Flipkart GRID 5.0

Problem Statement Title: *Personalized Product Recommendations*

Team Name: *TeamGRID*

Team members details

Team Name	TeamGRID		
Institute Name/Names	Indian Institute of Technology, Ropar		
Team Members >	1 (Leader)	2	3
Name	Vaibhavi Sanjivkumar Patil	Aviral Gupta	Suyash Varshney
Batch	2020-24	2020-24	2020-24

From Data to Delight: How Personalized Product Recommendations Revolutionize E-commerce

Problem statement

1

Enhance user experience by implementing personalized product ranking system

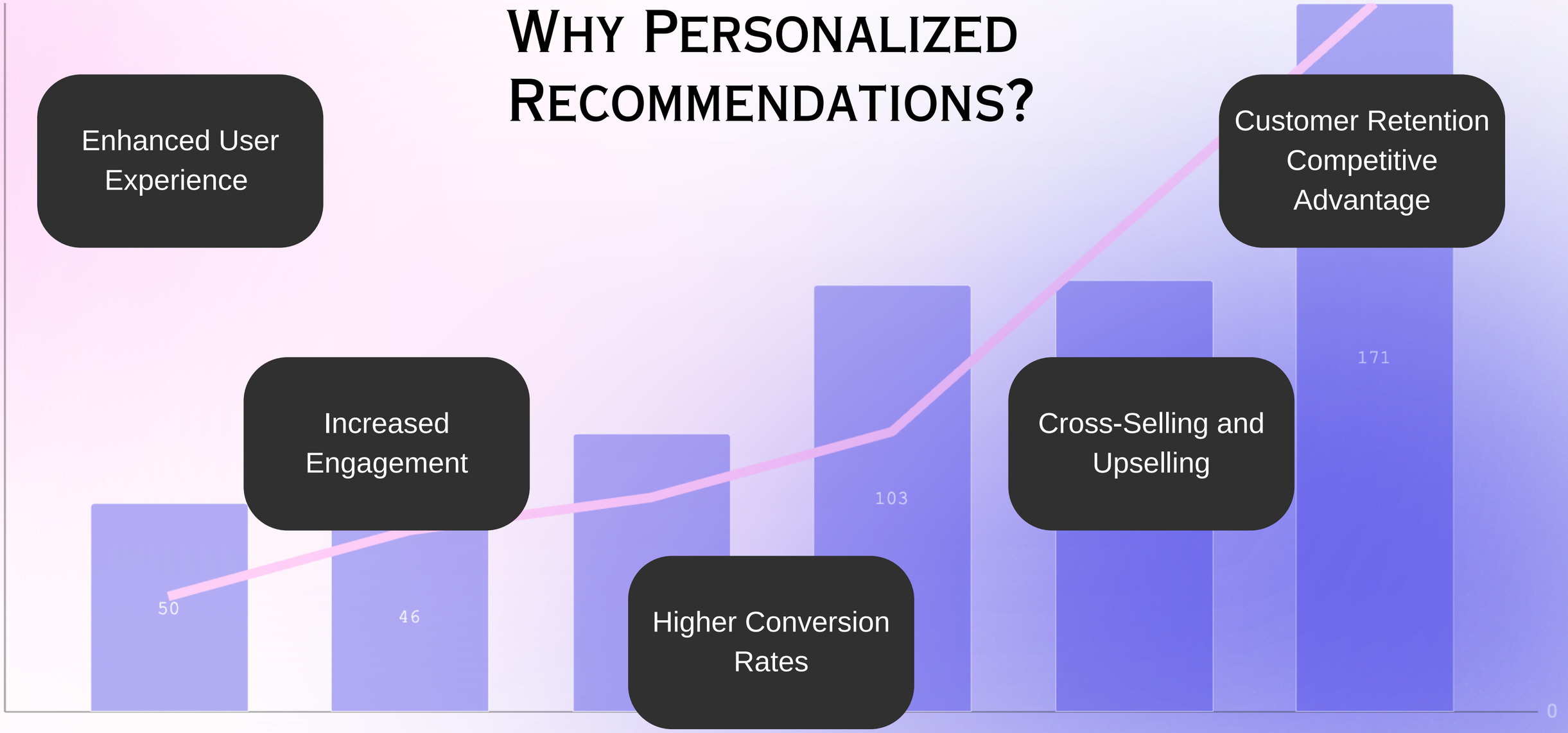
2

Develop an algorithm / model that can generate accurate and relevant product rankings for individual users.

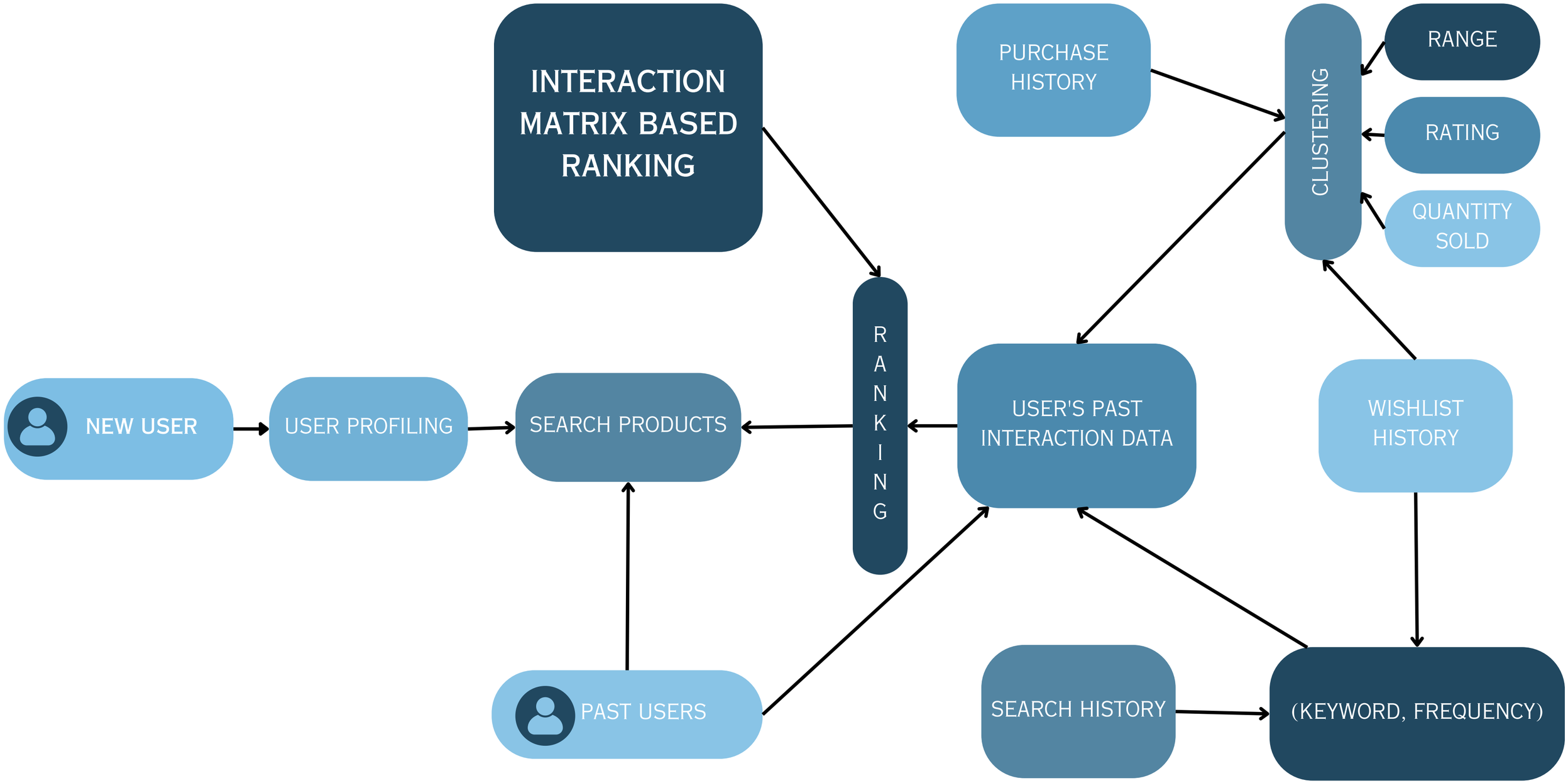
3

Solution should be able to rank products for a user, based on their unique characteristics and preferences

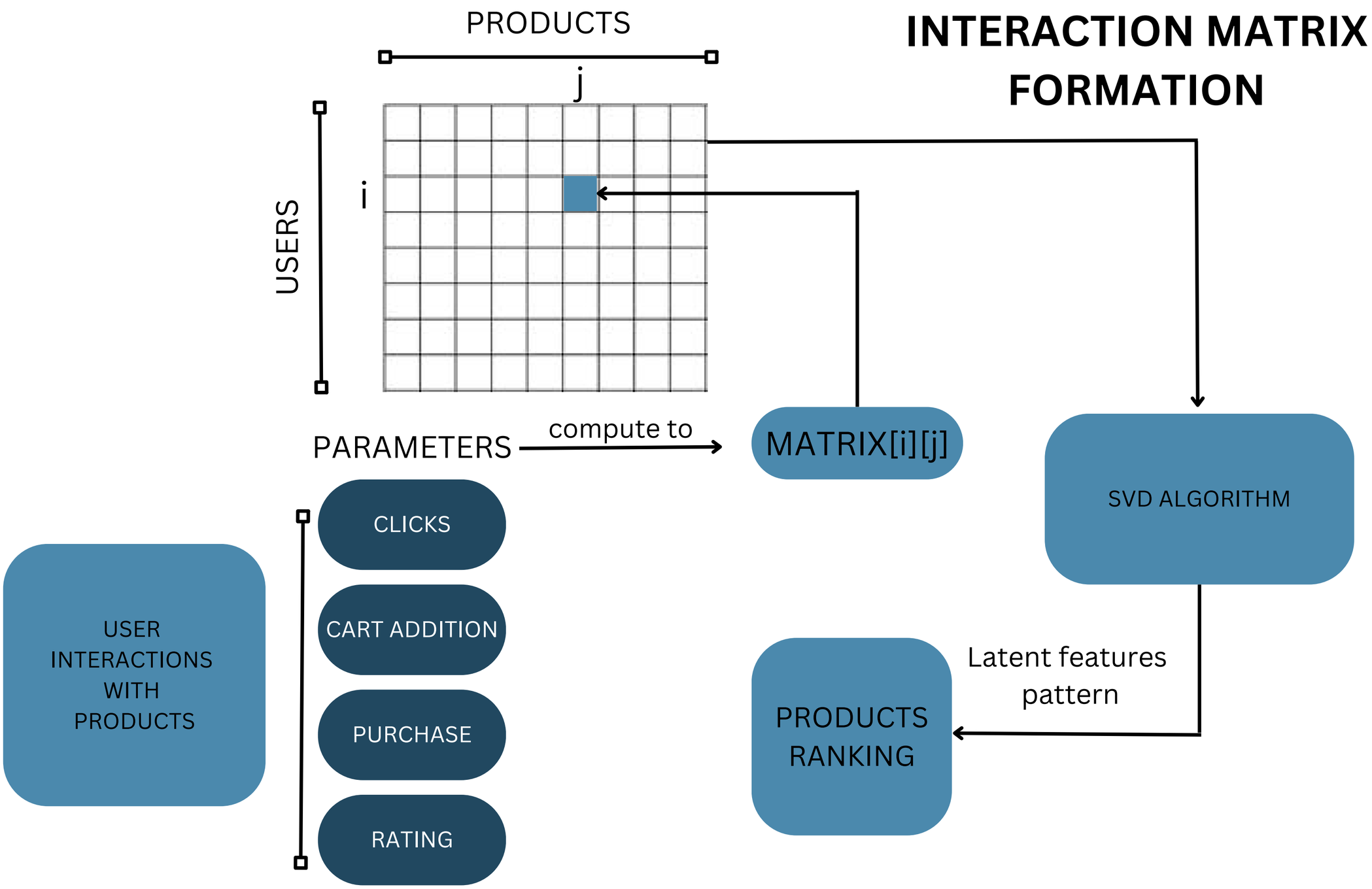
Why Personalized Recommendations?



FLOWCHART OF ALGORITHM



INTERACTION MATRIX FORMATION



SVD ALGORITHM WORKING

1 Prepare User-Item Interaction Matrix (A)

- Rows: Products / Items
- Columns: Users
- Entries: Interactions (ratings, clicks, purchases, etc.)

2 Apply COMPACT SVD Algorithm

a. Compute A^T * A
b. Compute Eigenvalues and Eigenvectors of A^T * A
c. Sort Eigenvalues in descending order
d. Calculate Singular Values
e. Compute U matrix using Eigenvectors of A^T * A
f. Compute V matrix (or V^T) using Eigenvectors of A * A^T

3 Select Number of Latent Features (k)

4 Generate Approximation of A

- Reconstruct A using U, Singular Values (Σ), and V matrix: A ≈ U * Σ * V^T

5 Use Latent Features for Recommendations

- Use U and V^T to predict missing entries or recommend products
- For user-based recommendations, use U; for item-based, use V^T

Techniques for Personalized product rankings

Content-Based Filtering

- Analyzes the characteristics of items and recommends similar items based on user preferences
- Uses item attributes such as product descriptions, tags, or categories to make recommendations
- Effective for recommending items in the same category or with similar features

Collaborative Filtering

- Recommends items based on the preferences and behaviors of similar users
- Uses the history of user interactions, such as ratings and reviews, to identify patterns
- Effective for recommending items based on user preferences and interests

WHY WE ARE USING SINGULAR VALUE DECOMPOSITION ALGORITHM?

Dimensionality Reduction

High-dimensional user-item interaction matrix

↓

Lower-dimensional matrices

Capturing the latent features

↓

Influence user preferences

Personalization

- Explicit user-item interactions
- Implicit preferences as well

Handling Data Sparsity:

Managing small fraction interactions

↑

Fill in missing entries in the user-item matrix

↑

Observed data and learned latent factors

LIMITATIONS

- System has limited or no historical data for new users or items. Without sufficient data, it's challenging to make accurate recommendations for these users or items

- Personalized recommendations rely on collecting and analyzing user data, which can raise privacy concerns. Users may be uncomfortable with the idea of their data being used to make recommendations, leading to issues of trust and data privacy

- Users are exposed only to products similar to their past preferences. This limits exploration of new interests

- Recommendation systems primarily rely on historical interactions without considering broader contextual information, such as the user's current situation, intent, or external factors. This can lead to recommendations that are not relevant in specific contexts

- Personalized recommendation models can overfit to noisy data, leading to recommendations that are too specific to a user's past behavior and less robust to changes in preferences.

FUTURE SCOPE

Using Demographic details of a user
to improve the recommendations/rankings by
identifying similar users.

Increasing responsiveness through real-time user behavior and preferences
-> adaptive and dynamic recommendations.

Demographic information, such as age, gender, locality and income level, can be
used to create more personalized recommendations
-> Helps provide recommendations that are contextually relevant to a user's life
stage or situation.
-> Location-based demographic data can enable localized recommendations.

Empowering users to have more control over their recommendations, including
adjusting privacy settings and preference weights, could be a future trend in
recommendation systems.

Collaboration between AI algorithms and human curators or experts, leading
to more curated and contextually relevant content.

Flipkart GRID 5.0

Thank You