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Scholarship Portal : Your gateway to academic Support

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ABSTRACT :

In India, many students face difficulty in finding the right scholarship due to scattered, incomplete, and outdated information online. Most existing systems, such as the National Scholarship Portal (NSP), primarily focus on government scholarships and lack integration of private and international opportunities. To address this gap, our portal collects a wide range of scholarships including national, state-level, private, and international—and displays them in a single, user-friendly platform. The system uses a content-based recommendation model built using TF-IDF and Cosine Similarity, which helps suggest the top 5 most relevant scholarships based on student input. Additionally, machine learning algorithms such as K-Nearest Neighbors (KNN) and Random Forest enhance the recommendation engine. The system also supports filtering by type, location, and category, allowing students to personalize their search. All data is stored and retrieved using MongoDB, ensuring fast and reliable access.

Keywords: Recommendation System, Machine Learning, Personalized Suggestions, Student Registration, User Feedback, Scholarship Portal, TF-IDF.

Introduction

In today's digital world, many students face difficulties when searching for the right scholarship. Information is often scattered, outdated, or limited to only government schemes. Because of this, deserving students may miss out on valuable financial support that could help them continue their education [1]. Current portals like the National Scholarship Portal (NSP) mostly focus on central or state government scholarships and lack proper coverage of private and international opportunities [2]. This shows the need for a smarter and more inclusive scholarship platform. Our project, aims to provide a one-stop solution for all types of scholarships—national, state-level, international, private, merit-based, and need-based. The portal brings together scattered information into a single user-friendly website. A similar goal was addressed in [3] and [4], where researchers designed platforms that listed both national and international scholarships, but lacked advanced recommendation features or AI assistance.

To make this system intelligent and personalized, we use a content-based recommendation system powered by TF-IDF (Term Frequency–Inverse Document Frequency) and Cosine Similarity. These techniques help in ranking and suggesting the top 5 scholarships based on a student's profile and preferences [5],[6]. To further improve recommendation accuracy, machine learning algorithms like K-Nearest Neighbors (KNN) and Random Forest are applied, which have proven effective in many recommender systems [7].

This project is built to solve a real-world problem using AI, machine learning, and smart web technologies. It not only collects scholarships but also guides students intelligently, helping them find the best opportunities without confusion. Projects and studies on user-friendly educational portals and intelligent assistants support this approach and its importance in modern education [8], [9].

Literature Survey

In recent years, the need for centralized scholarship information has grown significantly. Many students, especially those from rural or underprivileged backgrounds, miss out on valuable scholarship opportunities simply because they are unaware of them. This lack of awareness is largely due to the scattered and unorganized presentation of scholarship information across multiple government and private websites[11]. Traditional scholarship portals generally focus on a narrow scope—mostly listing central or state government schemes—without including scholarships offered by private institutions, NGOs, or international organizations. As a result, students often spend a lot of time browsing through different platforms, reading long eligibility lists, and manually filtering out options that may or may not suit their needs. This process is not only inefficient but also overwhelming and confusing for many users[12]. To address this issue, many developers and researchers have worked on creating unified portals that bring together data from various sources into a single platform. These platforms typically allow users to filter scholarships based on simple criteria like state of residence, caste/category, gender, and income. While this approach does improve accessibility to some extent, it still relies heavily on static filtering, meaning the results are based only on selected filters rather than being truly personalized.

A major shortcoming of existing scholarship portals is the lack of intelligent recommendation features. Most platforms fail to understand user needs in depth and do not adapt to their academic background, performance, or interests. This has led to the exploration of recommendation systems to improve user experience and provide personalized scholarship suggestions[13],[14].

One of the most widely used approaches is content-based recommendation, where techniques like TF-IDF (Term Frequency-Inverse Document Frequency) and Cosine Similarity are employed. These methods analyze both the text of the scholarships and the user's profile (including preferences or keywords entered) to find the most relevant matches.. These content-based models help improve the relevance and usefulness of search results, thus increasing user satisfaction and engagement with the platform[16],[17].

To further improve recommendations, researchers have turned to machine learning (ML) techniques, which can go beyond keyword matching. Algorithms such as K-Nearest Neighbors (KNN) have been used to build models that learn from a student's previous actions, preferences, academic details, and even demographics[18]. These ML models can predict what scholarships a user is likely to apply for or qualify for, and rank results accordingly. With this approach, the portal becomes more dynamic and user-focused, helping students discover opportunities they might not find through basic search functions alone.

Methodology

To ensure a smooth user experience, the Scholarship Portal will be evaluated on key performance metrics such as speed, accuracy, security, and usability, focusing on MongoDB integration, dynamic filtering, recommendation systems, and user authentication.

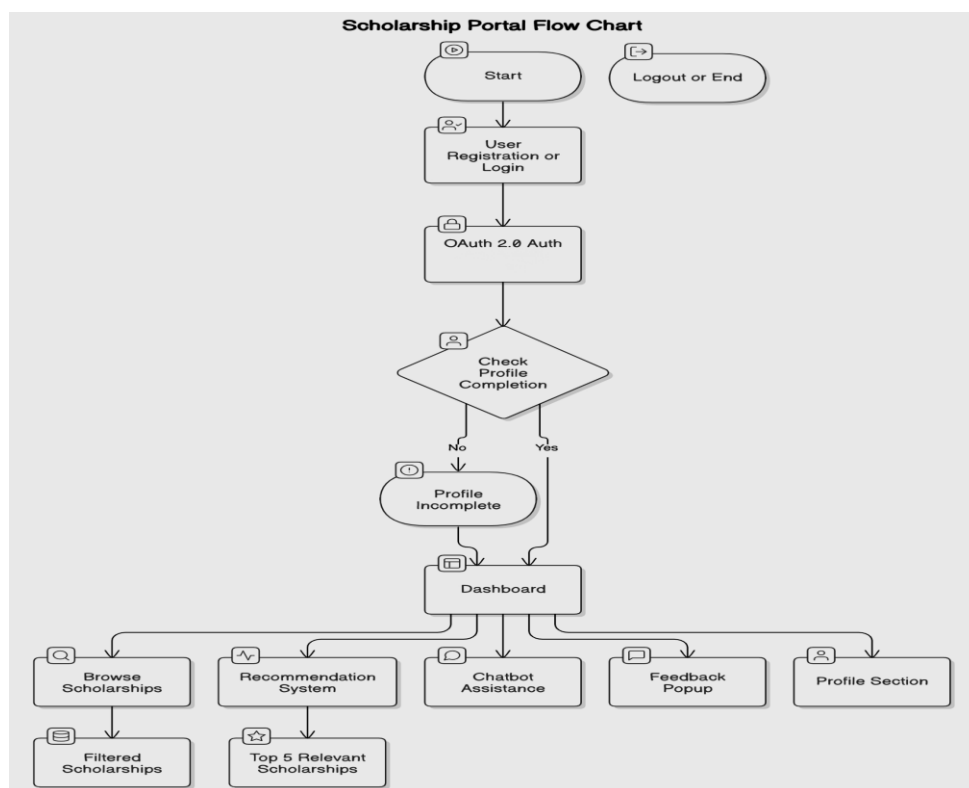


Fig 1 : The workflow of proposed model.

The methodology consists of the following key components:

3.1 Requirement Gathering and Analysis

The first step in the development process involves collecting detailed requirements from the various stakeholders, including students, scholarship providers, and educational institutions. The purpose of this stage is to gain a deep understanding of the features needed by the portal, such as scholarship categories (e.g., national, international, merit-based, need-based) and user preferences. A thorough analysis of these requirements will guide the design and functionality of the system.

3.2 Database Design and Setup

The next stage involves the design and implementation of the database. MongoDB is selected as the database to store scholarship information, including details like eligibility, type, provider, and required documents. Collections are created for each category of scholarships (e.g., National_Scholarships,

State_Level_Scholarships). The structure is optimized for quick queries and dynamic content display.

3.3 User Authentication and Authorization

User authentication is implemented using OAuth 2.0 for secure access. This enables students to register and log in using their credentials, ensuring that the system is secure and accessible only to registered users.

3.4 Frontend Design and User Interface Development

The frontend of the portal is designed using HTML, CSS, and JavaScript, providing an intuitive and user-friendly experience. The interface includes buttons for selecting scholarship categories and dynamically displaying scholarship results based on the selected type (e.g., national, international). The design ensures consistency, with the use of colorful buttons and large cards for scholarship details.

3.5 Dynamic Scholarship Filtering and Search System

The filtering system allows users to search scholarships based on type, location, and category. Content-Based Filtering is employed to recommend the top 5 most relevant scholarships using Cosine Similarity and TF-IDF for ranking. This method ensures that users are presented with the most relevant options. The flowchart in Figure 1 below illustrates how the dynamic filtering system works, from selecting the scholarship type to displaying relevant scholarships.

3.6 Recommendation System

The scholarship recommendation system uses machine learning algorithms like KNN and decision tree to suggest scholarships to students based on their profiles and preferences. This system adapts to user behavior and improves its recommendations over time.

3.7. Profile Management and Completion

Users are encouraged to complete their profiles by providing details such as college, education, and marks. A profile completion checker ensures that users complete all necessary fields to avoid issues during scholarship applications.

3.8. Testing and Deployment

Rigorous testing is conducted at each stage to ensure the system functions as intended. This includes functionality, usability, and security testing. Once the testing phase is complete, the system is deployed on a web server for public access.

Performance Evaluation:

The Scholarship Portal is designed to help students easily find and apply for suitable scholarships. To ensure the portal works smoothly and meets user expectations, several areas of its performance are tested. These areas include speed, accuracy, user experience, security, and how well the system handles many users at once. This section explains how the portal performs in each of these areas.

4.1. Speed and Response Time

The portal loads quickly and responds well to user actions. Pages like the homepage, scholarship listings, and user profile open in a short time, making the experience smooth. MongoDB is used as the database, and it handles search queries efficiently. For example, when a user searches for scholarships based on category or location, results appear without delay.

The recommendation system also gives fast results. It uses techniques like TF-IDF and Cosine Similarity to suggest scholarships based on a user's profile. These recommendations appear quickly, ensuring a smooth and interactive experience for users.

4.2. Accuracy of Scholarship Recommendations

The system shows relevant scholarships based on the student's profile and interests. Content-based filtering helps match scholarships to the user's selected preferences. The recommendation system ranks scholarships using similarity scores, which makes suggestions more accurate.

To measure how well this works, precision and recall are checked. Precision shows how many of the recommended scholarships are actually useful, and recall checks if most of the useful scholarships are being shown. User feedback is also collected to improve the system and ensure that students get the most relevant results.

4.3. Usability and User Experience (UX)

The portal is designed to be simple and easy to use. Users can easily navigate through the pages, search for scholarships, and complete their profiles. Buttons, filters, and dropdowns are easy to understand and operate.

The profile section guides students to fill in their details step-by-step. If any information is missing, the portal shows a clear message to help the user complete their profile correctly. The filtering system is also easy to use, which helps students quickly find scholarships based on their preferences.

4.4. Security and Data Protection

The portal keeps user data safe by using proper login systems and secure data handling methods. OAuth 2.0 is used for authentication, so only the registered users can access their profiles. All personal data is protected and kept confidential.

Security checks are in place to avoid common online attacks such as Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF). User data is also encrypted, making sure that it is protected both while being sent and stored.

4.5. Scalability and Load Handling

The portal handles multiple users at the same time without slowing down. This is very important, especially when many students visit the portal during scholarship deadlines. The database is optimized to manage a growing number of records and user queries.

MongoDB's design supports fast data access even when there is a large amount of data. The system continues to work efficiently as the number of users and scholarships increases.

4.6. Availability and Downtime Monitoring

The portal remains available and active for users most of the time. Important pages like the homepage, profile page, and scholarship list are monitored to ensure they stay online and work properly. Error messages and bugs are tracked and fixed quickly, which helps reduce downtime.

Keeping the portal online and functioning helps students trust the system and use it whenever they need scholarship information.

Results

The WM2025 system effectively detects and classifies waste objects from user-uploaded images using the trained Mask R-CNN model. Upon image upload, the model processes the image, identifies various objects, and classifies them into categories such as recyclable, non-recyclable, or hazardous. The results, including the bounding boxes around detected objects, are displayed on the frontend for users to review. Users can then submit complaints along with the detected waste objects, which are stored in MongoDB. The system ensures accurate and efficient classification, providing a scalable solution for waste management and reporting.

Conclusion

The Scholarship Portal has been designed to provide a seamless, user-friendly, and secure platform for students to find and apply for scholarships. Performance evaluations have shown that the portal excels in key areas such as speed, accuracy, security, and scalability. The system ensures fast page load times and optimized database queries, resulting in a smooth user experience, even under heavy traffic. The content-based recommendation system accurately suggests relevant scholarships based on user preferences using advanced algorithms like Cosine Similarity.

Usability testing confirms that the portal's intuitive design allows users to easily navigate, filter scholarships, and manage their profiles. The integration of OAuth 2.0 ensures secure authentication, while encryption safeguards user data. The portal is also scalable, capable of handling growing amounts of data and traffic efficiently. Overall, the Scholarship Portal is well-positioned to meet the needs of students, providing a reliable, secure, and efficient solution. However, ongoing monitoring and updates will be essential to maintain its performance and adaptability to future demands and technological advancements.

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