

Examshield AI-Secure Examination and Authentication Platform

Chaithanya S.D, Bharath H. S, Prof. Mahalakshmi

M Postgraduate Student, Department of MCA

Assistant Professor, Department of MCA

Maharaja Institute of Technology, Mysore

Abstract: *The examination process is one of the most important academic activities in educational institutions. Although many colleges and universities have adopted digital examination management systems, several activities such as student eligibility verification, hall ticket generation, and student identity authentication still require manual intervention. These traditional methods increase administrative workload, consume valuable time, and may lead to human errors and security issues such as hall ticket misuse and student impersonation during examinations. Therefore, there is a need for an intelligent and secure examination management system that automates these processes while improving accuracy, efficiency, and transparency.*

This paper presents ExamShield AI, an intelligent examination management and secure hall ticket authentication system developed using React.js, Fast API, Python, MySQL, Artificial Intelligence (AI), Machine Learning, QR Code Authentication, and Face Recognition. The proposed system automates student eligibility verification using a Random Forest Classifier based on attendance, internal assessment marks, fee payment status, and academic records. Eligible students are provided with digitally generated hall tickets containing unique QR codes, while face recognition is used to verify student identity before entering the examination hall. The system also offers centralized management of students, teachers, examinations, attendance, notifications, and reports, thereby reducing manual effort, enhancing examination security, and improving the overall efficiency of examination management in educational institutions..

Keywords: Artificial Intelligence, Examination Management System, Hall Ticket Generation, QR Code Authentication, Face Recognition, Random Forest Classifier, FastAPI, React.js, MySQL

I. INTRODUCTION

The examination process is an essential part of every educational institution as it evaluates students' academic performance and eligibility for certification. Today, many colleges and universities use ERP systems and online examination portals to manage examination activities. However, important tasks such as eligibility verification, hall ticket approval, and student identity verification still require manual intervention. These processes increase administrative workload, consume time, and may lead to human errors and security issues such as hall ticket misuse and student impersonation.

To address these challenges, this paper proposes ExamShield AI, an intelligent examination management and secure hall ticket authentication system. The system automates student eligibility verification using a Random Forest Classifier, generates digital hall tickets with unique QR codes, and verifies student identity through face recognition using a laptop webcam. Developed using React.js, Fast API, Python, and MySQL, the proposed system improves examination security, reduces manual effort, and provides a centralized platform for efficient examination management.



A. Contribution

The major contributions of the proposed system are:

- Development of an AI-based examination management system.
- Automated student eligibility prediction using Random Forest.
- Digital hall ticket generation with QR code authentication.
- Face recognition for secure student verification.
- Centralized management of students, teachers, examinations, and reports.
- Improved security, transparency, and efficiency in the examination process.

II. RELATED WORK AND RESEARCH GAP

The rapid growth of digital technologies has significantly transformed examination management in educational institutions. Many colleges and universities have implemented Enterprise Resource Planning (ERP) systems and online examination portals to manage student registration, examination scheduling, hall ticket generation, attendance, and result processing. These systems have reduced paperwork and improved administrative efficiency by maintaining examination records in a centralized database. Several researchers have also proposed web-based examination management systems that simplify communication between students, teachers, and administrators while providing online access to examination-related information.

Recent advancements in Artificial Intelligence (AI), Machine Learning (ML), QR code technology, and biometric authentication have further enhanced examination management. AI techniques have been applied to automate academic decision-making, while QR codes have been introduced for secure hall ticket verification and digital attendance management. Similarly, face recognition technology has been adopted to verify student identity during examinations and prevent impersonation. These technologies improve security and reduce manual effort; however, most existing systems implement only one or two of these features instead of providing a complete and integrated examination management solution.

Despite these developments, several limitations still exist in current examination systems. Student eligibility verification is generally performed manually by checking attendance percentage, internal assessment marks, examination fee payment, and backlog records. Hall ticket generation often requires administrative approval before students can download their hall tickets. In addition, student identity verification mainly depends on printed hall tickets and college identity cards, which increases the possibility of unauthorized entry and impersonation. These manual procedures consume time, increase administrative workload, and may lead to human errors during examination management.

Research Gap:

From the literature survey, it is evident that existing examination management systems primarily focus on digitizing administrative tasks such as examination registration, hall ticket generation, and result management. Although these systems improve operational efficiency, they provide limited support for intelligent eligibility verification and secure student authentication. AI-based eligibility prediction, QR code verification, and face recognition are generally implemented as separate solutions and are rarely integrated into a single platform. To overcome these limitations, the proposed ExamShield AI integrates AI-based eligibility prediction using the Random Forest Classifier, automated hall ticket generation, QR code authentication, face recognition, centralized examination management, notifications, and report generation within a single web-based application. By combining these features, the proposed system enhances examination security, reduces administrative workload, minimizes manual errors, and provides an intelligent, secure, and efficient examination management solution for modern colleges and universities.

III. METHODOLOGY

The proposed ExamShield AI system is designed to automate and secure the examination management process by integrating Artificial Intelligence, QR code authentication, and face recognition into a single web-based platform. The



system follows a structured workflow that begins with student registration and ends with secure examination verification. It consists of several modules, including data collection, data preprocessing, AI-based eligibility prediction, hall ticket generation, QR code authentication, face recognition, and report generation. The application is developed using React.js for the frontend, FastAPI and Python for backend processing, and MySQL for centralized data management.

3.1 Data Collection

The system collects academic and examination-related information from students, teachers, and administrators. The collected data includes student personal details, attendance percentage, internal assessment marks, examination fee status, backlog information, examination schedules, and subject details. This information is securely stored in the MySQL database and is used for eligibility prediction, hall ticket generation, and examination management.

3.2 Data Pre-processing

The collected data is validated and organized before it is used by the AI model. Missing or incorrect records are removed, and the data is converted into a structured format suitable for machine learning. Attributes such as attendance, internal marks, fee payment status, and backlog details are prepared as input features for the eligibility prediction model.

3.3 AI-Based Eligibility Prediction

The system uses the Random Forest Classifier, a supervised machine learning algorithm, to predict whether a student is eligible to appear for the examination. The model analyzes attendance percentage, internal assessment marks, fee payment status, and backlog information to generate the prediction. Students identified as eligible can proceed to the hall ticket generation process, while ineligible students are informed about the reason for their ineligibility.

3.4 Hall Ticket Generation

After successful eligibility verification, the system automatically generates a digital hall ticket for each eligible student. The hall ticket contains student information, examination details, subject information, examination center, and a unique QR code for secure verification.

3.5 QR Code Authentication

A unique QR code is generated for every hall ticket using Python QR code libraries. On the examination day, the QR code is scanned using the invigilator's laptop webcam. The system verifies the QR code by comparing it with the information stored in the MySQL database. If the details match, the student is authenticated and allowed to proceed for further verification.

3.6 Face Recognition Authentication

After QR code verification, the student's identity is verified using face recognition. The laptop's built-in webcam captures a live image of the student and compares it with the registered facial image stored in the database using OpenCV and the Face Recognition library. If both images match, the student is successfully authenticated before entering the examination hall.

3.7 Report Generation

The system automatically generates examination reports containing student eligibility status, attendance records, hall ticket information, and examination details. These reports help administrators monitor examination activities, maintain centralized records, and simplify administrative tasks.



IV. DATASET DESCRIPTION

The performance of the proposed ExamShield AI system depends on the academic and examination data collected from students. The dataset consists of student information required for eligibility prediction and examination management. It includes attendance percentage, internal assessment marks, examination fee payment status, backlog details, semester information, examination schedules, and hall ticket records. These data are stored in a centralized MySQL database and are used by the AI model to predict student eligibility and manage examination activities efficiently.

A. Dataset Distribution

The dataset contains records collected from different users of the system, including students, teachers, and administrators. Student records include personal information, attendance, internal marks, fee payment status, and backlog details. Teacher records contain attendance and internal assessment updates, while examination records include subject details, examination dates, hall allocation, and hall ticket information. The collected data is divided into training data for the AI eligibility model and operational data for examination management.

DATASET DISTRIBUTION – EXAMSHIELD AI

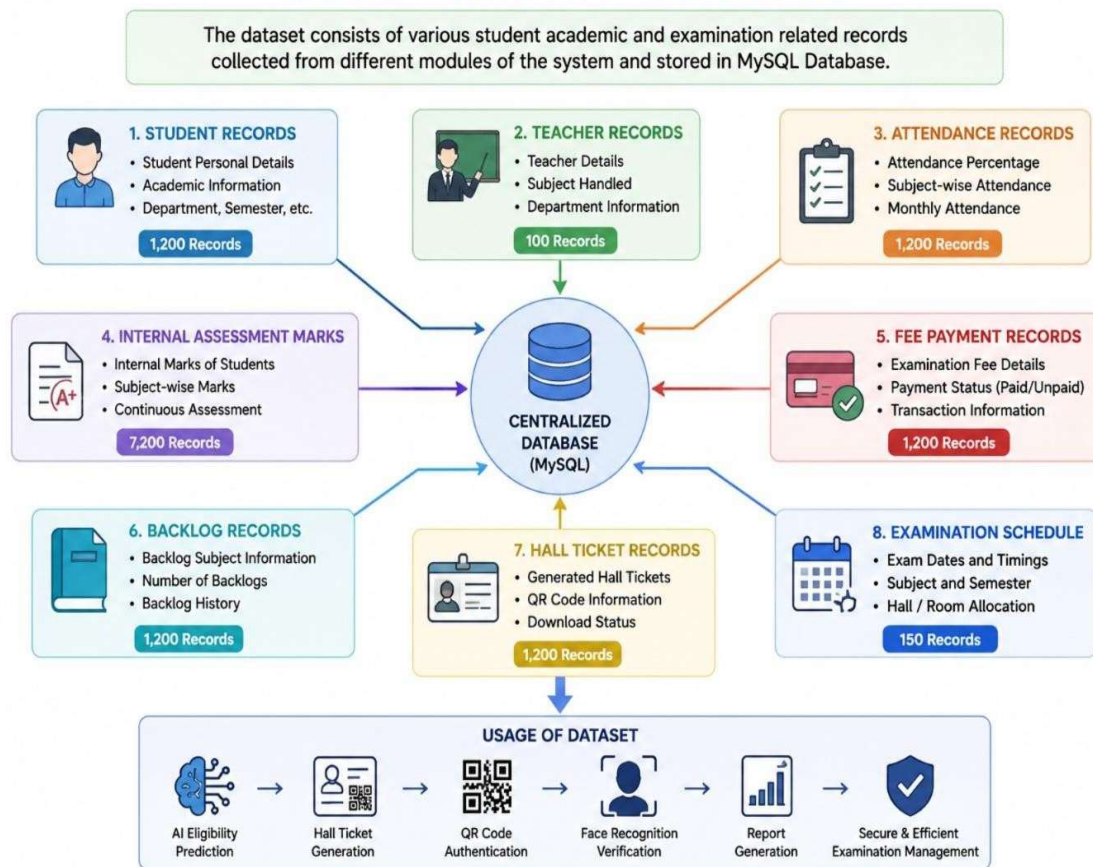


Figure 1: Dataset Distribution Examshield AI Records

B. Statistical Analysis

Before training the AI model, the collected data is preprocessed by removing incomplete records and organizing the data into a structured format. The Random Forest Classifier uses attendance percentage, internal assessment marks, fee payment status, and backlog information as input features to predict student eligibility. Statistical analysis helps



understand the distribution of the dataset and ensures that the data is suitable for machine learning and examination management..

STATISTICAL ANALYSIS OF EXAMSHIELD AI PROJECT



Figure 2: Statistical Summary of Examshield AI Features

V. IMPLEMENTATION

The proposed ExamShield AI: Smart Hall Ticket and Authentication Platform was developed to provide a secure and efficient way to manage examination activities. The system uses Python with Django framework for backend development, React for frontend development, and MySQL database for storing student details, examination records, hall tickets, and authentication data. The system integrates AI-based eligibility verification, QR code authentication, and face recognition to improve examination security

A. Student Management and Eligibility Verification

The implementation starts with collecting and managing student details such as personal information, attendance, internal marks, fee status, and academic records. The system automatically checks student eligibility based on predefined examination rules. Students who satisfy the required conditions are allowed to generate hall tickets, while others are marked as non-eligible.

B. Hall Ticket Generation and QR Authentication

The system automatically generates digital hall tickets for eligible students. Each hall ticket contains student details, examination information, and seating details. A unique QR code is generated for every hall ticket. During the examination, the QR code is scanned to verify the authenticity of the hall ticket and prevent fake or unauthorized entries.



C. Face Recognition Authentication

The face recognition module is used to verify student identity during examination entry. Student face data is collected during enrollment and stored securely. During verification, the system captures the student's face using a camera and compares it with the registered face data. Successful matching confirms the student's identity and allows examination access.

D. Examination and Seating Management

The examination management module helps administrators manage subjects, exam schedules, classrooms, and student details. The system automatically creates seating arrangements based on available rooms and student capacity. This helps to organize the examination process effectively.

E. Attendance and Notification System

The attendance module records student attendance after successful authentication. The system stores attendance details along with examination information. A notification system is also included to provide updates about hall tickets, exam

F. AI Chatbot and Prediction Module

An AI-based chatbot is integrated to answer common student queries related to examinations and hall tickets. The system also uses machine learning techniques to analyze student information and predict examination eligibility based on academic details.

G. Web Application Development

The user interface is developed using React, HTML5, CSS3, and Tailwind CSS to provide a simple and interactive experience. The application provides separate dashboards for administrators, teachers, and students. Administrators can manage examination details, teachers can handle exam-related activities, and students can access hall tickets and notifications.

H. Database Management and Report Generation

The system uses MySQL database to store and manage student details, examination records, hall tickets, attendance, QR verification details, and reports. The system generates reports containing examination information, authentication status, and attendance details for future reference.



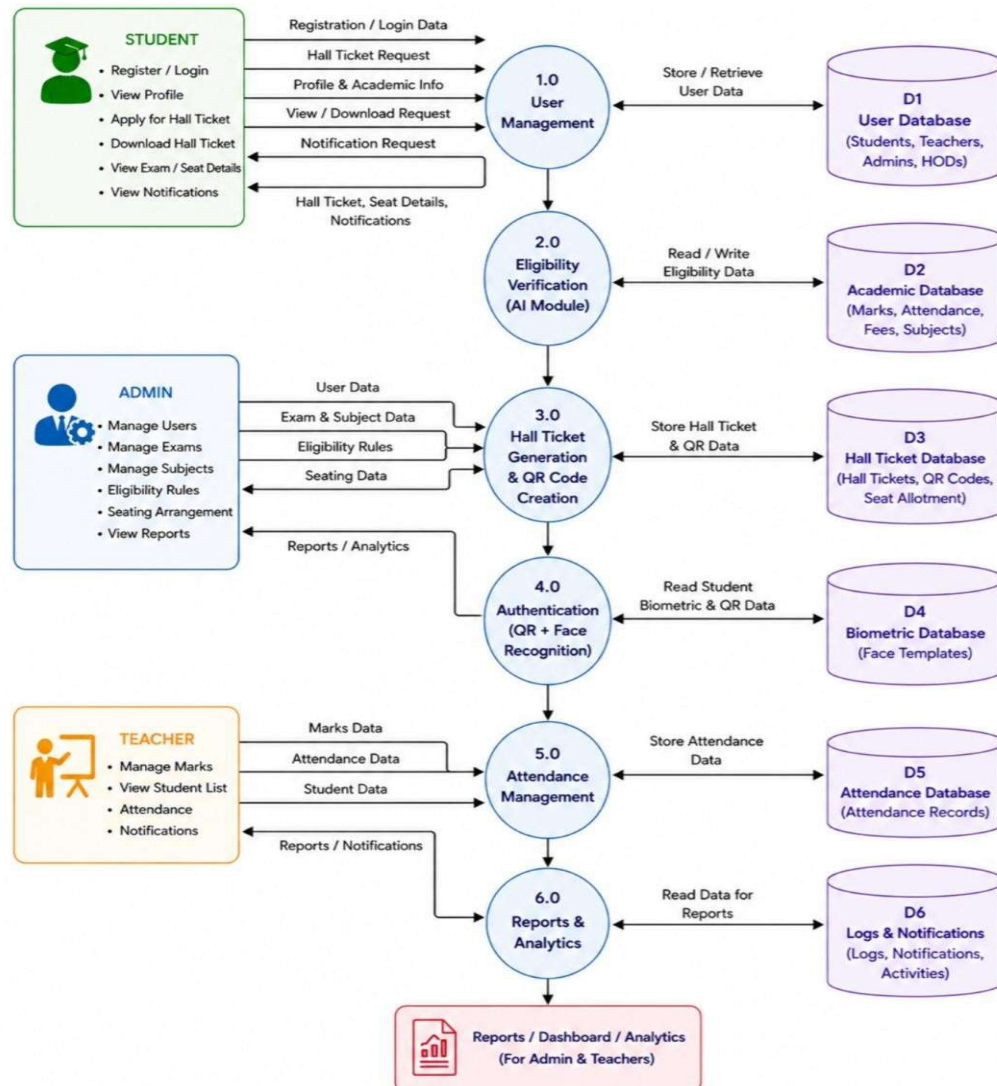


Figure 3: Workflow of the Intelligent ATS Resume Optimization and Career Intelligence System

VI. FUTURE WORK

The future scope of the ExamShield AI: Smart Hall Ticket and Authentication Platform focuses on improving security, automation, and scalability by integrating more advanced technologies. In the future, the system can be enhanced with advanced AI-based fraud detection techniques to identify suspicious activities during examinations, such as unauthorized access and malpractice attempts. A mobile application can be developed to allow students, teachers, and administrators to easily access examination-related services anytime and anywhere. The system can also be deployed on cloud platforms to support multiple institutions with secure and scalable data management. Further improvements can be made in the face recognition module by using advanced deep learning models to achieve higher accuracy under different environmental conditions. Real-time examination monitoring using AI-based video analysis can be integrated to detect unusual activities during exams. Blockchain technology can also be implemented to securely maintain examination records and certificates. Additionally, predictive analytics can be introduced to analyze examination data and provide useful insights for better



academic management. Integration with existing college ERP systems can further automate data exchange and improve overall efficiency. These future enhancements can transform ExamShield AI into a more intelligent, secure, and reliable examination management platform for modern educational institutions.

VII. CONCLUSION

The ExamShield AI: Smart Hall Ticket and Authentication Platform provides a secure and efficient solution for managing examination processes in educational institutions. The system successfully integrates Artificial Intelligence, Machine Learning, QR code authentication, and face recognition technologies to improve examination security and reduce unauthorized access. It automates important tasks such as student eligibility verification, hall ticket generation, seating arrangement, attendance management, and examination record maintenance. The use of QR-based verification and face recognition ensures reliable student authentication and helps prevent impersonation during examinations. The AI-based eligibility module improves accuracy by automatically analyzing student information and determining examination eligibility. With a user-friendly interface and centralized database management, the system simplifies examination administration and provides better control over academic records. Overall, ExamShield AI offers a reliable, secure, and intelligent platform that enhances the efficiency of modern examination management systems and provides a strong foundation for future improvements.

REFERENCES

- [1] F. Schroff, D. Kalenichenko, and J. Philbin, "FaceNet: A Unified Embedding for Face Recognition and Clustering," in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 815–823, 2015.
- [2] P. Viola and M. Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features," in Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 2001.
- [3] M. Turk and A. Pentland, "Eigenfaces for Recognition," Journal of Cognitive Neuroscience, vol. 3, no. 1, pp. 71–86, 1991.
- [4] A. K. Jain, A. Ross, and S. Prabhakar, "An Introduction to Biometric Recognition," IEEE Transactions on Circuits and Systems for Video Technology, vol. 14, no. 1, pp. 4–20, 2004.
- [5] X. Yang, D. Wu, X. Yi, J. H. M. Lee, and T. Lee, "iExam: A Novel Online Exam Monitoring and Analysis System Based on Face Detection and Recognition," 2022.
- [6] L. Breiman, "Random Forests," Machine Learning, vol. 45, pp. 5–32, 2001.
- [7] T. M. Mitchell, "Machine Learning," McGraw-Hill Education, 1997.
- [8] C. M. Bishop, "Pattern Recognition and Machine Learning," Springer, 2006.
- [9] J. Han, M. Kamber, and J. Pei, "Data Mining: Concepts and Techniques," 3rd ed., Morgan Kaufmann Publishers, 2012.
- [10] A. Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow," 3rd ed., O'Reilly Media, 2022.
- [11] T. Nguyen, B. Lakshmanan, and W. Sheng, "A Smart Security System with Face Recognition," 2018.
- [12] B. W. Mugalu, R. C. Wamala, J. Serugunda, and A. Katumba, "Face Recognition as a Method of Authentication in a Web-Based System," 2021.
- [13] Python Software Foundation, "Python Documentation." Available: <https://docs.python.org/3/>
- [14] Django Software Foundation, "Django Web Framework Documentation." Available: <https://docs.djangoproject.com/>
- [15] OpenCV Team, "OpenCV Documentation." Available: <https://opencv.org/>

