



## Rural Education and Employment Skill Improvement Model Using Artificial Intelligence

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### **Abstract**

This groundbreaking initiative introduces an advanced AI-powered model designed to revolutionize education and employment prospects in rural communities. The Rural Education and Employment Skill Improvement Model is an all-encompassing solution that adapts learning paths using sophisticated AI algorithms, ensuring a personalized approach tailored to the unique challenges faced by rural learners. This model collaborates closely with local educators, leveraging technology to augment traditional teaching methods and bridge the digital divide. At its core, a cutting-edge Learning Management System (LMS) powered by AI integrates various features, including interactive video tutorials, real-time assessments, and a dynamic grading system. The system goes beyond conventional evaluations by employing AI to monitor and prevent cheating during exams, ensuring a fair and secure evaluation process. The multifaceted LMS also includes a job portal, facilitating a seamless transition from academia to the professional arena. Live meeting classes create an interactive virtual environment for real-time engagement, complemented by community discussion chat for collaborative learning. Notably, the project introduces a unique article-creation feature, allowing both instructors and students to contribute valuable content to the educational community. The success metrics of this ambitious project include improved educational outcomes, increased employment rates, and an overall enhancement in community well-being. Serving as a scalable and adaptable solution, this AI-driven model offers a transformative blueprint for leveraging technology to

<p><b>CC License</b> CC-BY-NC-SA 4.0</p>	<p>empower individuals in rural areas, paving the way for a more prosperous economic future.</p> <p><b>Keywords—</b> <i>AI, LMS, job portal, Assessments, Live Class, Quizzes, student community, grade visualizes, Online Learning, Virtual Education.</i></p>
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## I. INTRODUCTION

In an era characterized by rapid technological advancements, the educational landscape is undergoing a transformative shift. Our project, the Comprehensive AI-Integrated Learning Management System (LMS), emerges as a pioneering solution at the intersection of artificial intelligence and education technology. Our approach harmoniously integrates innovative features for the evolving needs of both instructors and students, redefining conventional learning and teaching paradigms.

As traditional educational models face challenges in adapting to the demands of a digital era, our AI-driven LMS stands as a beacon of progress. The project envisions a dynamic and interactive educational ecosystem that not only facilitates knowledge dissemination but also addresses the intricacies of modern learning dynamics. At its core, the system introduces advanced video tutorials, online quizzes, and assessments, all fortified with real-time AI monitoring capabilities. The emphasis on secure examination environments, with the ability to detect and prevent cheating through environmental analysis, marks a significant leap forward in the quest for integrity in academic evaluations.

Going beyond conventional grading systems, our LMS provides a comprehensive performance evaluation through visualized graphs, offering insights into student progress and areas of improvement. The inclusion of an instant alert system for announcements ensures effective communication channels between instructors and students, fostering an environment conducive to active participation and engagement. Moreover, the project recognizes the pivotal transition from academia to the professional realm and, therefore, incorporates a dedicated job portal. This platform serves as a link between students and employment opportunities, aligning education with practical career prospects..

The live meeting classes feature brings an immersive and interactive element to virtual learning, enhancing the quality of knowledge transfer. Moreover, the chat room for community discussion encourages collaborative learning by allowing students to participate in meaningful discussions and share their insights.. An innovative aspect of our project lies in the creation of articles by both instructors and students, contributing valuable content to the educational community. This feature seeks to empower individuals to share their expertise and perspectives, enriching the overall learning experience.

In essence, our AI-integrated LMS project symbolizes a comprehensive and forward-thinking approach to education, aligning itself with the needs of a technologically driven era. Our goal is to improve education by addressing learning, assessment, communication, and career readiness..

## II. PRELIMINARIES

Certain preliminaries are as follows:

### i. *Algorithm*

Collaborative Filtering (CF) is a technique used by recommendation systems that operate using Machine Learning (ML) and Artificial Intelligence (AI) algorithms..

User-Based Collaborative Filtering:-

User-Based Collaborative Filtering stands out as a prominent technique employed by various websites to predict user preferences and enhance their recommendation systems. By leveraging the ratings provided by users with similar tastes, this method tailors recommendations to individual preferences. Let's delve into the steps involved in User-Based Collaborative Filtering.

Step 1: Determining User Similarity (Formula):

The first step is to compare the target user (U) with other users in the system to determine similarity.. The formula for calculating the similarity ( $\text{sim}(a, b)$ ) between two users 'a' and 'b' plays a pivotal role in this process. This formula is a key determinant in identifying users with comparable tastes.

$$Sim(a, b) = \frac{\sum_p (r_{ap} - \bar{r}_a)(r_{bp} - \bar{r}_b)}{\sqrt{\sum_p (r_{ap} - \bar{r}_a)^2} \sqrt{\sum_p (r_{bp} - \bar{r}_b)^2}}$$

$r_{up}$  : rating of user  $u$  against item  $p$   
 $p$  : items

Step 2: Predicting Missing Ratings with Weighted Averages:

Once user similarities are determined, the focus shifts to predicting missing ratings for items. In this step, the ratings provided by users who have similar preferences are given more weightage. This approach calculates user ratings by multiplying each user's rating with a similarity factor obtained from the formula.

To calculate the missing rating, please follow the steps outlined in the instructions.,

$$r_{up} = \bar{r}_u + \frac{\sum_{i \in users} sim(u, i) * r_{ip}}{\sum_{i \in users} |sim(u, i)|}$$

The development process is divided into two main components: front-end development and back-end development. The front end consists of visible components such as the home page, admin panel, and contact page. On the other hand, the back end is comprised of the database and its interactions with the front-end components. This division facilitates a systematic approach to address both the user interface and the underlying database functionality during the development lifecycle.

#### ii. **Front-End Development**

React JS, Ant design Library, HTML, CSS, JS.

#### iii. **Back-End Development**

NodeJS, MongoDB.

#### iv. **Software Tools**

Visual Studio Code IDE, GitHub, MongoDB.

### III. FEATURES

Our AI-Integrated Learning Management System (LMS) is designed to revolutionize education with a suite of innovative features. Secure assessments leverage AI to monitor exams in real-time, ensuring the integrity of evaluations by identifying and preventing potential cheating behaviors. The dynamic grading system not only displays grades but also visualizes performance through graphs, providing instructors and students with comprehensive insights. Instant alerts and communication facilitate seamless interaction between instructors and students, keeping all stakeholders informed of important announcements promptly. The job portal integration connects students with employment opportunities, aligning education with real-world career prospects and facilitating a smooth transition into the professional realm.

Live meeting classes add a real-time and interactive dimension to online learning, making it more engaging and effective, and allowing dynamic discussions, Q&A sessions, and collaborative activities. The community discussion chat feature provides a platform for students to engage in meaningful discourse, share insights, and collaborate on projects, fostering a sense of community within the virtual learning environment. Create articles to share your expertise, experiences, and perspectives with the educational community using our article creation feature. Help others learn and grow by contributing to our knowledge base. Each of these features collectively represents a forward-thinking approach to education, leveraging AI and technology to create a comprehensive and interactive learning environment that adapts to the needs of modern learners.

Our project aims to enhance education by combining cutting-edge technology with a user-centric focus, designing an interactive and captivating educational experience that caters to the needs of all parties involved.

#### ***Basic Features---***

- Video Tutorials
- Online Quizzes
- Job Portal
- Live Class

#### ***Advanced Features---***

- Online Assessments with AI monitoring
- Grade Display with Visualized Graphs
- Community Discussion Chat
- Article Creation for instruction and Student

### **IV. LITERATURE REVIEW**

Purnendu Patra's [1] research, featured in the December (2016) issue of the SMS Journal of Entrepreneurship & Innovation, sheds light on the crucial role of skill development in rural development in India. The study focuses on approximately two-thirds of the population living in around 600,000 villages and highlights the urgent need to bridge the gap between the demand and availability of skilled labor. Patra advocates for skill-oriented training as a transformative solution that can enhance rural youth employability and contribute significantly to comprehensive rural economic development. Initiatives such as Skill India and Make in India, highlighted in the December 2016 publication, act as critical catalysts for generating substantial employment opportunities. The study explores the natural progression of entrepreneurship, from developing innovative skills to enhancing positive impacts on rural landscapes.. Although primarily focused on government-launched initiatives, the study acknowledges the need for future exploration into actions by private organizations and non-governmental entities, providing a foundational understanding for advancing rural skill development in India.

Paadi's [3](2014) study focuses on the employability skills required for graduates in Human Resource Management (HRM). The research explores different types of skills, emphasizing those most attractive to employers and crucial for enhancing the employability of HRM graduates. Using a qualitative approach with semi-structured interviews, the study engages academics, employers, and HRM graduates to gather diverse perspectives. The findings underscore the significance of generic skills in the workplace and reveal distinct knowledge, competencies, and skills required at various levels of HRM employability. Paadi's work helps to develop the skills of HRM students, preparing them for a successful career after graduation. This ensures that HRM graduates have the necessary skills to thrive in the workforce.

Barbara L. Ludlow, John D. Foshay, Sara A. Brannan, Michael C. Duff, Katrina E. Dennison [4]

In their study published in the Rural Special Education Quarterly (March 2002), Ludlow et al. conducted a study to investigate the effects of online courses on the preparation of special education personnel. The study focuses on creating, implementing, and evaluating four online courses for practitioners in West Virginia and the Appalachian region. The findings show that participants gained new knowledge and skills, expressing high satisfaction with the online learning experience. The study, authored by Ludlow and the team, highlights the effectiveness of online instruction for staff development in enhancing the expertise of special education personnel in rural areas.

Kyoungwon Seo, Joice Tang, Ido Roll, Sidney Fels, Dongwook Yoon [6] In online learning, integrating Artificial Intelligence (AI) brings exciting possibilities for personalized learning, task automation, and better assessments. It is currently unclear how AI will affect the interactions between learners and instructors.. These interactions significantly affect student satisfaction and learning outcomes. In a study with 12 students and 11 instructors, there was a shared vision of AI scaling personalized interactions, but concerns about social boundaries emerged. While AI was praised for improving communication, concerns about responsibility and surveillance were noted. This underscores the need for careful AI design, focusing on explainability and ethical practices. The study introduces feasible AI storyboards and practical implications for maximizing its positive impact.

Available online at: <https://jazindia.com>

In pioneering an AI-driven essay grading system, this research leverages advanced natural language processing and Graph-based techniques. Beyond conventional evaluations, the system introduces a unique Graph-based approach to assess sentence similarity. Trained on a labeled dataset, it accurately grades new essays based on content and writing quality. Its seamless integration with existing learning management systems ensures practical implementation in educational frameworks. This work addresses the demand for efficient grading processes, empowering educators to provide insightful feedback. Presented at the [9](2023) ICICCS, the authors, V Suresh, R Agasthiya, J Ajay, A Amrith Gold, and D Chandru, contribute to the discourse on AI in education, presenting a vision for improved assessment methodologies.

Sahil Motwani, Chirag Nagpal, Manav Motwani, Nikhil Nagdev, Anjali Yeole In their May [14] (2021) paper, the authors affiliated with Vivekanand Education Society's Institute of Technology and the University of Mumbai present an innovative solution to the challenges of remote learning examinations. The proposed AI-based integrated system aims to effectively tackle cheating during remote assessments. Beyond identifying fraudulent activities, the system securely stores evidence, providing a comprehensive and cost-effective approach to ensure the integrity of remote examinations.

Wing Shui Ng [13] (2014) research delves into critical design factors for high-quality educational websites, uniquely considering the perspectives of pre-service teachers. Addressing a gap in the literature, the study gathers insights from 70 pre-service teachers, emphasizing the importance of user-friendly navigation and visually appealing multimedia elements. Ng's work, published in "Issues in Informing Science and Information Technology," provides valuable insights into designing effective educational websites.

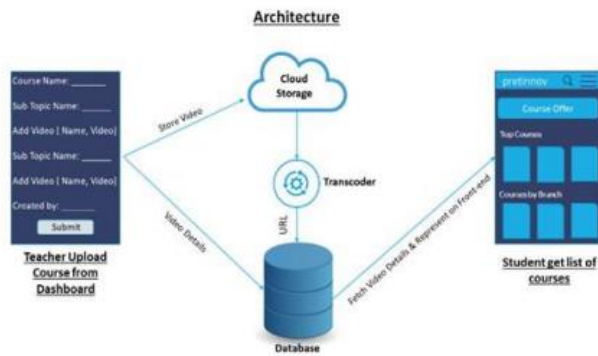
## V. PROPOSED METHODOLOGY

In our current development phase, we are prototyping and defining features for our AI-Integrated Learning Management System (LMS). Through close collaboration with educators, students, and industry professionals, We have collected significant information that will help us improve the design and features of the Learning Management System (LMS). Our team is actively engaged in evaluating AI technologies for secure assessments, dynamic grading, and real-time communication, ensuring the selection of optimal solutions. The development roadmap has been established, outlining the sequence of feature implementation and considering dependencies for a cohesive integration. Currently, we are in the agile development phase, building and refining the LMS iteratively. Regular feedback from stakeholders is being incorporated, and prototypes are being developed to visualize the user interface and functionality. As we progress, our focus remains on quality assurance, ensuring the reliability, security, and usability of the LMS. The team is committed to delivering a user-centric platform, and user training sessions are being planned for instructors, students, and administrators to facilitate a smooth transition to the new system.

Our iterative approach and commitment to continuous improvement drive the ongoing development of the AI-integrated LMS, aiming to provide a transformative and engaging educational experience for all users.

### ***Architectural Pattern--***

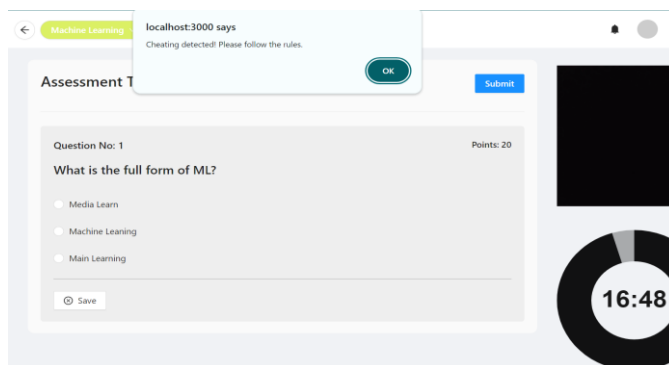
The provided architecture diagram outlines how the entire system will operate. The instructor will upload the course with all the necessary course details from their dashboard. Subsequently, the video will be stored in the cloud storage, while the video link and inputted course details, such as course name and sub-topic, will be saved. After uploading videos/courses from the instructor's side, the details of the video/course are fetched and displayed on the student dashboard. The video resolution is managed by the transcoder, and the data is stored in a database. Students can access courses and videos from their dashboard.



## VI. RESULTS

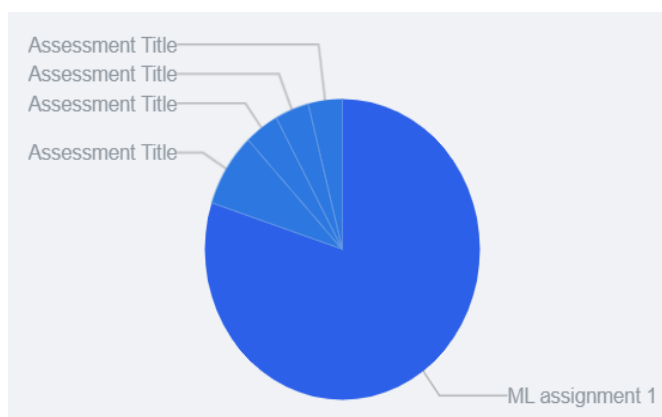
### 1. Secure Assessment with AI Monitoring:

The secure assessment feature employs AI to monitor and analyze the exam environment, ensuring integrity. This includes real-time detection of potential cheating behaviors by capturing and analyzing the surroundings during exams.



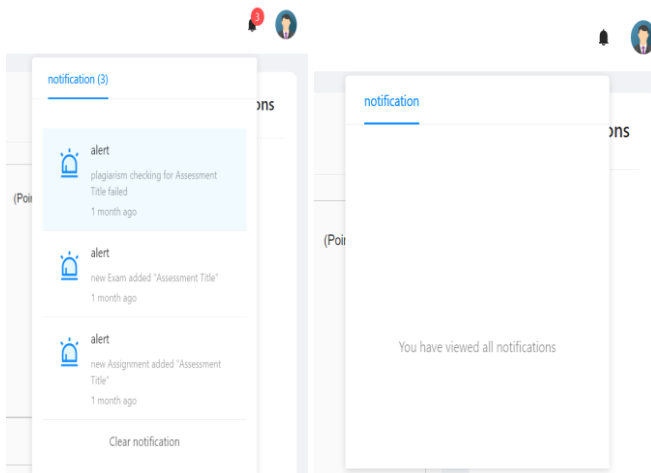
### 2. Dynamic Grading and Visualization:

Our system introduces a dynamic grading system that not only displays grades but also visualizes performance through graphs. This feature provides instructors and students with a comprehensive overview of strengths and areas for improvement.



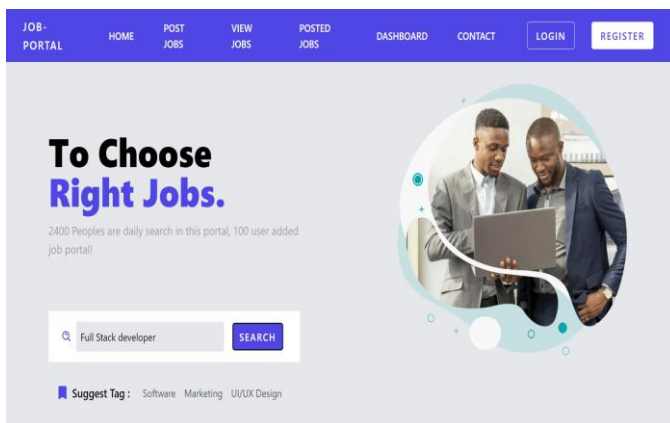
### 3. Instant Alerts and Communication:

The instant alert system ensures timely communication between all members of the learning community, keeping everyone informed about important announcements and fostering a more responsive and engaged environment.



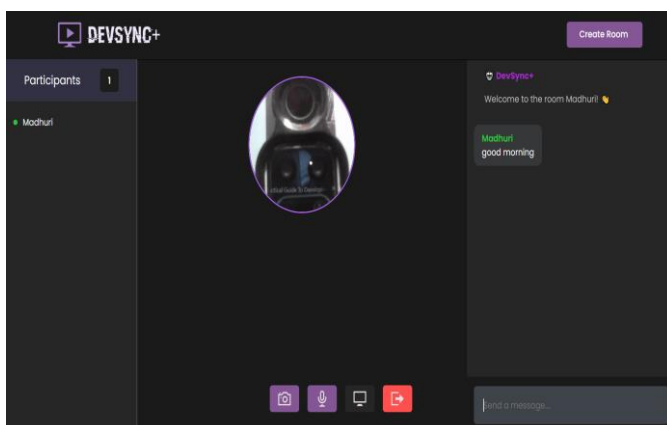
#### 4. Job Portal Integration:

The job portal feature serves as a bridge between education and the professional world. It connects students with relevant employment opportunities, facilitating a seamless transition from academic learning to practical application in the workforce.



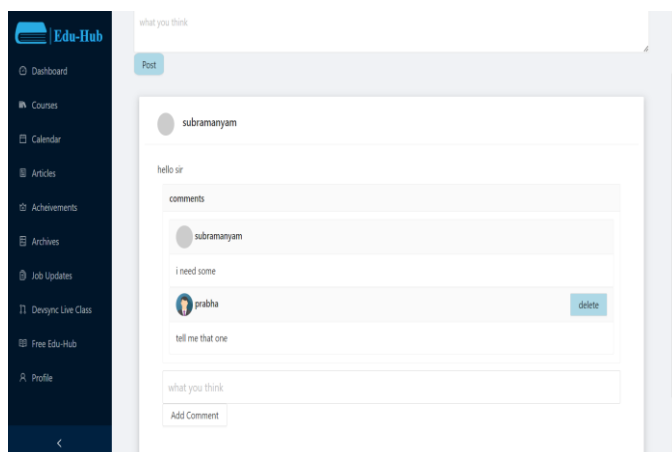
#### 5. Live Meeting Classes:

Live meeting classes bring a real-time, interactive dimension to virtual learning. This feature enables dynamic discussions, Q&A sessions, and collaborative activities, enhancing the overall quality of knowledge transfer.



#### 6. Community Discussion Chat:

The chat feature creates an engaging and collaborative environment for students to discuss and work on projects, fostering a sense of community in virtual learning..



## VII. CONCLUSION

Our Rural Education and Employment Skill Improvement Model, driven by AI, is an innovative solution to address the educational and economic disparities prevalent in rural communities. Our comprehensive Learning Management System utilizes advanced AI algorithms to enrich the learning experience and facilitate the transition from education to employment.

Our approach is tailored to meet the specific needs of rural learners by providing them with personalized learning paths, real-time assessments, and the opportunity to collaborate with local educators. We emphasize foundational skills aligned with contemporary job market demands, ensuring that individuals are equipped with a well-rounded skill set, breaking the cycles of poverty and fostering sustainable economic growth.

Our project includes technological advancements such as secure examination monitoring, dynamic grading systems, and a job portal, reflecting our commitment to creating an inclusive and forward-thinking educational ecosystem. The integration of live meeting classes, community discussion chat, and article creation features further promotes collaborative learning and knowledge sharing, enriching the overall educational experience.

Our AI-integrated LMS project signifies a holistic approach to education, leveraging cutting-edge technology to create a dynamic, interactive, and adaptive learning environment. In the digital era, we aim to redefine the standard for educational excellence by focusing on diverse aspects such as learning, assessment, communication, and career readiness.

Our model serves as a scalable and adaptable solution that transforms rural education and empowers individuals to navigate a rapidly evolving professional landscape. By leveraging the power of AI, our project strives to be a catalyst for positive change, providing a blueprint for a brighter economic future in rural communities.

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