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CAPSTONE PROJECT TITLE

Personalized Product Recommendation System Using K-nearest Neighbor Algorithm

ITA0612 - Machine Learning for Decision Making

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INTRODUCTION

- Online shopping platforms show many products, making it difficult for users to choose
- Personalized recommendation systems help users find products they like
- These systems analyze user behavior such as ratings and purchase history
- The K-Nearest Neighbor algorithm finds users with similar interests
- Products liked by similar users are recommended to the target user
- KNN works on the principle that users with similar behavior tend to like similar products.

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OBJECTIVE



- To design a personalized product recommendation system using the K-Nearest Neighbor algorithm.
- To analyze user behavior such as ratings, purchase history, and browsing data.
- To identify similar users or products based on similarity measures.
- To improve user experience by providing personalized suggestions.

Methodology Overview



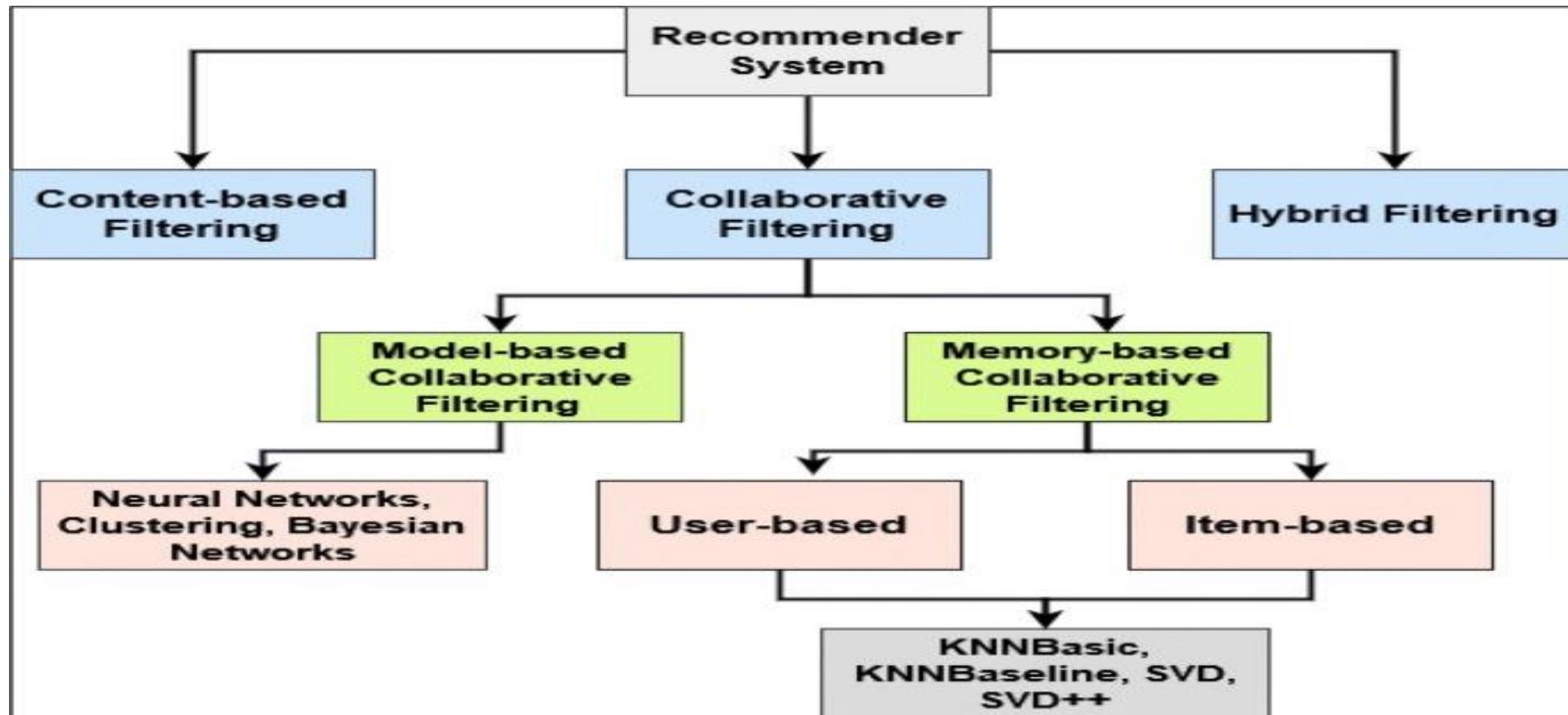
- Collect user interaction data such as ratings and purchase history
- Preprocess data by cleaning, normalizing, and forming a user–item matrix
- Represent users as feature vectors for similarity calculation
- Apply K-Nearest Neighbor algorithm using cosine similarity
- Generate personalized product recommendations based on similar users.

PROBLEM STATEMENT



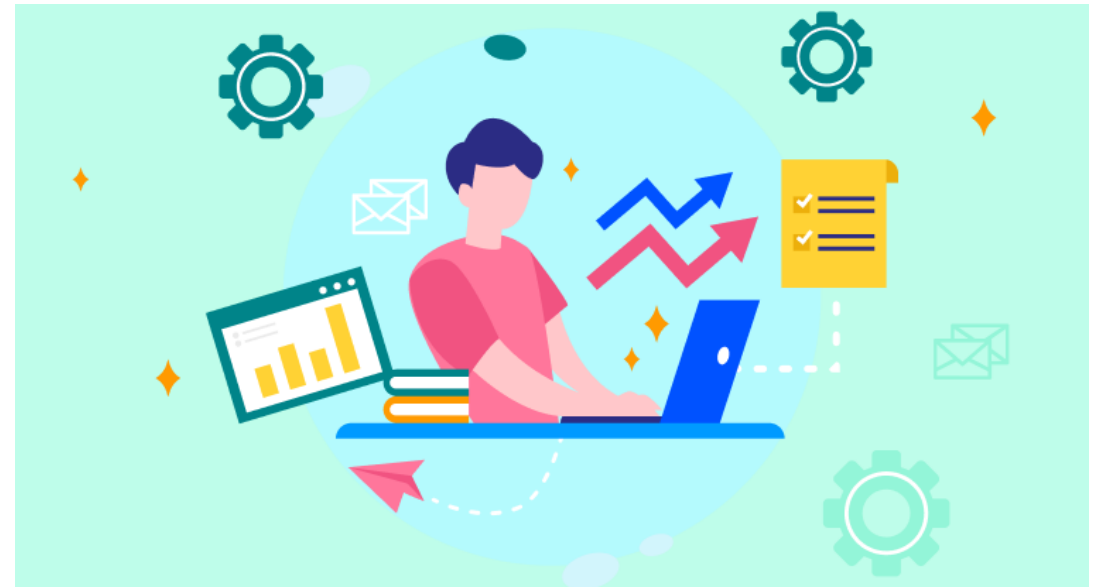
- Users face difficulty in choosing products from large catalogs
- Generic recommendations are not effective
- Need a system that provides **personalized** suggestions
- Existing systems lack accuracy for new preferences

ARCHITECTURE



SYSTEM OVERVIEW

- ❖ Data collection from users and products
- ❖ Feature engineering and preprocessing
- ❖ KNN-based recommendation model
- ❖ Evaluation and personalized output



MODULE 1: DATA PREPROCESSING FOR RECOMMENDATION SYSTEM

Module Description

This module is responsible for preparing raw user interaction data for recommendation processing. Data such as user IDs, product IDs, and ratings are collected and cleaned to ensure accuracy.

Key Processes

- Data collection from user interactions
- Removal of duplicates and missing values
- Rating normalization
- User–item matrix formation
- Feature vector generation

Outcome

A clean and structured dataset suitable for similarity computation and recommendation generation.



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MODULE 2: KNN RECOMMENDATION MODEL

Module Description

This module implements the core recommendation logic using the K-Nearest Neighbor (KNN) algorithm. Each user is represented as a feature vector derived from the user–item matrix. Cosine similarity is used to calculate the distance between users.

Key Algorithms Used

- K-Nearest Neighbor (KNN)
- Cosine similarity
- User-based collaborative filtering

Outcome

Personalized product recommendations generated based on user similarity.



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MODULE 3: MODEL EVALUATION AND METRICS

Module Description

This module evaluates the effectiveness of the recommendation system. These metrics help measure how accurately the system recommends relevant products. The final output is presented in a user-friendly format, showing recommended products.

Evaluation Metrics

- Precision
- Recall
- Similarity score
- Recommendation accuracy (optional)

Outcome

Validated and reliable recommendations with measurable performance indicators.



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CONCLUSION & FUTURE SCOPE

- Developed a personalized product recommendation system using KNN
- Successfully identified similar users based on behavior
- Generated relevant product recommendations
- Improved user experience and engagement
- Integrate hybrid recommendation techniques
- Apply deep learning models for better accuracy
- Support real-time recommendation updates

REFERENCES

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- S. B. Kotsiantis, “Collaborative Filtering and Recommendation Systems,” *International Journal of Computer Science and Applications*, 2010.
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<https://scikit-learn.org/stable/modules/neighbors.html>

Thank you

A top-down view of a wooden desk with various stationery items. In the center is a white rectangular card with the words "THANK YOU" printed in a large, black, serif font. Surrounding the card are several items: a blue pen, a silver pen, a white pen, a pair of silver tweezers, a blue ruler, a black pen, a blue stapler, and a silver stapler.

**THANK
YOU**