Problem Statement : Personalized Product Recommendations

Team Name: 686157-U3LV6E82

Team Name	Team Name: 686157-U3LV6E82		
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Team Members	1 (Leader)	2	3
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Batch	2025	2025	2025

Delivarables

- Developed a product recommendation system via collaborative filtering.
- Utilized user-user and item-item interactions for personalized and diverse suggestions.
- Address limitations: scalability for large datasets, potential cold start problem.
- The future scope includes AI-enhanced recommendation algorithms and integration with e-commerce platforms.
- Presenting a functional model with code on a GitHub repository.
- Delivering a video presentation explaining the solution's concept and demonstrating the working model.

Code Links

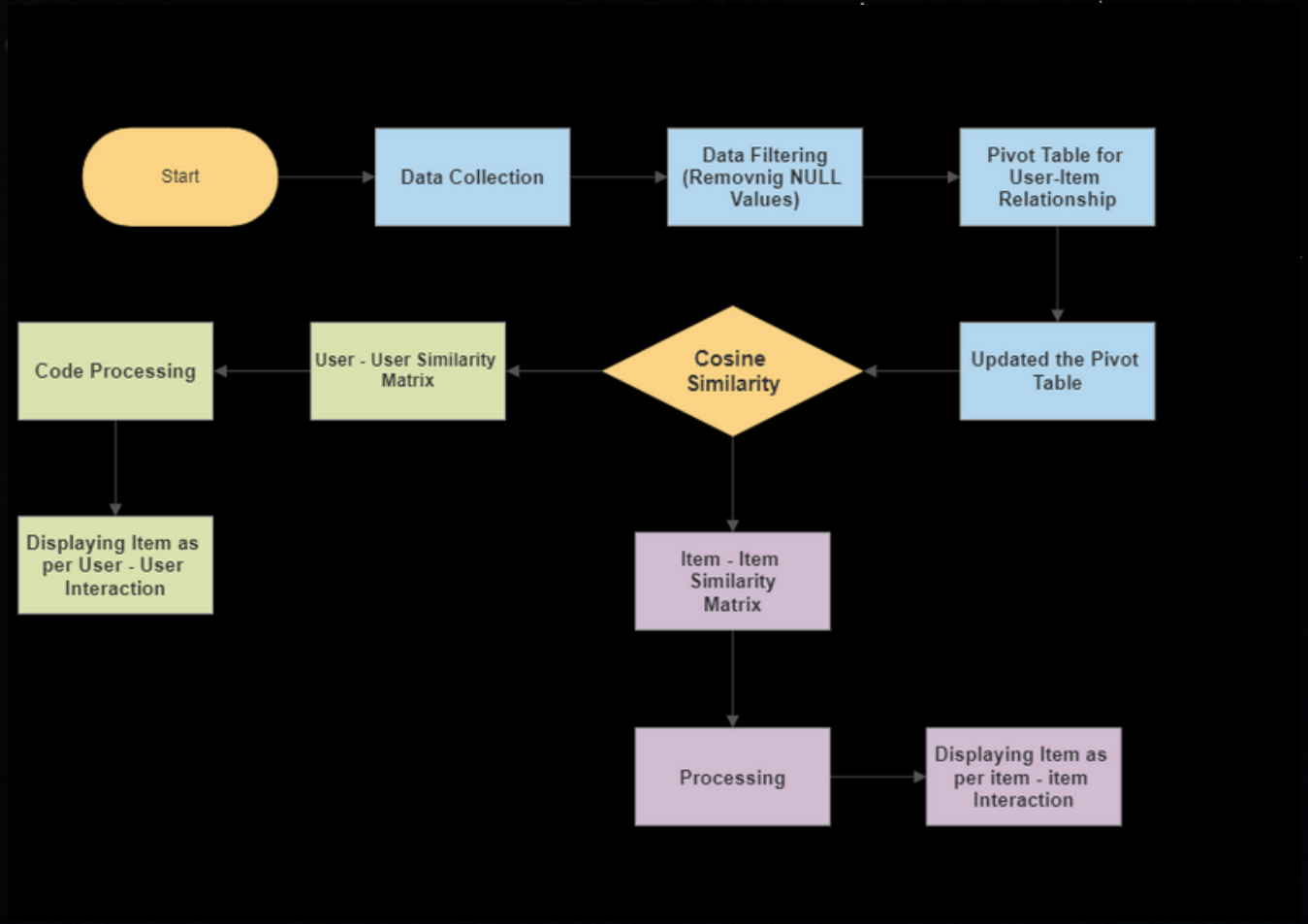
Use-Cases

- **P0 : Increase Sales and Revenue : Increase sales and revenue by showing customers products that they are more likely to be interested in.**

- **P1 : Reduced Marketing Costs : It can help businesses reduce marketing costs by making it easier to target customers with relevant advertising.**

- **P2 : Enhanced Customer Engagement and Sharing: Employing personalized product recommendations can enhance customer engagement by showcasing items aligned with their interests. This leads to increased time spent on the platform and heightened chances of customers sharing product discoveries with their social circle.**

- **P3 : Boosted Retention and Loyalty : Implementing personalized product suggestions not only offers a great shopping experience but also builds customer loyalty. By presenting products aligned with individual preferences , businesses can encourage repeat purchases and foster enduring customer relationships.**


Start
Data Collection
Data Filtering (Removnig NULL Values)
Pivot Table for User-Item Relationship
Updated the Pivot Table
Cosine Similarity
User - User Similarity Matrix
Code Processing
Displaying Item as per User - User Interaction
Item - Item Similarity Matrix
Processing
Displaying Item as per item - item Interaction

Solution Statement

- Our solution is towards improving how user experience our platform where each individual has their own personalized recommendations :

- **Collaborative Filtering Approach :** Our model is designed to utilize customers' interactions with products in order to provide recommendations. It's similar to when you receive suggestions for products based on your past purchases. This approach assists us in predicting which products customers might find appealing.

- **User-User Interaction Model :** We've built a special model that looks at how users interact with each other. If two people have similar tastes, we use this to suggest products. By looking at what you and others have liked, we suggest things that are likely to be interesting. This makes sure the recommendations feel personal and relevant to user.

Solution Statement

- **Item-Item Interaction Model :** Another model focuses on the products themselves. We look at which products are popular and how they're related. If you've liked certain items before, we use this to suggest other items that have been popular among people who liked the same things. This way, we introduce you to new things that are likely to match your interests.

- We have used **cosine similarity** which helped us to identify how closely a customer's preferences align with others who have shown similar tastes. This helps us pinpoint products that are likely to match their interests, offering a more tailored and accurate recommendation experience.

- Our Model helps us in predicting the top X items by analyzing both item-item and user-user interaction separately.

Limitations

- While this model works accurate in recommending user-item preferences ,but there are several limitations to this model where it produces less accurate recommendation.

- In case where the available user-item interaction data is sparse ,like most users have only interacted with a small fraction of the total items, and most items have only been interacted with by a small fraction of the total users , then there's not enough historical data to accurately recommend items they might like.

- As this model has two separate types of cosine similarity under collaborative filtering i.e.item-to-item similarity and user-to-user similarity that limits the system to recommend only one preference at a time either item-to-item or user-to-user similarity and also leads to low accuracy. But this can be improved by hybrid recommendation system.

- As the number of users and items increases, the computation of cosine similarity for every pair of users or items becomes computationally expensive and can slow down the recommendation process. The recommendation system should be able to efficiently process and analyze this large volume of data.

Future Scope

- The model which we have implemented looks into user-user matrix and extracts items rated by an active user and then uses this retrieved item to determine how similar they are to the target item. It then selects the most similar items and a recommendation is made by taking weighted average of the active users rating on the similar items.

- As this model has two separate methods for recommendation,if both the methods are to be combined or using hybrid recommendation system then it will improve customer personalized experience more better.

- Creating a user-friendly website with an integrated backend, offering login, sign-up, customer history, and showcasing items with descriptions, ratings, and more.

- Personalized experience will have a greater impact on sales than any product, and even help customers feel open to paying higher prices. They spent more on something because of personalized service. So, it will also boost overall company's profits, resulting in higher revenues.

Thank You