K.RAMAKRISHNAN
COLLEGE OF ENGINEERING
An Autonomous Institution
Permanently Affiliated to Anna University Chennai, Approved by AICTE New Delhi,
ISO 9001:2015, 14001:2015 certified institution, Accredited by NBA and with A grade by NAAC
Samayapuram, Tiruchirappalli – 621 112, Tamilnadu, India.

A Project Report On

PERSONALIZED COURSE RECOMMENDATION SYSTEM

Submitted in partial fulfillment of requirements for the award of the course of

MGB1201 – PYTHON PROGRAMMING

Under the guidance of

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Assistant Professor / CSE

Submitted By
V.SAMIDURAI (8115U23ME037)
in
DEPARTMENT OF MECHANICAL ENGINEERING

K.RAMAKRISHNAN COLLEGE OF ENGINEERING
(Autonomous)

TRICHY-621 112

DECEMBER

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(Autonomous Institution affiliated to Anna University, Chennai)

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BONAFIDE CERTIFICATE

Certified that thisproject report on **" PERSONALIZED COURSE RECOMMENDATION SYSTEM"** is the bonafide work of **V.SAMIDURAI(8115U23ME037)**who carried out the project work during the academic year 2024 - 2025 under my supervision.

Signature

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SubmittedfortheEnd Semester Examinationheldon… … … … … .

INTERNALEXAMINER **EXTERNALEXAMINER**

DECLARATION

I declare that the project report on **" PERSONALIZED COURSE RECOMMENDATION SYSTEM"** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **" ANNA UNIVERSITY CHENNAI"** for the requirement of Degree of **BACHELOR OF ENGINEERING**. This project report is submitted on the partial fulfilment of the requirement of the completion of the course **MGB1201 - PYTHON PROGRAMMING.**

signature

SAMIDURAI V

Place: Samayapuram

Date:

ACKNOWLEDGEMENT

It is with great pride that I express our gratitude and in-debt to our institution " **K.Ramakrishnan College of Engineering (Autonomous)**" , for providing us with the opportunity to do this project.

I glad to credit honourable chairman **Dr. K. RAMAKRISHNAN**, **B.E.,** for having provided for the facilities during the course of our study in college.

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I whole heartily thanks to **Dr. T. M. NITHYA, M.E.,Ph.D.,** Head of the department, **COMPUTER SCIENCE AND ENGINEERING** for providing her encourage pursuing this project.

I express our deep expression and sincere gratitude to our project supervisor **Mrs.S.RAJESWARI M.E.,** Department of **COMPUTER SCIENCE AND ENGINEERING,** for his incalculable suggestions, creativity, assistance and patience which motivated us to carry out this project.

I render our sincere thanks to Course Coordinator and other staff members for providing valuable information during the course.

I wish to express our special thanks to the officials and Lab Technicians of our departments who rendered their help during the period of the work progress.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE INSTITUTION

To achieve a prominent position among the top technical institutions

MISSION OF THE INSTITUTION

M1: To bestow standard technical education par excellence through state of the art infrastructure, competent faculty and high ethical standards.

M2: To nurture research and entrepreneurial skills among students in cutting edge technologies.

M3: To provide education for developing high-quality professionals to transform the society.

VISION OF THE DEPARTMENT

To create eminent professionals of Computer Science and Engineering by imparting quality education.

MISSION OF THE DEPARTMENT

M1: To provide technical exposure in the field of Computer Science and Engineering through state of the art infrastructure and ethical standards.

M2: To engage the students in research and development activities in the field of Computer Science and Engineering.

M3: To empower the learners to involve in industrial and multi-disciplinary projects for addressing the societal needs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

Our graduates shall

PEO1: Analyse, design and create innovative products for addressing social needs.

PEO2: Equip themselves for employability, higher studies and research.

PEO3: Nurture the leadership qualities and entrepreneurial skills for their successfulcareer.

PROGRAM OUTCOMES

Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments,analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one' s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Apply the basic and advanced knowledge in developing software, hardware and firmware solutions addressing real life problems.

PSO2: Design, develop, test and implement product-based solutions for their career enhancement.

ABSTRACT

The Personalized Course Recommendation System leverages advanced machine learning techniques to deliver tailored course suggestions to learners based on their unique preferences, skills, and goals. By integrating user profiling, recommendation algorithms, and diverse data sources, the system identifies courses that align with users' learning needs and career aspirations. Using methods like collaborative filtering, content-based filtering, and hybrid models, the system ensures accurate and relevant recommendations. Evaluation metrics such as precision, recall, and user satisfaction scores validate the system's performance, fostering a more engaging and efficient learning experience. This innovative solution bridges the gap between learners and the vast array of educational content, empowering them to achieve their objectives effectively.

The Personalized Course Recommendation System is an intelligent system designed to provide students with tailored course recommendations based on their individual learning needs, preferences, and goals. This system utilizes machine learning algorithms and data mining techniques to analyze student data, such as academic history, learning style, and career aspirations. By leveraging this data, the system generates personalized course recommendations that cater to each student's unique requirements, enhancing their learning experience and academic success. The system aims to improve student engagement, retention, and overall satisfaction with their academic programs.

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ABSTRACT WITH POs AND PSOs MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
The Personalized Course Recommendation System leverages advanced machine learning techniques to deliver tailored course suggestions to learners based on their unique preferences, skills, and goals. By integrating user profiling, recommendation algorithms, and diverse data sources, the system identifies courses that align with users' learning needs and career aspirations. Using methods like collaborative filtering, content-based filtering, and hybrid models, the system ensures accurate and relevant recommendations. Evaluation metrics such as precision, recall, and user satisfaction scores validate the system's performance, fostering a more engaging and efficient learning experience	**PO1,PO2, PO3,PO12**	**POS1**

Note: 1- Low, 2-Medium, 3- High

SUPERVISORHEAD OF THE DEPARTMENT

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTI

ON

1.1 Objective

The objective of a Personalized Course Recommendation System is to leverage machine learning and recommendation algorithms to suggest courses tailored to individual users' interests, skill levels, and learning goals. This system is particularly useful for
e-learning platforms, enabling users to discover relevant learning materials and improve engagement. Develop a personalized course recommendation system that suggests relevant courses to students based on their individual needs and preferences. Improve student engagement and academic success by providing tailored course recommendations. Enhance the overall learning experience by leveraging machine learning and data mining technique

1.2 Overview

The Personalized Course Recommendation System is a web-based application that utilizes machine learning algorithms to analyze student data and provide personalized course recommendations. The system consists of the following components:

1. **Data Collection:** Student data, including academic history, learning style, and career aspirations, is collected through surveys, quizzes, and other interactive tools.
2. **Data Preprocessing:** Collected data is preprocessed to remove missing values, handle outliers, and transform data into a suitable format for analysis.
3. **Machine Learning:** Preprocessed data is fed into machine learning algorithms, such as collaborative filtering, content-based filtering, and hybrid approaches, to generate personalized course recommendations.
4. **Recommendation Engine:** The recommendation engine integrates the outputs from multiple machine learning algorithms to provide a ranked list of recommended courses.
5. **User Interface:** A user-friendly interface is designed to display recommended course

1.3 Python Programming Concepts

The following Python programming concepts are used to develop the Personalized Course Recommendation System:

1. Data Structures: Lists, dictionaries, and data frames are used to store and manipulate student data.
2. **Machine Learning Libraries:** Scikit-learn, TensorFlow, and PyTorch are used to implement machine learning algorithms.
3. **Data Preprocessing:** Pandas and NumPy are used for data preprocessing, including handling missing values and data normalization.
4. **Web Development:** Flask or Django is used to design a user-friendly interface for the recommendation system.
5. **Database Integration:** SQLite or MongoDB is used to store student data and recommended courses.

CHAPTER 2

PROJECT

2.1 Proposed Work METHODOLOGY

1. Understand the challenges:

Cold-start problem: Lack of sufficient data for new users or courses.

Scalability: Managing large datasets efficiently.

Accuracy: Balancing relevance and novelty in recommendations.

2. Data Collection and Preprocessing

Data Sources:

User profiles (e.g., age, occupation, skill level).Course metadata (e.g., course descriptions, categories, ratings).User interactions (e.g., course enrollments, clicks, ratings).

Data Cleaning:

Handle missing or inconsistent data.Normalize text fields like course descriptions and user reviews.

Feature Engineering:

Generate features such as user activity scores, course popularity, and skill tags.Encode categorical variables (e.g., one-hot encoding or label encoding).

3. System Design

Content-Based Filtering:

Match users to courses using features like tags, descriptions, and categories.Use TF-IDF and cosine similarity for textual data.

Collaborative Filtering:

Use user-item interaction matrices for recommendations.Implement models like Singular Value Decomposition (SVD) or Alternating Least Squares (ALS).

2.2 Block Diagram

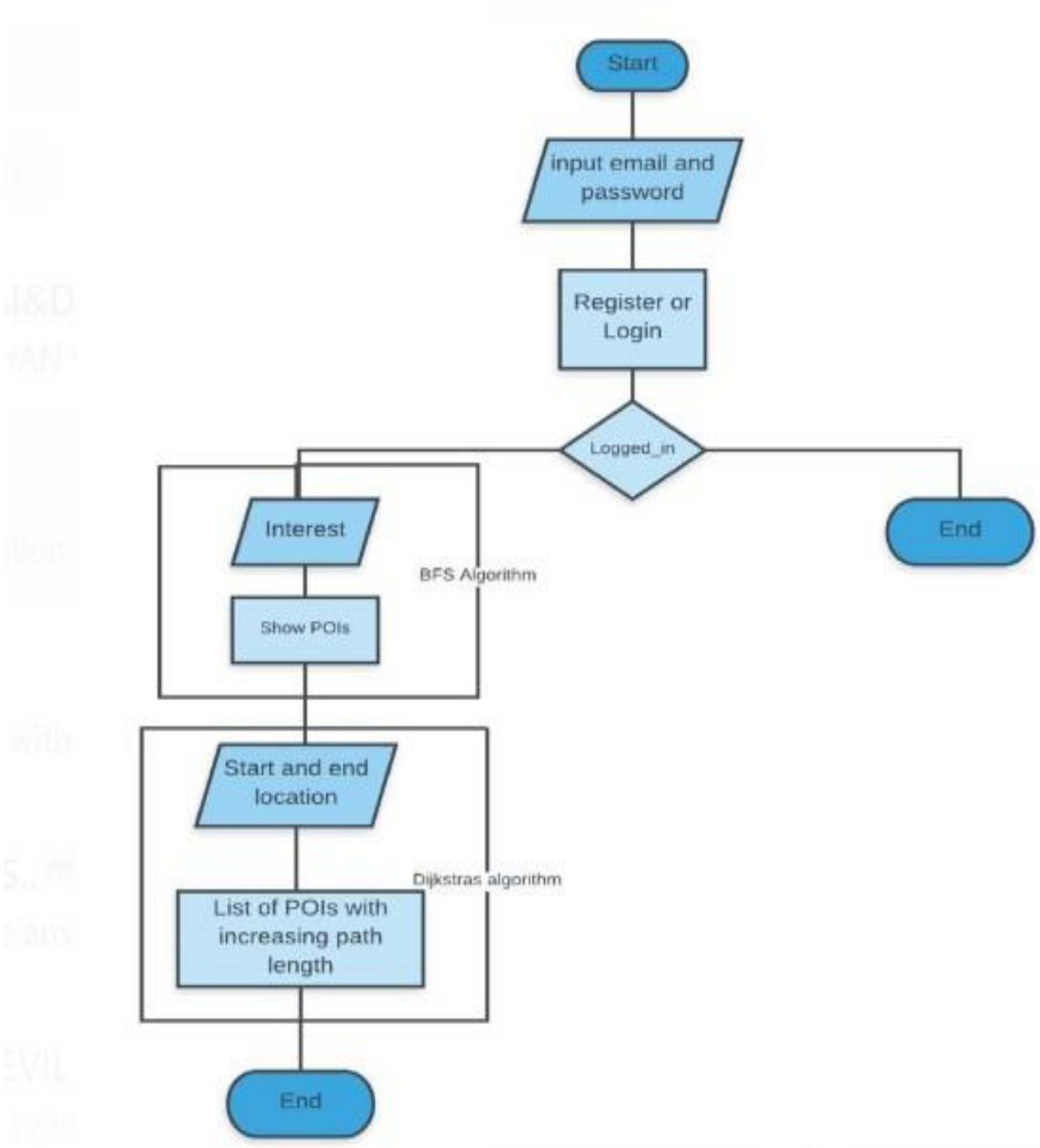

Fig 2.1

CHAPTER 3

MODULE DESCRIPTION

3.1 Module 1

Data Collection Module:

Collects and organizes data on user behavior (e.g., browsing history, course completion, ratings)and course details (e.g., content, difficulty level, prerequisites).This data serves as input for machine learning models and is usually stored in a database or data warehouse.

3.2 Module 2

User Profile Analysis Module:

Builds a user profile based on explicit inputs (e.g., selected interests, career goals)and implicit behavior (e.g., past courses completed, time spent on each module).

Creates a user representation vector, which helps in matching users to relevant courses.

3.3 Module 3

Content-Based Filtering Module:

Recommends courses by matching course attributes (keywords, topics, etc.) with thuser’s preferences and past course choices.Uses techniques like TF-IDF or wordembeddings to find similar course content based on textual data.

3.4 Module 4

Collaborative Filtering Module:

Identifies courses by looking at the choices of similar users (those who completed or liked similar courses).

Uses techniques like User-Based Collaborative Filtering, Item-Based Collaborative Filtering, and sometimes Matrix Factorization (e.g., Singular Value Decomposition, SVD).

3.5 Module 5

Hybrid Recommendation Module:

Combines content-based filtering, collaborative filtering, and sometimes additional models to generate a more robust recommendation.

Addresses the limitations of each individual approach and improves recommendation quality.

CHAPTER 4

RESULTS AND

DISCUSSION

(PERSONALIZED COURSE RECOMMENDATION SYSTEM)

RESULTS:

The Personalized Course Recommendation System serves as an innovative solution for enhancing online learning experiences by providing customized course suggestions based on individual user profiles, preferences, and learning behaviors. This approach ensures that learners are directed toward content that best fits their academic or professional goals, improving engagement and learning outcomes. By utilizing advanced algorithms to analyze data, the system can continuously evolve and adapt to the unique needs of each user, offering a highly personalized educational journey.Despite its advantages, challenges such as data accuracy, privacy concerns, and system scalability need to be carefully addressed. Ethical considerations surrounding data usage and user trust must be incorporated into the system's design to ensure transparency and fairness. Additionally, ongoing system optimization and user feedback will be essential for maintaining the relevance and effectiveness of the recommendations.In summary, the personalized course recommendation system represents a significant advancement in the field of online education, with the potential to improve the learning process by making it more intuitive, accessible, and tailored to individual needs.

DISCUSSION:

The Personalized Course Recommendation System offers significant potential to improve learning experiences by tailoring course suggestions based on individual preferences, skills, and learning patterns. One of the key strengths of the system is its ability to analyze vast amounts of user data, including past course enrollments, learning habits, and even performance metrics, to offer personalized recommendations. This ensures that users are guided toward courses that align with their learning goals and interests, leading to a more engaging and efficient educational experience.

However, several challenges remain in the development of such a system. One challenge is ensuring data accuracy and integrity. Inaccurate or incomplete data can lead to poor recommendations, undermining the system’ s effectiveness.

Explorer

CTP28132....

```
import pandas as pd

# Sample data: User ratings for different courses
data = {
    'user_id': [1, 1, 2, 2, 3, 3, 4, 4],
    'course_id': [101, 102, 101, 103, 102, 104, 103, 104],
    'rating': [5, 3, 4, 5, 5, 2, 4, 5]
}

# Load data into DataFrame
df = pd.DataFrame(data)

# Function to recommend courses based on what similar users liked
def recommend_courses(user_id):
    # Get the courses rated by the user
    user_courses = df[df['user_id'] == user_id]

    # Find other users who rated the same courses highly
    similar_users = df[(df['course_id'].isin(user_courses['course_id'])) &
                       (df['rating'] >= 4) &
                       (df['user_id'] != user_id)]

    # Recommend courses liked by similar users that the user hasn't rated
    recommended_courses = df[(df['user_id'].isin(similar_users['user_id'])) &
                             (~df['course_id'].isin(user_courses['course_id'])) &
                             (df['rating'] >= 4)]

    # Get unique course recommendations
    return recommended_courses['course_id'].unique().tolist()

# Test the recommendation system for a specific user
user_id = 1
recommended_courses = recommend_courses(user_id)
print(f"Recommended courses for User {user_id}: {recommended_courses}")
```

```
$ python CTP28132.py
Recommended courses for User 1: [103]
  === YOUR PROGRAM HAS ENDED ===
```

CHAPTER 5

CONCLUSION

The Personalized Course Recommendation System serves as an innovative solution for enhancing online learning experiences by providing customized course suggestions based on individual user profiles, preferences, and learning behaviors. This approach ensures that learners are directed toward content that best fits their academic or professional goals, improving engagement and learning outcomes. By utilizing advanced algorithms to analyze data, the system can continuously evolve and adapt to the unique needs of each user, offering a highly personalized educational journey.Despite its advantages, challenges such as data accuracy, privacy concerns, and system scalability need to be carefully addressed. Ethical considerations surrounding data usage and user trust must be incorporated into the system's design to ensure transparency and fairness. Additionally, ongoing system optimization and user feedback will be essential for maintaining the relevance and effectiveness of the recommendations.In summary, the personalized course recommendation system represents a significant advancement in the field of online education, with the potential to improve the learning process by making it more intuitive, accessible, and tailored to individual needs.

REFERENCES:

1. Ricci, F., Rokach, L., & Shapira, B. (2015). Recommender Systems Handbook. Springer.

This book provides comprehensive insights into the design and development of recommendation systems, including personalized course recommendations.

2. Shaffer, J. B., Konstan, J. A., & Riedl, J. (2001). Recommender Systems: Challenges and Opportunities. ACM Computing Surveys, 35(2), 74-81.

A foundational paper on the challenges and opportunities in building recommender systems, relevant to personalized course recommendation.

3. Janna ch, D., & Adomavicius, G. (2016). Recommender Systems: Challenges and Research Opportunities. Computer Science Review, 17, 1-29.

Discusses advanced techniques in recommender systems, including collaborative filtering, content-based filtering, and hybrid approaches used in course recommendation systems.

4. Korean, T., & Bell, R. (2012). Matrix Factorization Techniques for Recommender Systems. Computer Science and Engineering.

A detailed study on matrix factorization methods for creating personalized recommendations, which can be applied to course recommendation algorithms.

APPENDIX

(Coding)

```
import pandas as pd

# Sample data: User ratings for different courses data = {
    'user_id': [1, 1, 2, 2, 3, 3, 4, 4],
    'course_id': [101, 102, 101, 103, 102, 104, 103, 104],
    'rating': [5, 3, 4, 5, 5, 2, 4, 5]
}
# Load data into DataFrame df =
pd.DataFrame(data)
# Function to recommend courses based on what similar users liked def
recommend_courses(user_id):
    # Get the courses rated by the user
    user_courses = df[df['user_id'] == user_id]
    # Find other users who rated the same courses highly similar_users =
    df[(df['course_id'].isin(user_courses['course_id'])) & (df['rating'] >= 4) &
      (df['user_id'] != user_id)]
    # Recommend courses liked by similar users that the user hasn't rated
    recommended_courses = df[(df['user_id'].isin(similar_users['user_id'])) &
```

```
(~df['course_id'].isin(user_courses['course_id']))

  (df['rating'] >= 4)

  # Get unique course recommendations
      return recommended_courses['course_id'].unique().tolist() # Test
```

the recommendation system for a specific user user_id = 1

```
recommended_courses = recommend_courses(user_id)

print(f"Recommended courses for User {user_id}: {recommended_courses}")
```

APPENDIX

output

```
Recommended courses for User 1: [103

=== Code Execution Successful ===
```