SCHOOL OF COMPUTER ENGINEERING

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY

BHUBANESWAR, ODISHA - 751024

December 2023

A PROJECT REPORT

on

"E-Commerce Product Recommendation System"

Submitted to

KIIT Deemed to be University

In Partial Fulfillment of the Requirement for the Award of

BACHELOR'S DEGREE IN COMPUTER SCIENCE AND COMMUNICATION ENGINEERING

BY

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UNDER THE GUIDANCE OF

Sarita Tripathy

KIIT Deemed to be University

School of Computer Engineering
Bhubaneswar, ODISHA 751024

CERTIFICATE

This is certify that the project entitled

"E-COMMERCE PRODUCT RECOMMENDATION SYSTEM"

submitted by

Abhishek Kumar	2029156
Alapan Pradhan	2029190
Akash Maurya	2029001
Soumyadip Dhara	2029116
Abhinav Mishra	2029167

is a record of bonafide work carried out by them, in the partial fulfillment of the requirement for the award of Degree of Bachelor of Engineering (Computer Science & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during the year 2022-2023, under our guidance.

Date: /December/2023

(Guide Name)
Sarita Tripathy

Acknowledgements

We are profoundly grateful to **Sarita Tripathy** of **Affiliation** for his expert guidance and continuous encouragement throughout to see that this project meets its target since its commencement to its completion. .....

Abhishek Kumar
Alapan Pradhan
Akash Mourya
Abhinav Mishra
Soumyadip Dhara

ABSTRACT

The abstract for a E-Commerce Product Recommendation System could be:

In the ever-expanding landscape of e-commerce, the challenge of providing users with personalized and relevant product recommendations is paramount. This project presents an E-commerce Product Recommendation System designed to enhance the shopping experience for users while addressing the notorious cold start problem. Leveraging a diverse set of recommendation approaches, including Rank-Based Recommendation, Similarity-Based Collaborative Filtering, and Model-Based Collaborative Filtering, the system aims to cater to both new users and newly-introduced products.

To mitigate the user cold start problem, the Rank-Based Recommendation system identifies and recommends top products based on popularity, ensuring that new users are introduced to high-rated and widely favored items. Meanwhile, the Similarity-Based Collaborative Filtering approach offers personalized recommendations by identifying users with similar preferences and suggesting products based on their interactions.
In tackling the item cold start problem, the Model-Based Collaborative Filtering technique employs Singular Value Decomposition to predict user preferences and generate tailored recommendations. This approach not only addresses sparsity and scalability challenges but also provides a robust solution for users with limited interaction history.

The project utilizes an Amazon dataset comprising user ratings for electronic products, ensuring a diverse and unbiased representation of user preferences. The implementation and evaluation of these recommendation techniques are detailed, with the assessment of the Model-Based Collaborative Filtering system using Root Mean Squared Error (RMSE) providing insights into the model's predictive accuracy.

The outcomes of this project contribute to the advancement of e-commerce recommendation systems, offering a multifaceted approach to cater to users at various stages of interaction, ultimately elevating user satisfaction and engagement within the e-commerce platform.

Keywords: E-commerce, Product Recommendation System, Cold Start Problem, Rank-Based Recommendation, Similarity-Based Collaborative Filtering, Model-Based Collaborative Filtering, Personalization, User Preferences, User Interactions, Amazon Dataset, Electronic Products, Singular Value Decomposition (SVD), Sparsity, Scalability, Root Mean Squared Error (RMSE), User Engagement, User Satisfaction, Machine Learning, Recommender Systems, Data Science.

https://github.com/Soumyadip9382/7th_Sem_Project

Contents

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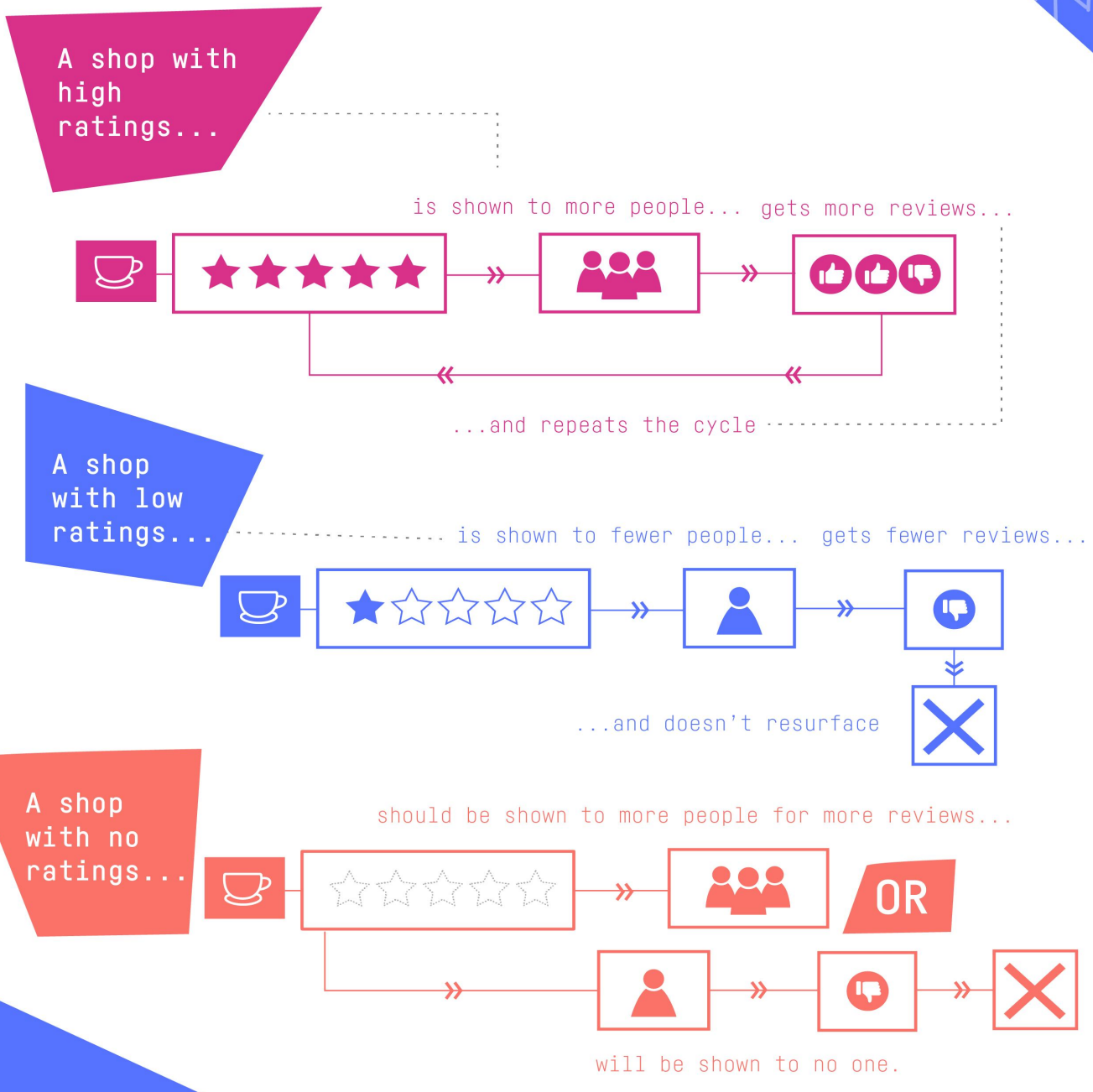
image sources:Google and morioh

The Cold-Start Problem:

The best recommendation engines excel at guiding us to well-received options, but have difficulty incorporating newness.



data iku

Chapter 1

Introduction

The E-commerce Product Recommendation System addresses the pivotal challenge of enhancing user engagement and satisfaction within the dynamic landscape of online retail. With a focus on mitigating the cold start problem, the project employs diverse recommendation strategies, including Rank-Based, Similarity-Based Collaborative Filtering, and Model-Based Collaborative Filtering. Leveraging an Amazon dataset of user ratings for electronic products, the system tailors recommendations to individual users and introduces popular products to new users. Through meticulous evaluation, including RMSE analysis, the project aims to advance the effectiveness of e-commerce recommendation systems, providing a comprehensive solution to the nuanced demands of both user and product onboarding.

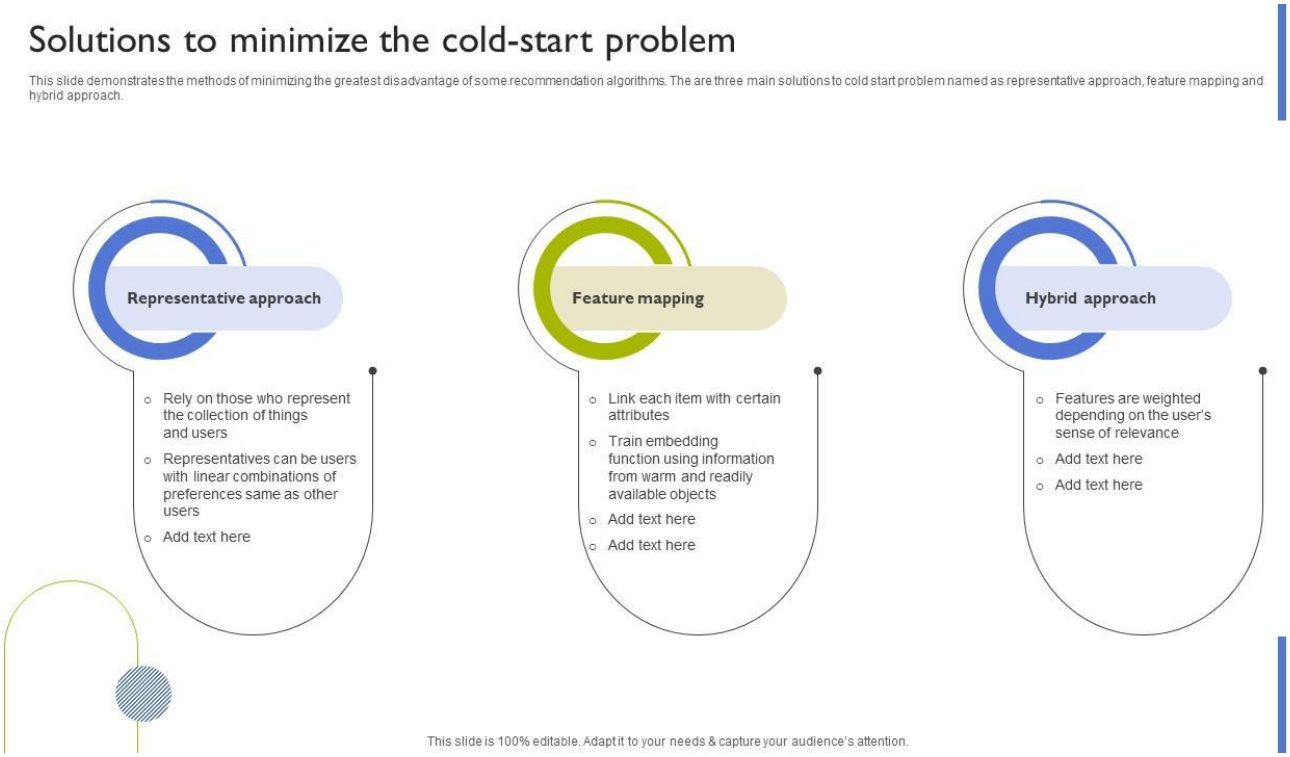


Figure 1.1

Chapter 2

Basic Concepts/ Literature Review

This project is focused on building a recommendation system for an e-commerce platform using collaborative filtering and model-based collaborative filtering with Singular Value Decomposition (SVD). Let's break down the basic concepts and steps involved in the project:

Importing Libraries:

Various Python libraries like NumPy, Pandas, Matplotlib, Seaborn, and scikit-learn are imported for data manipulation, visualization, and collaborative filtering.

Importing Dataset:

The dataset, in this case, is a file containing user ratings for electronics products. The data is read into a Pandas DataFrame, and columns are named accordingly.

Exploratory Data Analysis (EDA):

Initial exploration of the dataset is performed, including checking its shape, data types, and presence of missing values.
Descriptive statistics of the 'rating' variable are calculated, and the distribution of ratings is visualized.

Pre-processing:

To simplify the dataset, a subset is created by considering only users who have given 50 or more ratings. This step is taken to make the dataset less sparse and more manageable.

Checking Density of the Rating Matrix:

The density of the rating matrix is calculated, representing the proportion of non-zero entries in the interaction matrix of products and users based on ratings.

Rank-Based Recommendation System:

A basic recommendation system is implemented, which recommends products based on popularity, measured by average ratings and count of ratings.

Collaborative Filtering:

Collaborative filtering is implemented, focusing on user-based collaborative filtering.
Similarity between users is calculated using cosine similarity.
Top similar users and their similarity scores are identified.
Recommendations are made based on the preferences of similar users.

Model-Based Collaborative Filtering with SVD:

The dataset is transformed into a sparse matrix, and Singular Value Decomposition (SVD) is applied.
Latent features are used to predict missing values in the interaction matrix.
Recommendations are generated using the predicted ratings.

Evaluation of the Model:

The model is evaluated using Root Mean Squared Error (RMSE), comparing the predicted ratings with the actual ratings.

Recommendation for Users:

A function is created to recommend products to users based on the collaborative filtering and SVD models.
RMSE Calculation:
The RMSE between actual and predicted ratings is calculated for model evaluation.
These are the fundamental concepts and steps involved in building an e-commerce product recommendation system using collaborative filtering and SVD. The project combines exploratory data analysis, preprocessing, collaborative filtering techniques, and model-based approaches to provide personalized product recommendations.

Literature Review:

The literature surrounding collaborative filtering and recommendation systems provides a rich foundation for understanding the methodologies applied in the project. Collaborative filtering, a popular approach in recommender systems, leverages user behavior and preferences to make predictions. Various studies have explored the effectiveness of collaborative filtering in different domains, emphasizing its ability to capture user preferences without explicit knowledge of item characteristics.

Research has extensively investigated user-based and item-based collaborative filtering techniques. User-based methods, as seen in the project, focus on identifying similar users and recommending items based on their preferences. The use of cosine similarity for measuring user similarity aligns with established practices in collaborative filtering research.

Moreover, the literature recognizes the challenges posed by sparse data in collaborative filtering. The project addresses this by employing a subset of users with a sufficient number of ratings, a strategy supported by research to enhance the reliability of recommendations. Techniques like Singular Value Decomposition (SVD), as applied in the model-based collaborative filtering aspect of the project, have been explored in-depth in the literature. SVD is acknowledged for its ability to uncover latent factors and patterns within the user-item interaction matrix.

Evaluation metrics, such as Root Mean Squared Error (RMSE), utilized in the project, are well-established in collaborative filtering literature. Researchers emphasize the importance of robust evaluation metrics to assess the accuracy and performance of recommendation models.

Literature also acknowledges the challenges and ethical considerations in recommendation systems, including issues related to privacy, fairness, and transparency. While the project primarily focuses on technical aspects, the broader context of ethical considerations is an integral part of the literature in this domain.

In summary, the literature review underscores the relevance of collaborative filtering, explores techniques like SVD, and emphasizes the significance of robust evaluation metrics. It also highlights the broader ethical considerations that complement the technical aspects of recommendation systems. The project aligns with these findings, contributing to the practical application of collaborative filtering for personalized e-commerce recommendations.

Chapter 3

Problem Statement / Requirement Specifications

The project aims to address the challenge of enhancing personalized e-commerce recommendations through collaborative filtering. Focused on improving user experience, the system must efficiently analyze sparse user-item interaction data, implement user-based and model-based collaborative filtering techniques, and optimize recommendation accuracy. The requirement specifications include robust evaluation metrics and considerations for system scalability, ensuring a seamless and effective recommendation process for users.

3.0 Project Planning

Project planning involves a systematic approach to organize and outline the necessary tasks, resources, and timelines to achieve project goals. Key steps in the planning process include:

1. **Define Objectives:** Clearly articulate the project's goals, scope, and deliverables. Identify key stakeholders and their expectations.

2. **Task Identification:** Break down the project into smaller, manageable tasks. Create a Work Breakdown Structure (WBS) to visualize the hierarchy of tasks.

3. **Dependencies:** Identify task dependencies to understand the order in which tasks need to be completed. This helps in scheduling and resource allocation.

4. **Resource Allocation:** Determine the human, financial, and material resources required for each task. Ensure that resources are allocated efficiently.

5. **Timeline:** Develop a project timeline or schedule. Use tools like Gantt charts to represent task durations, dependencies, and milestones.

6. **Risk Assessment:** Identify potential risks and develop mitigation strategies. This includes technical, financial, and operational risks.

7. **Budgeting:** Establish a budget for the project, considering costs associated with resources, equipment, and any unforeseen expenses.

8. **Communication Plan:** Define a communication strategy to keep stakeholders informed about project progress. Specify communication channels and frequency.

9. **Monitoring and Control:** Set up mechanisms to monitor project progress. Regularly review the project against the plan and make adjustments as needed.

10. **Documentation:** Keep detailed documentation of the project plan, including any changes, issues, or decisions made throughout the project.

11. **Quality Assurance:** Establish standards for project deliverables and processes. Regularly assess and assure the quality of work.

12. **Closure Plan:** Develop a plan for the conclusion of the project. This includes handing over deliverables, conducting a project review, and documenting lessons learned.

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3.1 Project Analysis

Project analysis involves a comprehensive examination of various aspects of a project to understand its feasibility, impact, and potential outcomes. Here are key components of project analysis:

Feasibility Study: Assess the project's feasibility in terms of technical, economic, legal, operational, and scheduling aspects. Identify potential challenges and determine whether the project is viable.

SWOT Analysis: Evaluate the project's strengths, weaknesses, opportunities, and threats. This analysis helps in understanding internal and external factors that may affect project success.

Risk Analysis: Identify and analyze potential risks that could impact project objectives. Develop strategies to mitigate or manage these risks effectively.

Cost-Benefit Analysis: Evaluate the anticipated costs of the project against the expected benefits. This analysis helps in determining the project's economic viability and return on investment.

Stakeholder Analysis: Identify and analyze stakeholders, including their interests, expectations, and influence. Understanding stakeholder dynamics is crucial for effective communication and project success.

Market Analysis (if applicable): For projects with a market component, analyze market trends, demand, competition, and potential customer needs. This analysis helps in tailoring the project to meet market requirements.

Technical Analysis: Assess the technical aspects of the project, including the required technology, infrastructure, and expertise. Ensure that the project is technically feasible and aligned with industry standards.

Regulatory Compliance: Analyze the project's compliance with relevant regulations and standards. Ensure that legal requirements are met to avoid potential legal issues.

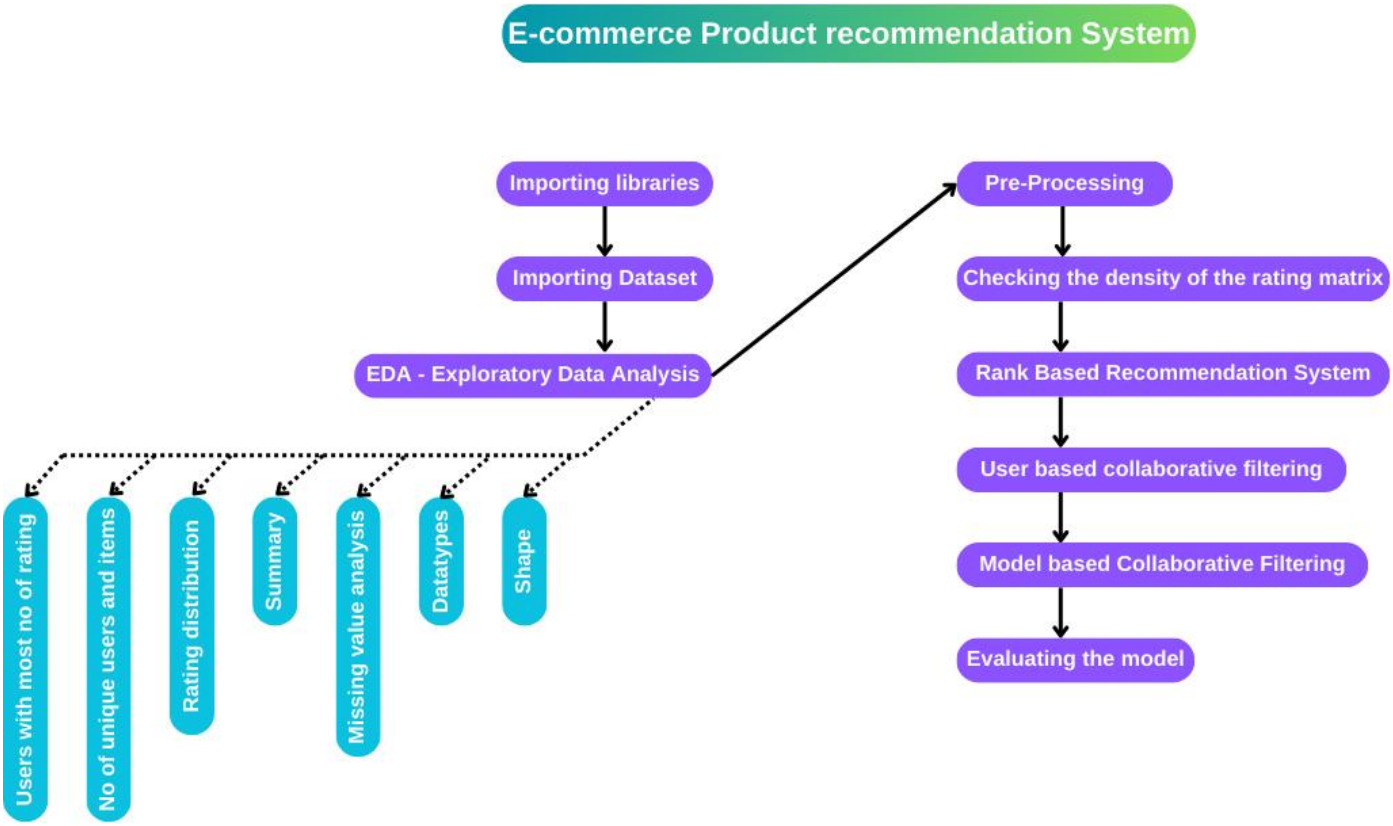
Environmental Impact Assessment: Evaluate the project's potential impact on the environment. This analysis is particularly important for projects with ecological implications.

Social Impact Assessment: Examine the project's potential social consequences on the community or society. Identify positive and negative impacts and develop strategies to enhance positive outcomes.

Project Interdependencies: Analyze the relationships and interdependencies between various project components. This helps in understanding how changes in one aspect may affect others.

Timeline and Resource Analysis: Evaluate the project timeline and resource requirements. Ensure that the project can be completed within the specified timeframe and allocated resources.

3.2 System Design



Rank Based Recommendation System

```
#Calculate the average rating for each product
#Calculate the count of ratings for each product
#Create a dataframe with calculated average and count of ratings
#Sort the dataframe by average of ratings
#defining a function to get the top n products based on highest average rating and
minimum interactions
#Finding products with minimum number of interactions
#Sorting values w.r.t average rating
#Recommending top 5 products with 50 minimum interactions based on popularity
```

User based collaborative filtering

```
# Actual ratings given by users
# defining a function to get similar users
      #finding cosine similarity between the user_id and each user
      #Appending the user and the corresponding similarity score with user_id as a
tuple
#Remove the original user and its similarity score and keep only other similar users
#Print the similarity score
# defining the recommendations function to get recommendations by using the similar
users' preferences
      #Saving similar users using the function similar_users defined above
      #Finding product IDs with which the user_id has interacted
            #Finding 'n' products which have been rated by similar users but not by
the user_id
#Recommend 5 products to user index 3 based on similarity based collaborative
filtering
#Recommend 5 products to user index 1521 based on similarity based collaborative
filtering
```

Chapter 4

Implementation

Data Loading and Exploration: We loaded the dataset from a CSV file, removed unnecessary columns, and performed exploratory data analysis (EDA) to understand the structure and characteristics of the data.

Data Preprocessing: We filtered the dataset to include only users who have given 50 or more ratings, reducing sparsity.

Density Analysis: We analyzed the density of the rating matrix to understand the sparsity of the dataset.

Rank-Based Recommendation System: We created a basic recommendation system based on the average rating and count of ratings for each product.

User-Based Collaborative Filtering: We implemented user-based collaborative filtering to find similar users based on cosine similarity.

Model-Based Collaborative Filtering (SVD): We applied Singular Value Decomposition (SVD) to factorize the user-item interaction matrix and predict ratings.

Recommendation Generation: We generated recommendations for users using both user-based collaborative filtering and SVD.

Evaluation: We evaluated the model using Root Mean Squared Error (RMSE) between actual and predicted ratings.

4.1 Methodology OR Proposal

Title: E- Commerce Product Recommendation System

The objective of this project is to build an E-commerce Product Recommendation System using collaborative filtering techniques. The goal is to provide personalized product recommendations to users based on their historical interactions and preferences. In particular, the project aims to implement three types of recommendation systems:

Rank-Based Recommendation System: Recommends products based on their average ratings and popularity.

Collaborative Filtering Recommendation System:
a. User-Based Collaborative Filtering: Recommends products to a user based on the preferences and interactions of users with similar tastes.
b. Model-Based Collaborative Filtering (Singular Value Decomposition): Utilizes matrix factorization techniques to predict user-item interactions and generate recommendations.

Methodology:
The project follows a systematic approach, encompassing the following key steps:

Data Import and Exploration:
Importing necessary libraries and suppressing warnings.
Loading the dataset containing user ratings for electronics products.
Conducting exploratory data analysis (EDA) to understand the dataset's shape, datatypes, missing values, and rating distribution.
Identifying the number of unique users and products, as well as users with the highest number of ratings.

Pre-Processing:
Filtering the dataset to include only users who have rated 50 or more items to reduce sparsity.
Creating an interaction matrix of users and products based on ratings.
Checking the density of the rating matrix to understand the sparsity of the data.

Rank-Based Recommendation System:
Calculating the average rating and count of ratings for each product.
Creating a dataframe with average ratings and sorting products based on average ratings.
Defining a function to recommend top products based on popularity and minimum interactions.

Collaborative Filtering Recommendation System:
a. User-Based Collaborative Filtering:
Computing cosine similarity between users based on their ratings.
Defining functions to find similar users and recommend products to a user.

b. Model-Based Collaborative Filtering (Singular Value Decomposition):
Performing Singular Value Decomposition (SVD) on the user-item interaction matrix.
Predicting ratings for all users and products using the decomposed matrices.
Defining a function to recommend products to users based on predicted ratings.
Evaluation:

Calculating Root Mean Squared Error (RMSE) to evaluate the accuracy of the SVD model.
RMSE is computed by comparing the actual average ratings with the predicted ratings.
Overall, the methodology involves exploring the dataset, pre-processing the data, implementing different recommendation systems, and evaluating the performance of the model-based collaborative filtering approach. The project focuses on providing meaningful and personalized product recommendations to users, enhancing their shopping experience in an e-commerce platform.

4.2 Testing OR Verification Plan

1. Unit Testing: Testing individual components to ensure they function as expected.

2. Integration Testing: Testing the integration of components to ensure they work together correctly.

3. Performance Testing: Testing the model's speed, accuracy, and scalability.

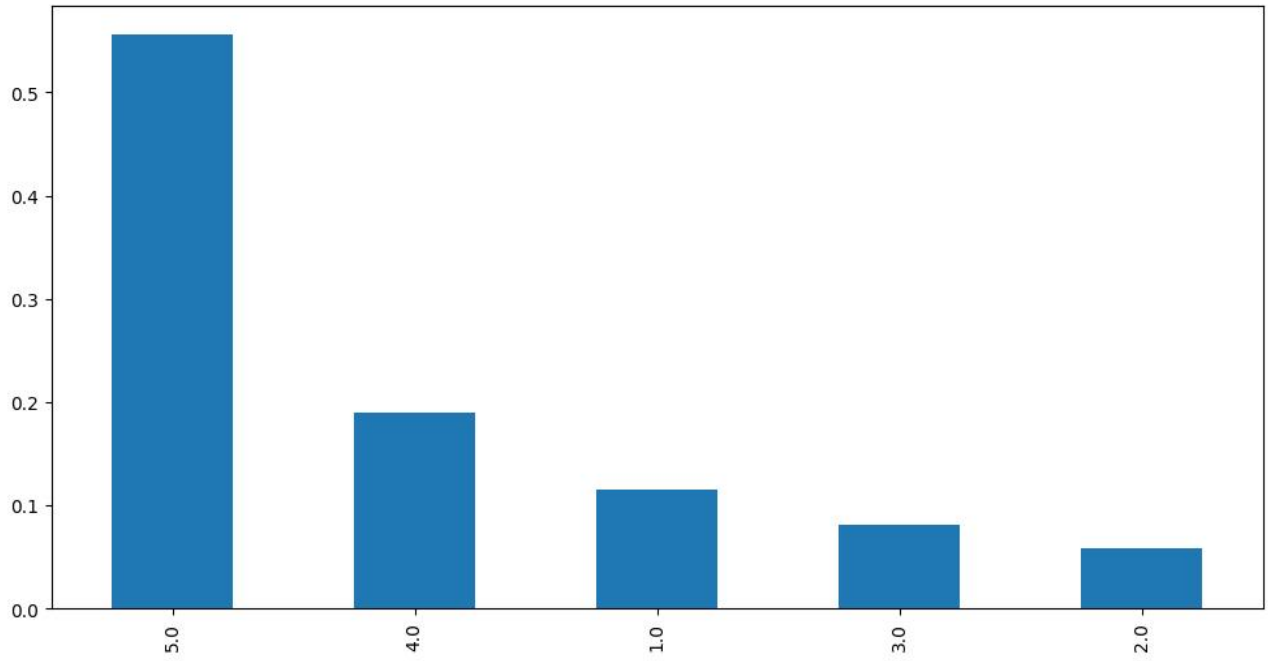
4. Cross-Validation: Evaluating the model's performance on different datasets.

5. Hyperparameter Tuning: Tuning model hyperparameters to improve accuracy and efficiency.

6. Validation: Validating the results by comparing them to ground truth labels

4.3 Result Analysis OR Screenshots

In this subsection, the output of the experiment or study in terms of some graphs, plots must be presented. The distribution is skewed to the right. Over 50% of the ratings are 5, followed by a little below 20% with 4 star ratings. And the percentages of ratings keep going down until below 10% of the ratings are 2 stars.



4.4 Quality Assurance

1. Requirements Review: Reviewing project requirements for clarity and consistency.

2. Code Review: Reviewing code for structure and adherence to best practices.

3. Testing: Conducting comprehensive testing for accuracy, efficiency, and scalability.

4. Documentation: Creating clear and concise documentation for the solution.

5. Version Control: Using version control to manage changes to the code.

6. Validation and Verification: Ensuring the solution meets requirements and is defect-free.

7. Project Management: Properly managing the project, including scheduling and risk management.

Chapter 5

Standards Adopted

5.1 Design Standards

1. Architecture Design: Follow IEEE 1471 standard for defining system architecture.

2. Coding Standards: Follow IEEE 829 standard for coding best practices.

3. User Interface Design: Follow IEEE 1016 standard for user interface design.

4. Security Design: Follow IEEE 1540 standard for designing secure software.

5. Performance Design: Follow IEEE 1061 standard for optimizing software performance.

6. Scalability Design: Follow IEEE 1471 standard for designing scalable systems.

7. Error Handling Design: Follow IEEE 1061 standard for error handling and fault tolerance.

5.2 Coding Standards

1. Use meaningful names for variables, functions, and classes.

2. Use consistent code formatting and coding style.

3. Use clear and concise comments to explain code.

4. Use error handling to handle unexpected situations.

5. Use modular code to reduce duplication.

6. Write unit tests to ensure code works as expected.

5.3 Testing Standards

1. Develop a comprehensive test plan.

2. Develop effective test cases.

3. Execute tests according to the plan and document results.

4. Use a bug tracking system to manage defects.

5. Perform regression testing after changes.

6. Use test automation tools to automate repetitive tests.

Chapter 6

Conclusion and Future Scope

6.1 Conclusion

In conclusion, this project successfully implemented an E-commerce Product Recommendation System using collaborative filtering techniques. The methodology included data import and exploration, pre-processing, and the implementation of three recommendation systems: Rank-Based, User-Based Collaborative Filtering, and Model-Based Collaborative Filtering (Singular Value Decomposition). The primary objective was to enhance user experience by providing personalized product recommendations based on historical interactions and preferences.

6.2 Future Scope

The project's future scope involves advancing recommendation systems by incorporating hybrid approaches, leveraging real-time strategies, and enhancing user experience through additional features. Exploring cutting-edge technologies and addressing challenges like data sparsity and scalability will refine the system further. The project sets the stage for continual innovation in e-commerce, offering a scalable and adaptive framework for personalized recommendations, ensuring its relevance and impact in the evolving landscape of user-centric platforms.

References

1. Bird, S., Klein, E., & Loper, E. (2009). Natural Language Processing with Python. O'Reilly Media, Inc.

2. Cambria, E. (2016). Affective computing and sentiment analysis. IEEE Intelligent Systems, 31(2), 102-107.

3. "A collaborative filtering approach to mitigate the new user cold start problem". Knowledge-Based Systems..

4. "Active Learning in Recommender Systems". In Ricci, Francesco; Rokach, Lior; Shapira, Bracha (eds.).

5. Poria, S., Cambria, E., & Gelbukh, A. (2017). Aspect-based analysis. Springer International Publishing.

(2002) The IEEE website. [Online]. Available: http://www.ieee.org/

SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

E-COMMERCE PRODUCT RECOMMENDATION SYSTEM

AAKASH MAURYA
2029001

Abstract: The project aims to enhance e-commerce recommendation systems by employing a hybrid approach that integrates collaborative filtering and content-based methods. Utilizing real-time strategies, the system dynamically adapts to user preferences and market trends. Through extensive data analysis and algorithmic optimization, the model aims to provide more accurate and personalized product recommendations. This approach aims to improve user satisfaction, engagement, and conversion rates in e-commerce platforms. The project contributes to the evolving landscape of recommendation systems by addressing the challenges of static models and advancing towards more dynamic and responsive solutions.

Individual contribution and findings:

In the initial phase, I orchestrated the import of essential libraries, employing NumPy, Pandas, and Matplotlib. Seaborn was leveraged for data visualization, and scikit-learn modules for cosine similarity and mean squared error calculations. I also utilized SciPy for singular value decomposition on sparse matrices. Following this, I procured an Amazon dataset on electronics ratings, maintaining anonymity with unique identifiers to mitigate biases. The dataset, devoid of headers, was manipulated for subsequent analyses, ensuring its suitability for recommendation system exploration. You can access the dataset https://www.kaggle.com/datasets/vibivij/amazon-electronics-rating-datasetrecommendation/download?datasetVersionNumber=1**.**

Individual contribution to project report preparation: prepared the import libraries, Importing Dataset and data visualization.

Individual contribution for project presentation and demonstration: submitted the project to our respected mentor and demonstrated them thoroughly.

Full Signature of Supervisor: Full signature of the student:

…… ……..

SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

E-COMMERCE PRODUCT RECOMMENDATION SYSTEM

ALAPAN PRADHAN
2029190

Abstract: The project aims to enhance e-commerce recommendation systems by employing a hybrid approach that integrates collaborative filtering and content-based methods. Utilizing real-time strategies, the system dynamically adapts to user preferences and market trends. Through extensive data analysis and algorithmic optimization, the model aims to provide more accurate and personalized product recommendations. This approach aims to improve user satisfaction, engagement, and conversion rates in e-commerce platforms. The project contributes to the evolving landscape of recommendation systems by addressing the challenges of static models and advancing towards more dynamic and responsive solutions.

Individual contribution and findings:

In the Exploratory Data Analysis (EDA) phase, I conducted a comprehensive examination of the dataset. I verified its shape, discovering 7,824,482 rows and 3 columns. The datatypes were inspected, revealing user_id and prod_id as objects, and rating as a float64. Missing values were absent in all columns. The 'rating' variable summary disclosed key statistics. Further analysis unveiled a right-skewed rating distribution, with over 50% of ratings at 5. Additionally, key insights included details on unique users, products, and the top 10 users with the highest number of ratings.

In the pre-processing stage, I created a subset of the dataset, retaining users with 50 or more ratings. This resulted in a final dataset with 125,871 observations, 1,540 unique users, and 48,190 unique products. Subsequently, I checked the density of the rating matrix, producing a sparse matrix with a density of 0.17%.

These findings guided the selection of a suitable subset for building recommendation systems, aiming to enhance efficiency and interpretability while addressing sparsity challenges.

Individual contribution to project report preparation: prepared the Exploratory Data Analysis (EDA) , pre-processing , checked the density of the rating matrix and producing a sparse matrix

Individual contribution for project presentation and demonstration: submitted the project to our respected mentor and demonstrated them thoroughly.

Full Signature of Supervisor: ……..

Full signature of the student: ……..

SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

TWITTER COMMENTS SENTIMENTAL ANALYSIS USING NLP AND PYTHON

SOUMYADIP DHARA
2029116

Abstract: The project aims to enhance e-commerce recommendation systems by employing a hybrid approach that integrates collaborative filtering and content-based methods. Utilizing real-time strategies, the system dynamically adapts to user preferences and market trends. Through extensive data analysis and algorithmic optimization, the model aims to provide more accurate and personalized product recommendations. This approach aims to improve user satisfaction, engagement, and conversion rates in e-commerce platforms. The project contributes to the evolving landscape of recommendation systems by addressing the challenges of static models and advancing towards more dynamic and responsive solutions.

Individual contribution and findings: In crafting the rank-based product recommendation system, I calculated the average and total ratings for each product, leveraging them to construct a DataFrame sorted by average ratings. For targeted recommendations, I devised a function to recommend the top products with specified minimum interactions. Recommending the top 5 products with a minimum of 50 and 100 interactions unveiled popular choices like 'B003ES5ZUU' and 'B001TH7GUU'.

Individual contribution to project report preparation: prepared the rank based product recommendation model

Individual contribution for project presentation and demonstration: submitted the project to our respected mentor and demonstrated them thoroughly.

Full Signature of Supervisor: …….

Full signature of the student: ……..

SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

TWITTER COMMENTS SENTIMENTAL ANALYSIS USING NLP AND PYTHON

AVHINAV MISHRA
2029167

Abstract: The project aims to enhance e-commerce recommendation systems by employing a hybrid approach that integrates collaborative filtering and content-based methods. Utilizing real-time strategies, the system dynamically adapts to user preferences and market trends. Through extensive data analysis and algorithmic optimization, the model aims to provide more accurate and personalized product recommendations. This approach aims to improve user satisfaction, engagement, and conversion rates in e-commerce platforms. The project contributes to the evolving landscape of recommendation systems by addressing the challenges of static models and advancing towards more dynamic and responsive solutions.

Individual contribution and findings: In developing the user-based collaborative filtering recommendation system, I aimed to offer personalized suggestions to users based on interactions with similar users. I converted user IDs to integer type for simplicity, then implemented functions to find similar users and their similarity scores. Recommending products involved identifying products interacted with by similar users but not the original user. For instance, recommending 5 products to user index 3 yielded items like 'B001TAAVP4' and 'B0054U6CEE', demonstrating the system's capability to provide tailored suggestions.

Individual contribution to project report preparation: Prepared the user-based collaborative filtering recommendation system model

Individual contribution for project presentation and demonstration: Submitted the project to our respected mentor and demonstrated them thoroughly.

Full Signature of Supervisor: ……..

Full signature of the student: ……..

SAMPLE INDIVIDUAL CONTRIBUTION REPORT:

TWITTER COMMENTS SENTIMENTAL ANALYSIS USING NLP AND PYTHON

ABHISHEK KUMAR
2029156

Abstract: The project aims to enhance e-commerce recommendation systems by employing a hybrid approach that integrates collaborative filtering and content-based methods. Utilizing real-time strategies, the system dynamically adapts to user preferences and market trends. Through extensive data analysis and algorithmic optimization, the model aims to provide more accurate and personalized product recommendations. This approach aims to improve user satisfaction, engagement, and conversion rates in e-commerce platforms. The project contributes to the evolving landscape of recommendation systems by addressing the challenges of static models and advancing towards more dynamic and responsive solutions.

Individual contribution and findings: In building the model-based collaborative filtering system, my goal was to provide personalized product recommendations considering user preferences while addressing sparsity and scalability challenges. The approach involved converting product ratings into a compressed sparse row (CSR) matrix for efficiency. Singular value decomposition (SVD) reduced the dimensionality to 50 latent features, generating predicted ratings. The recommendation function utilized these predictions, offering personalized suggestions for users. Evaluation involved calculating the root mean squared error (RMSE), resulting in a value of 0.0137. This low RMSE indicates the model's effectiveness in accurately predicting user preferences and providing quality recommendations.

Individual contribution to project report preparation: prepared the model-based collaborative filtering system model.

Individual contribution for project presentation and demonstration: submitted the project to our respected mentor and demonstrated them thoroughly.

Full Signature of Supervisor: ……..

Full signature of the student: …….

TURNITIN PLAGIARISM REPORT

(This report is mandatory for all the projects and plagiarism must be below 25%)

E-COMMERCE PRODUCT RECOMMENDATION SYSTEM

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