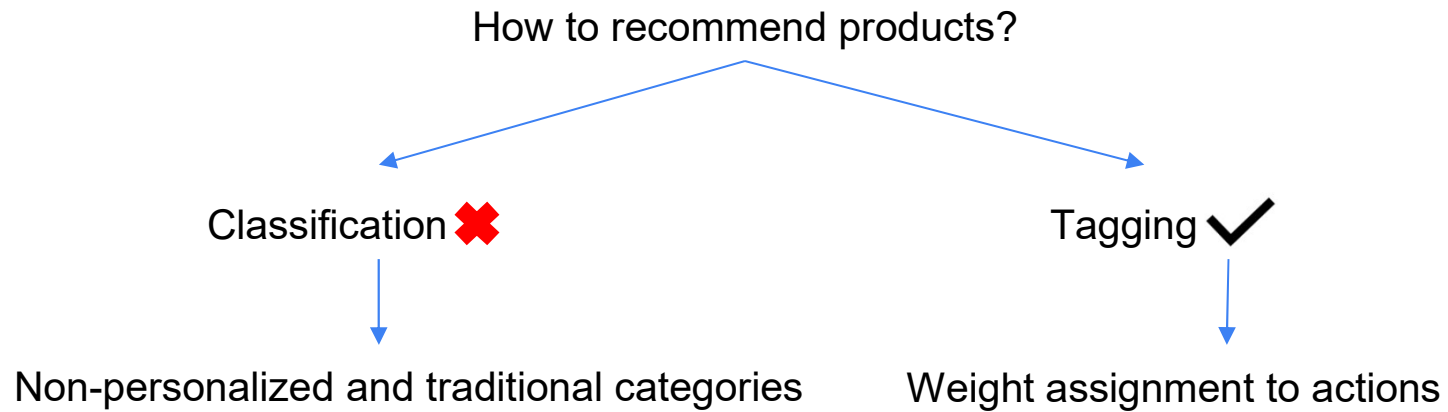
2. Simulate User Interactions:

1. Simulate user interactions such as product views, clicks, cart/wish-list additions, and searches.

3. User Similarity Calculation:

1. Design a method to calculate user similarity based on their profiles and interactions.
2. Choose similarity metrics like cosine similarity or sigmoid kernel#.

Why content based filtering? => Personalization



Sub-Problems and Solutions:

1. User Profile Generation:

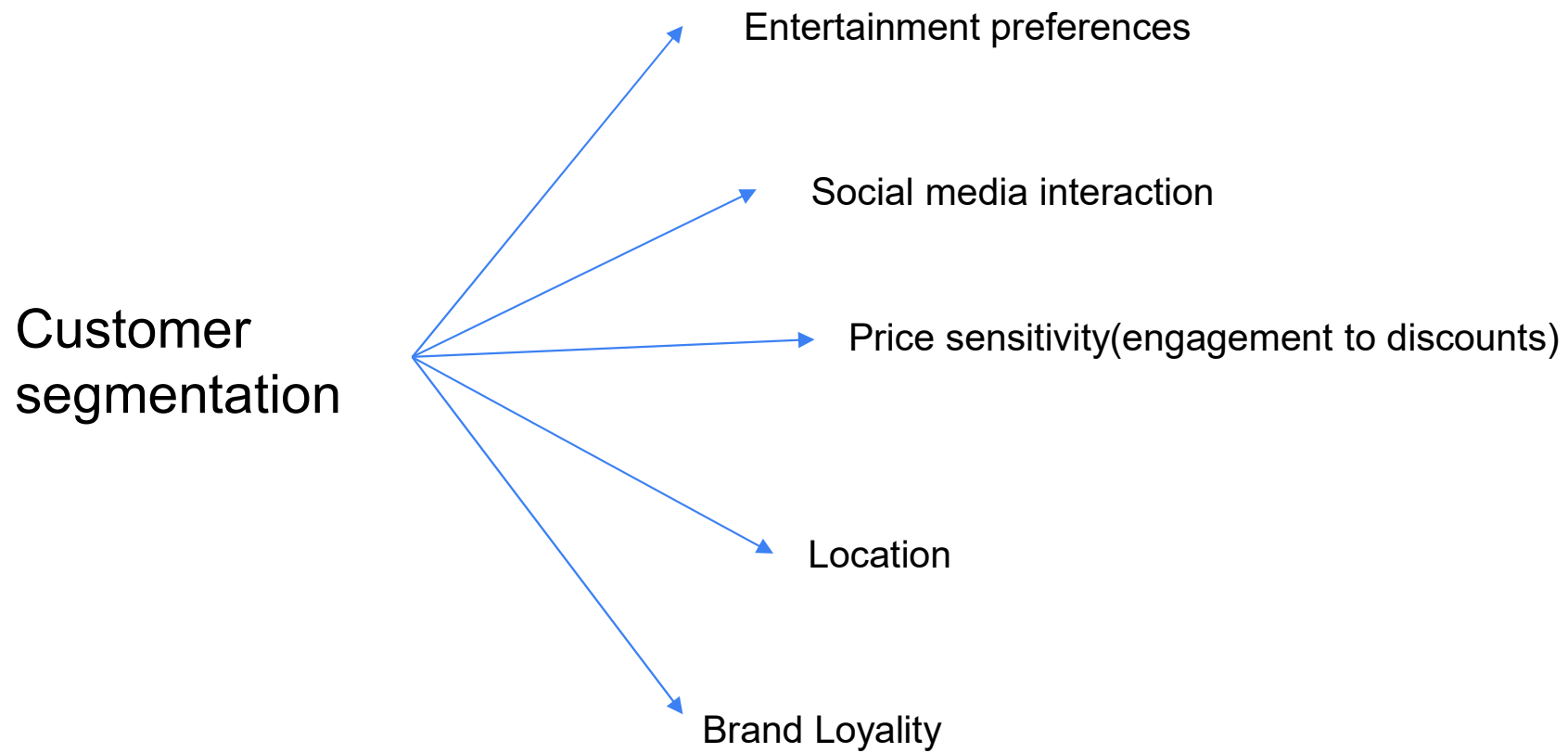
- Define attributes like age, gender, location, and interests for user profiles.
- Create a fail-safe authentication mechanism for user data security.

2. Initial Product Rankings:

- Rank products based on a combination of scores and attributes.
- Implement a function that sorts products using predefined criteria.

3. User Feedback Collection and Incorporation*:

- Provide mechanisms for users to provide explicit feedback, ratings, or reviews for products.
- Incorporate user feedback into the recommendation model to improve accuracy.



Limitations

1.Limited Tag Diversity: The effectiveness of the tag-based recommendation system heavily relies on the availability and diversity of relevant tags. If the dataset lacks a comprehensive range of descriptive and nuanced tags, the system may struggle to accurately capture users' preferences and provide meaningful recommendations.

2.Sparse Data for New Users: New users with limited interaction history may receive less accurate recommendations due to insufficient tagging data. The model might struggle to understand their preferences until they have provided enough interactions.

3.Model Bias: The recommendation model might inadvertently learn biases present in the dataset, leading to recommendations that reflect existing stereotypes or exclude certain user segments.

4.Lack of real world data-set:Publicly available datasets are out of date and insufficient for properly implementing some of the functionalities.

Future Scope

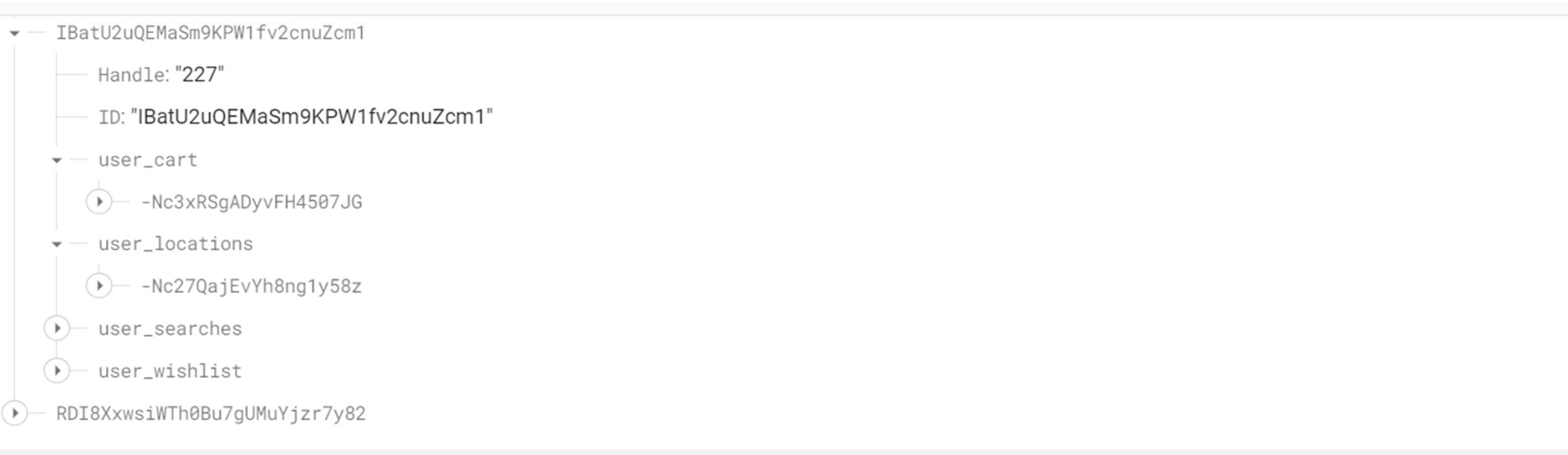
Advanced Machine Learning Models: As the field of machine learning continues to evolve, you can explore more advanced recommendation algorithms, such as deep learning-based models, reinforcement learning, and hybrid models that combine multiple techniques. These models can potentially capture more intricate patterns in user behavior and product attributes.

Contextual and Temporal Recommendations: Extend the system to provide recommendations based on contextual information, such as the user's current location, time of day, or device. Incorporating temporal dynamics could improve the accuracy of recommendations by considering changing preferences and trends over time.

Integration with Social Networks: Allow users to connect their social media accounts to the system, enabling recommendations based on their social interactions, interests, and connections.

Augmented Reality (AR) and Virtual Reality (VR) Integration: Explore opportunities to provide personalized recommendations through AR and VR experiences, allowing users to visualize and interact with products in immersive environments.

Database Structure



Proof of Concept

1. **Objective:** The objective of this Proof of Concept (PoC) is to demonstrate the feasibility of a personalized product recommendation system using user interactions and preferences.
2. **Overview:** The provided code implements a basic version of a personalized product recommendation system within a Streamlit web application. The PoC showcases how user interactions, such as cart additions, wishlists, and searches, can be utilized to generate personalized product rankings. The recommendation algorithm considers user-specific tags and interactions to provide relevant product suggestions.
3. **Key Components:**
 - 1.**User Authentication:** The PoC utilizes Firebase authentication to allow users to sign up or log in. Users are required to verify their email addresses before gaining access.
 - 2.**User Interactions:** The system records user interactions, including adding products to the cart, wishlists, and search queries, in a Firebase database.
 - 3.**Product Data:** Product data is loaded from pickled files, which represent a simplified product dataset.
 - 4.**Personalized Recommendation Algorithm:**
 1. The recommendation algorithm calculates personalized product scores based on user interactions.
 2. User-specific tags from cart, wish-list, and search interactions are combined with product tags to determine relevancy.
 3. Products are ranked based on combined scores, and the top recommendations are displayed.

- Github link-<https://github.com/vanshrl9ine/ProductRecommender>



Thank You