IJIREEICE ISSN (O) 2321-2004, ISSN (P) 2321-5526

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Impact Factor 8.021 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 3, March 2025

DOI: 10.17148/IJIREEICE.2025.13358

COLLEGE FORUMS WITH ALUMNI BASED ON CONTENT FILTERING

Vishwa.B[1], Mrs.A.Sathiya Priya[2]

Department of Information Technology, Dr.N.G.P. Arts and Science College, Coimbatore,TamilNadu, India[1]

Assistant Professor, Department of Information Technology, Dr.N.G.P. Arts and Science College, Coimbatore,TamilNadu, India[2]

Abstract: College forums serve as essential platforms for communication, knowledge sharing, and networking among students and alumni. However, traditional forums often lack personalization, leading to irrelevant content recommendations and limited engagement. To address this issue, a content-based filtering approach can be implemented to enhance interactions within college forums by recommending relevant discussions, resources, and alumni connections based on user preferences and past activities. By utilizing natural language processing (NLP) and machine learning techniques, the system can analyze forum content, user interests, and alumni expertise to provide personalized recommendations. This ensures that students are connected with alumni who share similar academic or career interests, fostering mentorship opportunities and career guidance. The content-filtering approach improves the relevance of forum discussions, leading to increased user engagement and more meaningful interactions. Additionally, it creates an adaptive learning environment where students receive tailored insights and support from experienced alumni. Future enhancements may involve hybrid filtering techniques, integrating collaborative filtering to further refine recommendation accuracy. This work contributes to the development of intelligent, personalized college forums that strengthen alumni networks and promote continuous learning and professional growth.

Keywords: College forums, alumni network, content-based filtering, personalized recommendations, Natural Language Processing (NLP), machine learning, mentorship, career guidance, user engagement, adaptive learning.

I. INTRODUCTION

College forums serve as interactive platforms that facilitate communication, knowledge sharing, and networking among students, faculty, and alumni. These forums provide opportunities for academic discussions, career guidance, and professional mentorship. However, traditional forum systems often suffer from information overload, where users struggle to find relevant content and meaningful connections. This limitation reduces engagement and hinders the effectiveness of alumni-student interactions.

To address these challenges, content-based filtering techniques can be employed to enhance the functionality of college forums by personalizing recommendations based on user preferences and past activities. Content-based filtering utilizes natural language processing (NLP) and machine learning algorithms to analyze forum discussions, user interests, and alumni expertise. By matching students with relevant alumni and discussion threads, this approach ensures a more engaging and productive forum experience.

The integration of content-based filtering in college forums enables students to access tailored career advice, mentorship opportunities, and domain-specific knowledge from experienced alumni. Additionally, it strengthens alumni engagement by allowing them to contribute insights that align with their expertise. This system fosters a dynamic and intelligent learning environment, where users receive relevant recommendations that enhance their academic and professional growth.

This study explores the role of content-based filtering in transforming traditional college forums into intelligent, personalized, and efficient networking platforms. The research highlights the impact of personalized recommendations on user engagement, information relevance, and the overall effectiveness of alumni-student interactions. Furthermore, we discuss potential enhancements, such as hybrid filtering approaches, which combine content-based and collaborative filtering techniques to further improve recommendation accuracy and user satisfaction. By integrating advanced recommendation techniques, academic institutions can create smart and dynamic college forums that foster continuous learning, mentorship, and professional networking in an efficient and user-friendly manner.

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II. RELATED WORKS

Phalle and Bhushan (2024) conducted a comparative study on content-based and collaborative filtering methods, highlighting their applications in recommendation systems. They emphasized that content-based filtering leverages user data to predict preferences, facilitating personalized content recommendations. This approach is particularly beneficial in academic forums where aligning content with user interests can enhance engagement.

Dake and Bhushan (2024) developed "Campus Connect," a web-based platform designed to bridge the gap between students and alumni by facilitating direct communication and knowledge-sharing. The platform utilizes modern web technologies to enable real-time messaging, mentorship sessions, and career-related discussions, thereby enhancing student preparedness and strengthening alumni engagement.

Wang *et.al.*,(2024) conducted a bibliometric and content analysis of AI applications in education, encompassing adaptive learning and personalized tutoring. These AI-driven approaches could inform the development of intelligent content filtering mechanisms in educational forums, tailoring discussions to user preferences and enhancing engagement.

Raza *et.al.*,(2022) explored the development of recommender systems from traditional techniques to advanced methods involving deep learning and graph-based models. The insights from this review can be applied to enhance content filtering strategies in college forums to ensure relevant and personalized content delivery.

Ismail (2020), this paper provides a thorough review of recommendation methods, including content-based filtering, collaborative filtering, and hybrid systems. It examines the effectiveness and challenges of these systems, such as filter bubbles and the "cold start" issue, which are pertinent to content filtering in educational forums.

Kumar & Lee (2023) conducted a systematic review of AI-driven educational platforms, encompassing adaptive recommendation models and student profiling. These insights could facilitate the implementation of intelligent content moderation in university forums, fostering meaningful discussions.

Chen *et.al.*,(2022) analyzed the role of machine learning in digital education, emphasizing automated content curation and sentiment analysis. These findings could support the development of dynamic filtering mechanisms, optimizing user experience in academic discussion platforms.

Barudwale *et.al.*,(2024) introduced "Alumni Connect," an interactive forum designed to enhance networking and mentorship among alumni. The system facilitates effective communication and supports professional growth for both alumni and current students, demonstrating efficient resource utilization in educational institutions.

III. METHODOLOGY

1. Data Collection

Data is gathered from college forums, including alumni discussions, posts, comments, and profiles. Web scraping or API access is used to collect structured data, capturing user interactions, topics, timestamps, and sentiment. To ensure data quality, irrelevant or spam content is filtered out using preprocessing techniques such as stop word removal and text normalization.

2. Data Preprocessing

The collected textual data undergoes several preprocessing steps to improve its usability. Text cleaning techniques like tokenization, stemming, and lemmatization help standardize the content. Feature extraction methods such as TF-IDF and word embedding's (Word2Vec, BERT) are employed to convert text into numerical representations. Additionally, user profiling is performed by analyzing past interactions, including posts, likes, and comments, to understand user preferences.

3. Content-Based Filtering Approach

A content-based filtering approach is used to recommend relevant posts to users. Similarity calculations, such as cosine similarity or Jaccard similarity, help measure the relevance of content. TF-IDF weighting is applied to determine the importance of words in a document for better recommendations. Latent Semantic Analysis (LSA) is also utilized to identify hidden patterns in alumni discussions, further improving recommendation accuracy.

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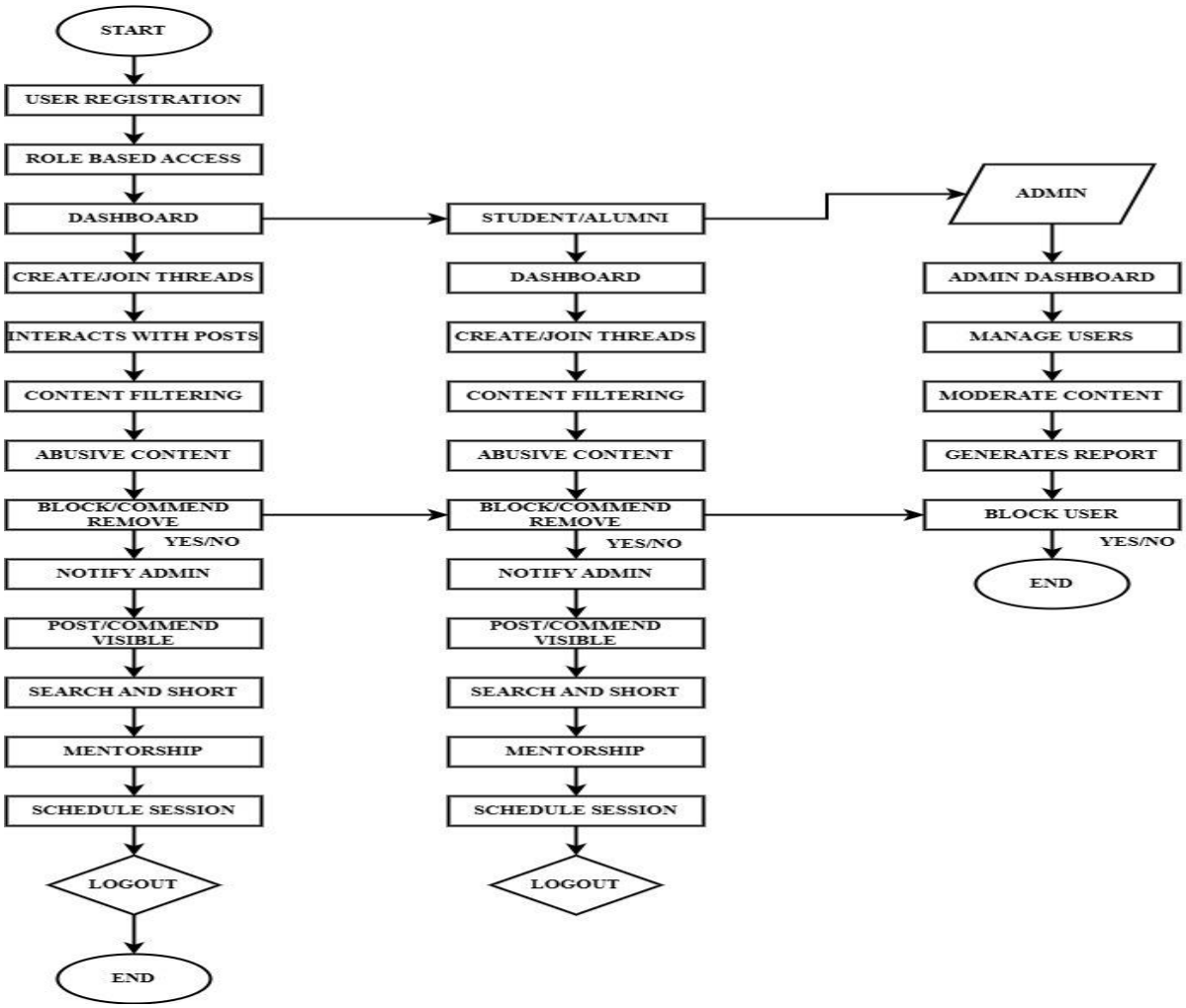
4. Recommendation System Design

The recommendation system is built using various machine learning models. Naïve Bayes is applied for topic classification, while K-Nearest Neighbours (KNN) helps find similar posts. More advanced models, such as neural networks (LSTM and Transformer models), are used for personalized recommendations. The system ranks alumni posts based on user preferences and relevance, ensuring that users receive the most meaningful and engaging content.

5. Architecture Diagram



IV. PROPOSED WORK

1. Data Extraction and Cleaning for Alumni Engagement Analysis

Alumni posts, comments, and discussion threads are extracted from college forums to build a comprehensive dataset. These discussions serve as valuable sources of information, reflecting alumni experiences, professional insights, and academic knowledge. By analyzing this data, meaningful connections and patterns can be identified, helping to enhance alumni engagement on the platform. Before further processing, the raw text data undergoes an essential cleaning phase. This step involves removing unnecessary elements such as special characters, irrelevant content, and spam messages that do not contribute to meaningful interactions. By ensuring that only relevant discussions are retained, the quality of the dataset is significantly improved, making it more suitable for analysis.

2. Textual Data Transformation for Machine Learning

To transform the textual data into a format that machine learning models can understand, numerical representations are generated using advanced feature extraction techniques. Term Frequency-Inverse Document Frequency (TF-IDF) is

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applied to determine the importance of words within a document, helping to distinguish significant terms from commonly used ones. Additionally, word embedding methods such as Word2Vec, FastText, and BERT are employed to capture the semantic relationships between words, allowing the system to understand context better. Furthermore, user preferences are extracted by analyzing past interactions, such as liked posts and comments. This analysis enables the system to identify patterns in user behaviour, making recommendations more personalized and relevant to individual interests.

3. Machine Learning for Personalized Recommendations

A content-based filtering approach is implemented to ensure that users receive recommendations that align with their preferences. The system calculates content similarity using mathematical techniques such as Cosine Similarity and Jaccard Similarity. These methods help measure the degree of resemblance between different discussions, allowing the system to suggest posts that are closely related to the user's interests. To enhance the accuracy of recommendations, Latent Semantic Analysis (LSA) is utilized to uncover hidden patterns and relationships within the text. Additionally, machine learning models, including Naïve Bayes, Support Vector Machines (SVM), and Long Short-Term Memory (LSTM) networks, are applied for text classification and ranking. These models help in categorizing discussions and ensuring that users receive high-quality recommendations tailored to their engagement history.

4. Engagement-Based Ranking and Feedback Loop

To further improve user experience, the recommendation system ranks alumni posts based on their relevance and level of interaction. Posts that receive higher engagement through likes, comments, and shares are given more weight in the ranking process, ensuring that the most meaningful discussions appear at the top of users' feeds. Additionally, a feedback loop is integrated into the system to facilitate continuous learning and improvement. By allowing users to provide feedback on recommendations, the system can refine its suggestions over time. This iterative process enhances the accuracy and reliability of recommendations, making the forum a more engaging and personalized space for users.

Seamless Integration for Enhanced Alumni Engagement

The final step involves integrating the recommendation system seamlessly into the forum's interface. The system is designed to display personalized content recommendations, ensuring that users can easily discover discussions that align with their interests and professional backgrounds. By leveraging machine learning insights and user preferences, the platform creates an interactive and dynamic environment where alumni can engage in meaningful conversations. This approach fosters stronger networking opportunities, knowledge-sharing, and continuous interaction, ultimately enhancing the overall alumni experience on the forum.

V. CONCLUSION

The proposed content-based filtering system for college forums with alumni engagement aims to enhance student-alumni interactions by providing personalized recommendations. By leveraging machine learning, NLP, sentiment analysis, and hybrid recommendation techniques, the system efficiently categorizes discussions, prioritizes relevant content, and fosters meaningful networking opportunities. Additionally, advanced techniques such as deep learning models, graph-based social network analysis, and AI-powered chatbots improve the accuracy and effectiveness of recommendations. The integration of real-time feedback mechanisms, privacy-preserving techniques, and multi-modal content processing ensures a secure, adaptive, and user-friendly platform. Overall, this intelligent recommendation framework bridges the gap between students and alumni, facilitating career guidance, knowledge sharing, and professional networking. Future enhancements, such as federated learning, real-time resume review, and mobile app integration, can further optimize the system's efficiency and scalability. This research contributes to the development of intelligent and interactive college forums, empowering students with valuable insights from alumni experiences.

VI. FUTURE SCOPE

The future of college forums with alumni-based content filtering involves integrating AI-driven enhancements for better engagement. Hybrid recommendation systems using deep learning models like Transformers and GNNs will improve personalization. AI-powered career assistance, including resume screening and job matching, will enhance student opportunities. Sentiment analysis with BERT and GPT models will prioritize impactful discussions. Multi-modal content processing will enable recommendations beyond text, incorporating images and videos.

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Block chain technology can verify alumni credentials, ensuring security and authenticity. Privacy-preserving AI techniques like federated learning will enhance user confidentiality. Gamification features, such as rewards and leader boards, will boost alumni participation. A mobile application with push notifications and chatbots interactions will improve accessibility. Expanding globally with AI-powered multi-language support will create a seamless networking experience.

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