



AN EMPIRICAL PROTOTYPE FOR STUDENT AND FACULTY INTERACTION

Dr. G.N. Beena Bethel, Professor, Dept. Of Computer Science and Engineering, Gokaraju Rangaraju Institute of Engineering and Technology

Madhi Reddy Keerthi Reddy, Student, Dept. Of Computer Science and Engineering, Gokaraju Rangaraju Institute of Engineering and Technology

Lalitha Shreya Chengalvala, Student, Dept. Of Computer Science and Engineering, Gokaraju Rangaraju Institute of Engineering and Technology

Akshitha Boini, Student, Dept. Of Computer Science and Engineering, Gokaraju Rangaraju Institute of Engineering and Technology

Abstract

Nowadays, interaction among students across different years and with faculty is limited. We aim to bridge this gap with a dedicated web application. The main issue we address is the lack of communication between sophomores and seniors. Our platform fosters connections, promoting collaboration and learning between students and faculty. It streamlines faculty workload by enabling peer-to-peer assistance and offers a comfortable space for questions, especially for those hesitant in larger settings. Our website allows discussions on institute-specific and global topics. Users sign up using verified IDs via an image processing model. Authorized users can ask questions, create polls, answer queries, vote, upvote answers, and comment. Answers are sorted by upvotes, and comments by date. Our mission is simple: to share knowledge, engage, and have fun while learning.

Keywords: Tesseract, Optical Character Recognition, Image Preprocessing, Neural Networks, OpenCV.

1. Introduction

An Empirical Prototype for Student and Faculty Interaction Over a Common Platform is a secure online platform designed to foster seamless communication and collaboration among students and faculty members. With the integration of cutting-edge technology such as **Tesseract**, a powerful machine learning model for twofactor authentication, the forum ensures enhanced security and a streamlined user experience. By utilizing **Optical Character Recognition (OCR)** techniques, Tesseract reads characters from ID cards, allowing verified users access to the platform and maintaining the integrity of the community. The functionality of the website goes beyond traditional discussion platforms. By leveraging **React** for the frontend and **Express.js** and **Node.js** for the backend, the forum delivers a dynamic and interactive user interface that promotes engagement and knowledge sharing. The utilization of these modern web development technologies ensures a responsive and intuitive platform, allowing users to navigate seamlessly through various features and contribute to meaningful discussions effortlessly. Underlying this website is a robust data management system powered by MongoDB. This highly scalable and flexible NoSQL database efficiently stores and retrieves user-generated content, including questions, answers, comments, and user profiles. The utilization of MongoDB enables quick and reliable access to information, facilitating efficient search functionalities and ensuring a smooth user experience even during periods of high activity and increased data volume. This website serves as an inclusive hub for students and faculty to collaborate and thrive as a community. It fosters a vibrant ecosystem where students can seek guidance, gain insights, and network with alumni who share their experiences and industry knowledge. The platform goes beyond academic boundaries by enabling discussions on various topics such as internships, career development, and emerging technologies. Through the active participation of faculty members, the forum facilitates mentorship opportunities, where students can receive valuable guidance and advice to shape their educational and professional journeys.



2. Literature Survey

This section provides an overview of prior research conducted within the same domain, offering a comprehensive literature survey that contextualizes the current study.

The authors of this paper [2] propose a practical and evolving working model of student engagement that has been put into practice and studied over the course of a 16-month experimental project. In order to address cross institutional aspects of learning, teaching, evaluation, and overall student experience, the emphasis is on building collaboration with students. Key phases of project implementation are explained within the framework of the Educational Development Unit's initiatives and the institution's Graduate Attributes effort in this study, which is done as a reflective case study within a prestigious London university.

Another work presented at the Rochester Institute of Technology [13], shows each on-campus course has its own dedicated online platform, complete with email communication, forums, and areas for uploading important course materials including syllabi, assignments, and grades. Notably, different teachers at RIT engage with these online resources to different degrees. Some use them only for administrative needs, while others use the discussion forums for instructional exchanges. The authors conducted a thorough survey of students enrolled in structural analysis and structural loads courses to determine the effect of online discussion forums on student learning in the area of engineering technology on-campus courses.

As per a research study [7], the objective was to assess the efficiency of virtual discussion platforms staffed by volunteers within the context of higher education. Two separate studies were conducted as part of the inquiry into intrinsic forum engagement and its possible effects on students' course achievement. In Experiment 1, a first-year undergraduate psychology course (N = 1184) began with the introduction of an online discussion forum. The study linked levels of forum involvement to several course performance measures, including writing assignment grades, exam scores, and extra credit accomplishments. A similar strategy was used in Experiment 2 (N = 1334) in an additional introductory psychology course. The findings revealed that students who engaged in the forum often performed better in the course, and that reading forum posts in particular helped participants do somewhat better on exams.

According to [11], due to the current situation of lockdown and social distancing, many educational institutions have shifted to online learning. This study aimed to identify the key factors that should be present for successful online discussion and explores the advantages of merging two activities, e-mentoring and online discussion, to improve the quality of the online discussion. A mixed methods design-based was conducted in the setting of the online program in health professions education. Several success factors were identified by the current study: merging of mentorship and online discussion, shifting of roles, structuring of the discussion, assessment, and the use of guides. The study also magnified the role of supervision as moderation and mentorship and suggested solutions to deal with silent participants. Finally, the use of a student guide and shifting of roles between the students play a crucial role in the success of the ODFs.

[10] addresses the impact of the COVID-19 pandemic on the education sector, particularly the shift to online learning. It focuses on the mental health challenges faced by college and university students during lockdowns. The study involves a survey covering academic credentials, technology use, sleep patterns, emotional health, and academic success. Results reveal a clear relationship between online learning and mental health, as well as a positive correlation between academic success and the use of digital resources.

[1] investigates the factors contributing to successful online discussions, especially in the context of health professions education. It identifies key success factors, including the merging of mentorship and online discussion, role shifting, discussion structure, assessment methods, and the use of guides. The study emphasises the role of supervision, moderation, and mentorship in enhancing the quality of online discussions. Furthermore, it suggests solutions for dealing with silent participants and underscores the significance of student guides and role shifting for effective online discussion forums.

[9] explores the effectiveness of social media versus traditional Course Management Systems (CMS) in an online Principles of Microeconomics course. While it highlights the popular hypothesis that social media enhances engagement and learning outcomes, the study presents contrary results. Consider examining the findings of this study when designing features for discussion forums to ensure that the platform enhances engagement and positively influences learning outcomes.

[8] conducts content analysis on non-course-based online discussions in a virtual physics laboratory. The research investigates the nature of online discussions and provides useful guidelines for developing discussion forums for learning purposes. We can incorporate analysing participation rates, interaction types, and cognitive/metacognitive skills, to enhance the quality and structure of our forum's discussions.

[14] focuses on an online discussion forum, "Questions in Biology," designed for developing questioning skills and deep learning about Evolution. This aligns with the educational aspect of our project. The study emphasises the positive effects of student questioning on learning and the role of assessment and teacher feedback. This helps us consider implementing features that encourage students to ask questions, engage in deep learning, and receive constructive feedback from peers and teachers.

3. Methodology

The project architecture encompasses the following key components: user registration/login, authorization verification, user database management, and user interaction. Initially, users are required to register or login to the website using their unique credentials, establishing their identity within the system. To ensure authorized access, a verification system is employed, validating user authorization. The system conducts a comprehensive check against its database to verify the user's affiliation with university. Upon successful verification, authorized users are seamlessly redirected to the home page, granting them access to a wide array of features and functionalities. These include the ability to engage in active knowledge exchange by posting and answering questions, participating in polls with voting capabilities, facilitating discussion threads with commenting and upvoting features, accessing timetable information, and staying updated with relevant announcements.

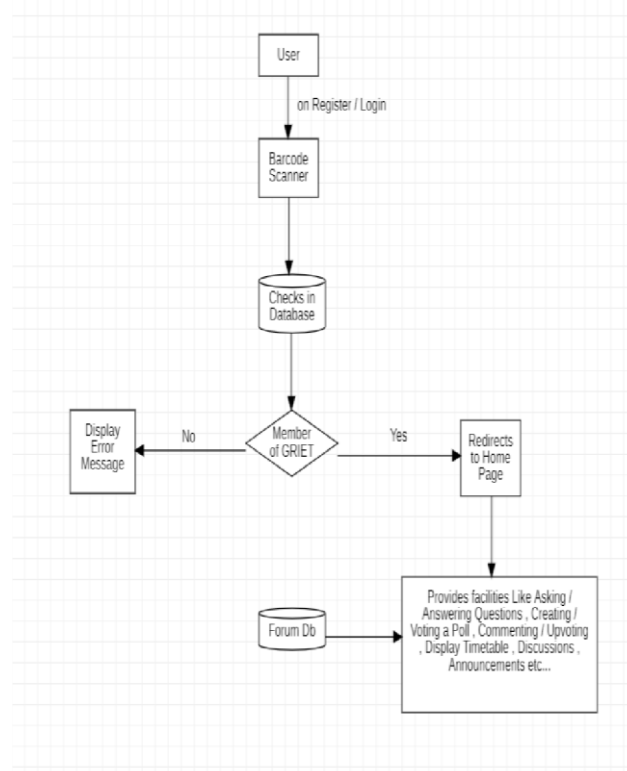


Figure 1: Project Architecture



3.1. System Components

3.1.1 Create Account

Both students and faculty can create an account on the website by providing the necessary information. Participate in Discussions: Students and faculty can engage in discussions on various topics within the forum, exchanging knowledge and ideas.

1. Create Poll or Vote: Students and faculty can create polls on specific subjects or vote in existing polls, contributing to decision-making processes within the forum.
2. Access website: Both students and faculty can access the website to avail its features and functionalities.

3.1.2 Login Module

It is responsible for authenticating and authorizing users to access the system. It uses a database of authorized users to verify credentials and generates tokens for subsequent requests to ensure continued authorization. It allows students to enter their details into the forum. The implemented ML model then verifies the provided information. If the student is recognized as a member of the university, they are considered an authorized user, and access to the platform is granted. On the other hand, if the student is not affiliated with the university, access to the platform is denied. This process ensures that only authorized individuals from university can access the website.

3.1.3 Asking/Answering a question

Allows users to post and answer questions related to their courses, internships, and professional development. When a user asks a question, the question details are stored in the database for future reference. When a user browses for a question, the relevant question details are retrieved from the database and displayed on the user interface. When another user provides an answer to a question, the answer details are stored in the database, and the user interface is updated to display the newly added answer alongside the question. This allows for seamless question and answer interactions within the website, ensuring a collaborative learning environment.

3.1.4 Discussions and Announcements

Enables users to start and engage in conversations on various topics, allowing for the exchange of knowledge and ideas. In the website, when a user wants to view the timetable, the timetable data is fetched from the database and displayed on the user interface. Similarly, for announcements and discussions, the relevant data is retrieved from the database and presented to the user. This ensures that users have access to up-to-date timetable information, important announcements, and engaging discussions within the forum.

3.1.5 Creating/Voting in a Poll

It enables users to conduct and participate in polls related to various topics of interest. When a user creates a poll in the system, the poll details are sent to the database, which stores the poll information and updates the user interface to display the newly created poll. When a person votes in a poll, the vote is recorded in the database, and the UI is updated to reflect the vote count or any relevant changes.

3.1.6 Commenting/ Upvoting an Answer

Allows users to endorse or promote answers to questions or comments made by other users by awarding them with an upvote. When a user wants to comment on an answer, they can input their comment in the designated field and submit it. The comment is then stored in the database, associated with the respective answer. Additionally, users can upvote an answer if they find it helpful or valuable. When an upvote is registered, the corresponding answer's upvote count is incremented in the database.

3.2 Algorithm for ML Model – Tesseract based Optical Character Recognition

- **Image Preprocessing:** The input image is preprocessed to enhance readability. This includes converting the image to black and white, reducing noise, correcting text tilt, and adjusting the size of the image.



- **Text Localization:** Tesseract performs text localization by identifying regions in the image that are likely to contain text. It utilizes contrast changes between dark and light areas to identify potential text regions.
- **Character Segmentation:** Tesseract accurately separates individual letters and words within the localized text regions, ensuring precise recognition and understanding.
- **Feature Extraction:** Tesseract examines visual characteristics of each letter, such as shape and texture, extracting meaningful features to comprehend the represented content.
- **LSTM Neural Network:** Tesseract employs a Long Short-Term Memory (LSTM) neural network, a type of intelligent program, to analyze the relationship between letters and words. By considering the contextual information, the network determines the most probable word or phrase formed by the recognized characters.
- **Language Models:** Tesseract utilizes language patterns and rules to further enhance the understanding of words and correct any recognition errors. Language models aid in contextual analysis and assist in improving accuracy.
- **Post-processing:** The final stage involves postprocessing steps to refine the recognized text. Tesseract compares recognized words against a dictionary, checks for spelling errors, and considers language-specific rules. This helps ensure the accuracy and usability of the extracted text.

4. Implementation

4.1 User Authentication

This test case checks that a user can log in with legitimate credentials, validating the platform's successful login capability. Valid login information must be put into the login forms, followed by the click of the "Login" button, in order to run this test. The purpose of this verification procedure is to verify that users who enter the system using the proper credentials have a smooth login process.

4.2 User Authentication - Invalid Credentials

This test case verifies that users cannot log in to the platform using invalid credentials. In this test scenario, an error message stating that the login attempt failed due to invalid credentials should be displayed by the system. The purpose of this verification procedure is to guarantee that security protocols and user authentication integrity are upheld, and that the platform appropriately manages and alerts users to erroneous login attempts.

4.3 Create a New Question

This test case verifies the feature that allows users to ask new questions on the platform. The user goes to the question creation section, fills in the details, and submits the query to start the exam. The new question should be successfully submitted and posted on the platform for other users to see and answer.

4.4 View Question Details

This test case confirms that users can obtain information on a particular question on the platform. The user clicks on a question that is shown on the home page to begin the test. The user should be able to view all of the information related to the question they have chosen, including the question and any related answers or responses, after being redirected.

4.5 Respond to a Question

This test case ensures that users can reply to queries on the platform in an efficient manner. The user goes to the question details page, chooses the response choice, and then clicks the "Submit" button to complete the test. The successful recording of the user's response should be reflected in the question's statistics.

4.6 Logout

This test case ensures that users who access the system can successfully log out. The user clicks the "Logout" button on the platform and logs out of the system without any issues. The user should be taken back to the login page after selecting the "Logout" button, indicating that their session has ended.

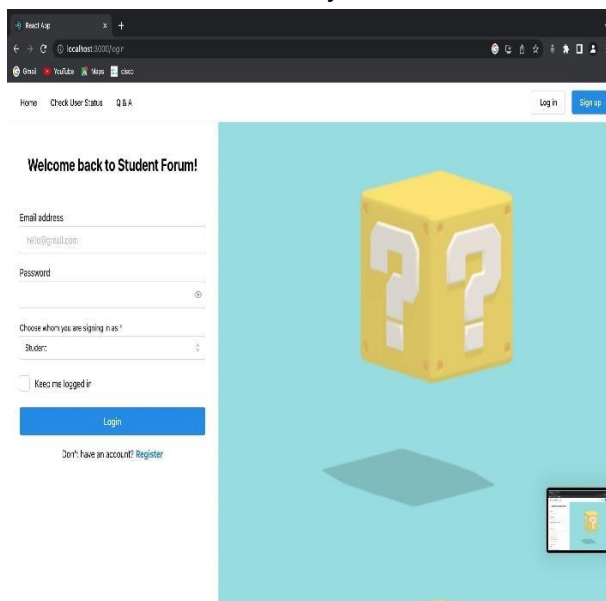


Figure 2: Login Page

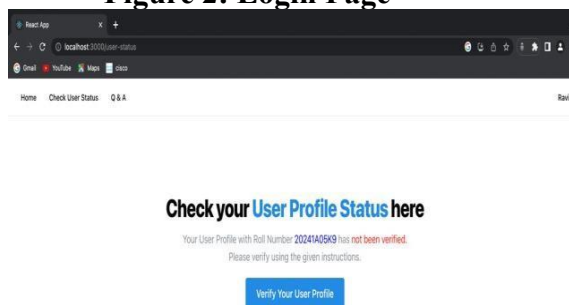


Figure 3: User Profile Verification

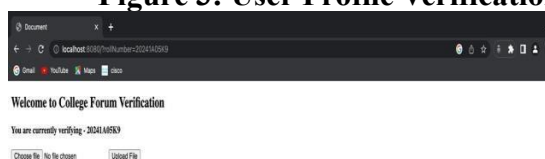


Figure 4: Verification of User using Image Processing Model

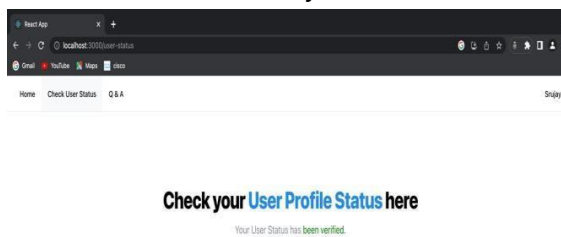


Figure 5: User has been verified

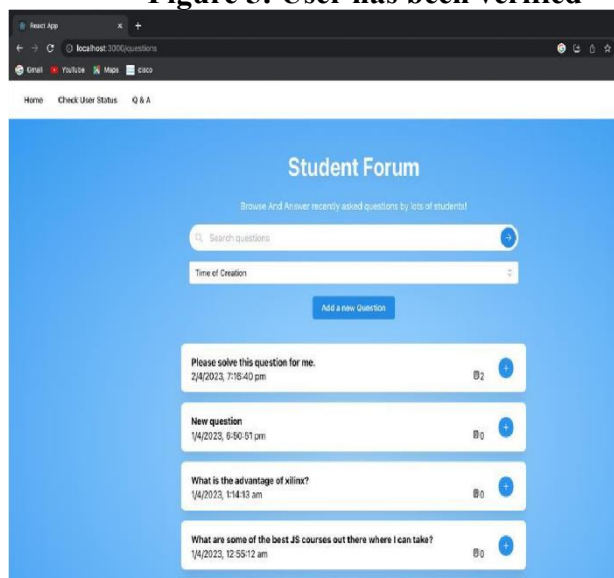


Figure 6: Asking a Question

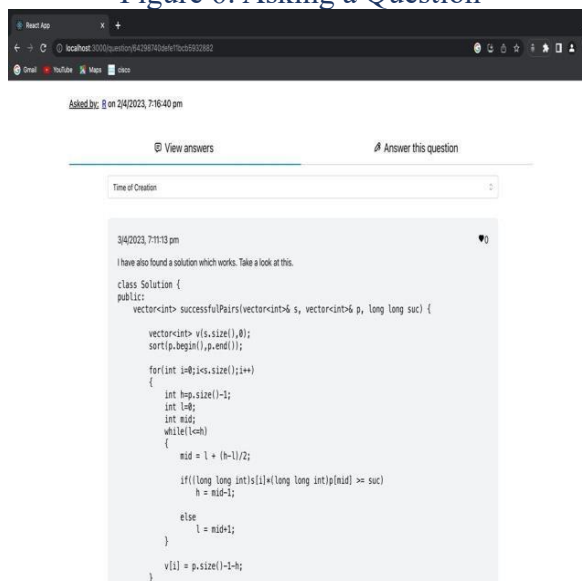


Figure 7: Viewing answer



5. Results

An Empirical Prototype for Student and Faculty Interaction Over a Common Platform is a dynamic and interactive online platform that facilitates seamless communication, collaboration, and knowledge sharing among students and faculty members. By providing a dedicated space for engagement and interaction, the project aims to enhance the learning experience and foster a sense of community within the university ecosystem.

The implementation of the project enables students to register and login to the platform using their credentials, ensuring secure access to the system. A verification system is in place to authenticate users and validate their affiliation with university. Once authenticated, users are redirected to the home page, where they can actively participate in various activities.

6. Conclusion and Future Scope

In conclusion, the web application dedicated to students and faculty offers an informal and accessible space for knowledge sharing and collaboration. In conclusion, this website offers an accessible space for knowledge sharing and collaboration. It addresses the limitations of minimal interaction between students and faculty, time constraints, by providing a virtual platform for sharing knowledge and seeking guidance.

Our project has the potential for expansion in the future. A few ways we can achieve this are by:

- Developing a mobile application which can provide users with the flexibility to access the platform on-the-go.
- Introducing a voice assistant that can revolutionize the user's experience by enabling hands-free and intuitive interactions. With voice commands, users can effortlessly ask questions, get instant answers, and navigate through the platform
- Additionally, implementing a notification system to alert the faculty of unanswered questions within their respective departments can foster timely responses and encourage faculty engagement in addressing student queries.
- Gamification- A method where we incorporate elements like achievements, badges, and leaderboards. This tool can help improve user engagement and motivation, fostering a dynamic learning environment.

Overall, our project's mission to provide a platform for sharing and growing knowledge among students and faculty has the potential to create a positive impact on the learning experience and foster a culture of collaboration and continuous learning within the college.

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