Food Recommendation System

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The Need for Food Recommendation Systems

Culinary Diversity

The increasing variety of food options can overwhelm consumers, making choice difficult.

Personalization Trend

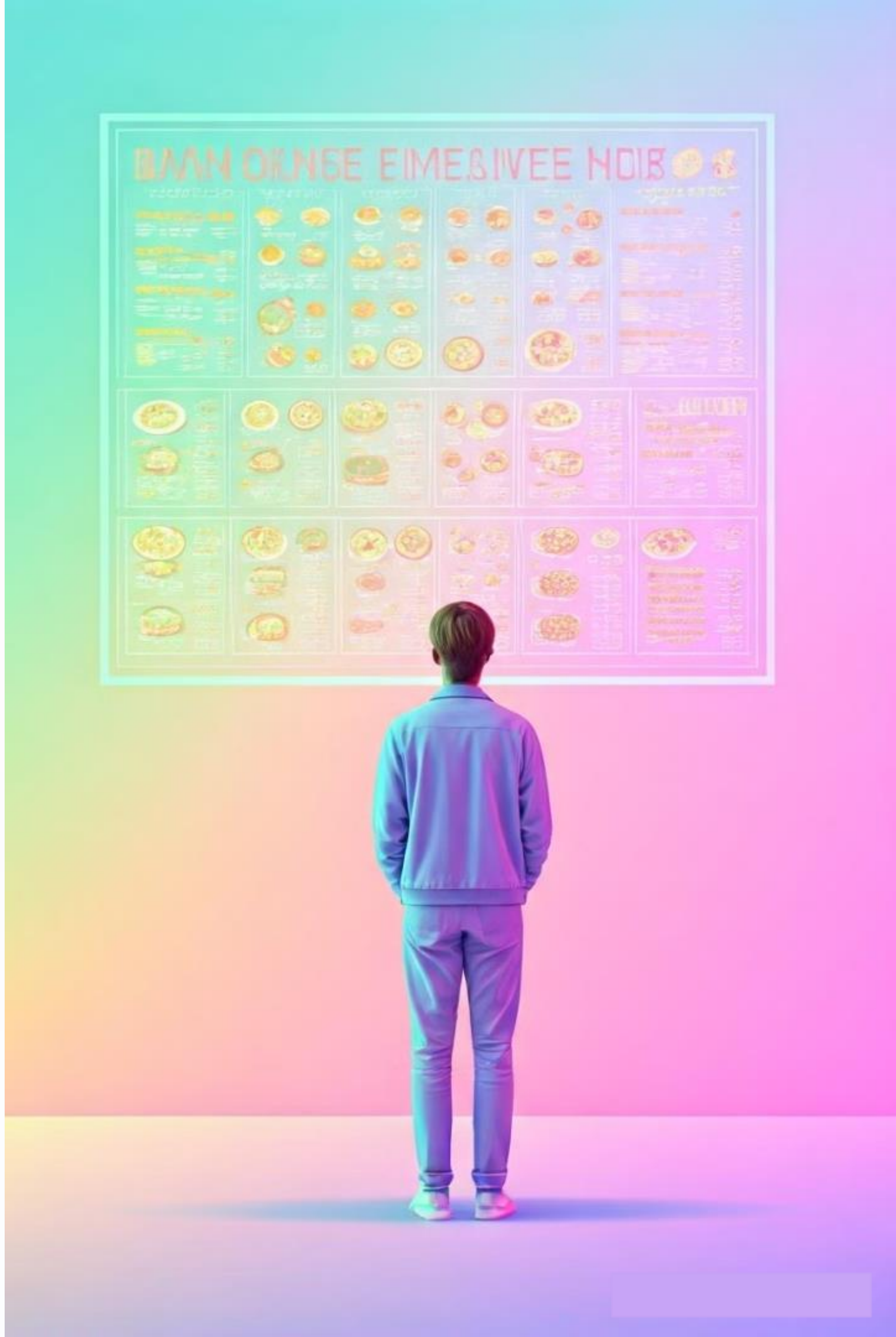
Growing interest in tailored food suggestions based on individual tastes and needs.

Information Overload

In the digital age, users face an abundance of options, necessitating simplified decision-making tools.

Enhanced User Experience Experience

Recommendation systems improve satisfaction by aligning suggestions with personal preferences.



Data Preprocessing: The Foundation

1. **Dataset Composition**

   Four key files: pp_recipes, pp_users, raw_interactions, and raw_recipes, containing comprehensive information on recipes, users, and interactions.

2. **Cleaning and Filtering**

   Removal of irrelevant columns and duplicates. Filtering of users with fewer than 10 interactions to ensure data quality.

3. **Data Transformation**

   Splitting of nutritional information, normalization of columns, and mapping of user and recipe IDs to continuous indices.

4. **Matrix Creation**

   Development of a sparse matrix to efficiently store user ratings and interactions.

Recommendation Techniques

New Users

- Nutrient-Based Recommendations using content based filtering

- Top-Rated Recipes leveraging collaborative filtering

Existing Users

- Personalized Nutrient-Based Recommendations

- Top-Rated Recipes

- Preference-Based Recommendations using collaborative filtering with K-Nearest Neighbors (KNN)

Core Algorithms: The Heart of the System

Content based Filtering (Cosine Similarity)

Measures similarity between items or user profiles by calculating the cosine of the angle between two vectors representing their features.

K-Nearest Neighbors (KNN)

Identifies nearest neighbors based on similarity metrics, ensuring recommendations are derived from similar users or items.

Collaborative Filtering

Utilizes user behavior and preferences to make recommendations, finding patterns in user-item interactions.

Recommendation Logic: Step-by-Step Process

1. ### ID Mapping

   Maps user and recipe IDs to continuous indices for efficient processing.

2. ### Approximate Nearest Neighbors

   Utilizes KNN to find similar users based on preferences and interactions.

3. ### Top-Rated Recommendations

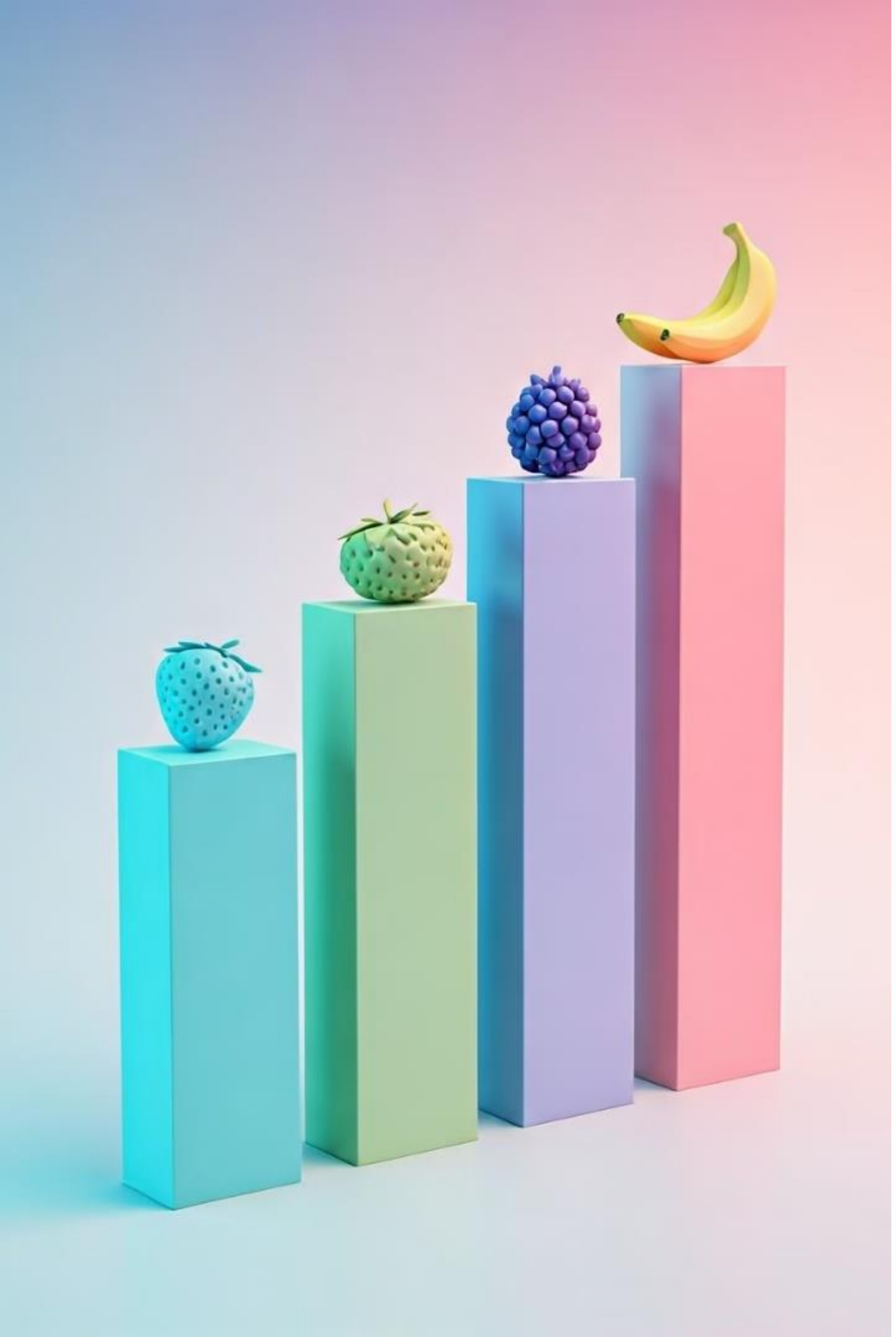
   Suggests highest-rated recipes using collaborative filtering techniques.

4. ### Nutrition-Based Recommendations

   Recommends recipes based on nutritional preferences and dietary goals.

5. ### Similarity-Based Recommendations

   Suggests recipes based on ratings from similar users identified through KNN.



Evaluation Metrics: Measuring Success

0.9119

MAE

Mean Absolute Error, measuring average magnitude of errors in predictions.

1.3932

RMSE

Root Mean Squared Error, emphasizing larger errors in the model.

0.9322

F1-Score

Harmonic mean of precision and recall, balancing both metrics.

4.37

Mean Rating

Average predicted rating, indicating overall positive recommendations.

Test: Outputs from the Model

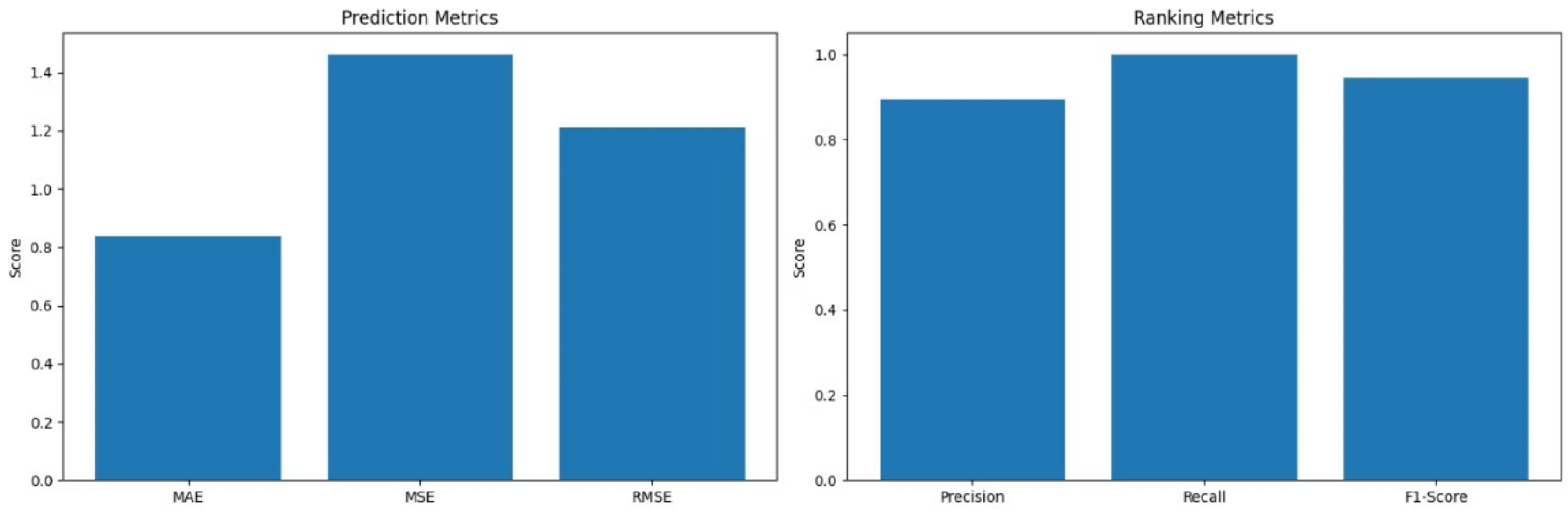
```
Recommendations based on nutritional preferences:
        recipe_id                     name  calories  total fat     sugar  \
455710     264904    easy caramel frosting  0.005281   0.001571  0.005795
80513         913  ritz mock apple pie iii  0.003735   0.002037  0.003374
194823      81289        chocolate lemonade  0.004060   0.001280  0.003937

          sodium   protein  saturated fat  average_rating
455710  0.000750  0.001526       0.005195        4.666667
80513   0.001091  0.001832       0.003271        5.000000
194823  0.000784  0.002747       0.002982        4.000000
```

```
Recommendations based on top-rated recipes:
    recipe_id                          name  calories  total fat  \
17      17387              pizza breadsticks  0.000969   0.000873
6       52077  spicy banana fritters  zitumbuwa  0.000275   0.000349
16      68986                  apricot mousse  0.000544   0.000233
14      14807         californian apple crunch  0.000664   0.001862
2       27789        ham and swiss in puff pastry  0.000516   0.001455

       sugar    sodium   protein  saturated fat  average_rating
17  0.000014  0.000920  0.003663       0.000770             5.0
6   0.000050  0.000136  0.000916       0.000289             5.0
16  0.000433  0.000375  0.003816       0.000673             5.0
14  0.000229  0.000170  0.000305       0.006349             5.0
2   0.000006  0.000136  0.004731       0.004233             4.0
```

Results: Insights and Performance



Conclusion and Future Directions

1 **Enhanced User Experience**

Improved UI and real-time updates

2 **Advanced Filtering**

More sophisticated content-based and collaborative filtering

3 **Data Integration**

Incorporating more diverse data sources

4 **Personalization**

Deeper understanding of individual preferences

5 **Current Success**

Effective personalized food recommendations

Our Food Recommendation System demonstrates the power of combining content-based and collaborative filtering techniques. As we look to the future, we aim to refine our algorithms, expand our data sources, and create an even more intuitive user experience.