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EEXAMPRO: A WEB-BASED ADMISSION AND PROGRAM CHECKER WITH MACHINE LEARNING

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Abstract. The increasing demand for an efficient and data-driven admission process has necessitated the development of eExamPro: A Web-Based Admission and Program Checker with Machine Learning. This study aims to modernize entrance examinations by automating test administration, real-time scoring, and personalized program recommendations using machine learning algorithms, improving decision-making for both students and institutions. The system provides a comprehensive platform for admissions management, integrating a secure offline examination system with a machine learning-driven course recommendation engine. It streamlines applicant evaluation by automating exam distribution, scoring, and result processing, ensuring consistency and reducing human error while offering institutions insights into student performance trends for data-driven decision-making. eExamPro features an adaptive testing mechanism, a personalized course suggestion system, and real-time data visualization tools for admissions officers. It allows applicants to take exams offline, ensuring accessibility. Administrators can monitor exam statistics, program demand, and student performance trends through dynamic dashboards, enabling improved institutional planning. The system's external interface includes a responsive web-based platform with multi-device compatibility. It supports user authentication, secure communication protocols, and seamless integration with institutional databases. Additionally, it provides customizable role-based access for administrators, program heads, and applicants, ensuring data privacy and a structured, efficient admissions workflow. Beyond functional requirements, eExamPro ensures high performance, security, and usability. It incorporates scalable infrastructure, automated backups, data encryption, and access control policies. The system adheres to educational data privacy regulations, maintaining audit trails and compliance measures for secure handling of student and institutional records. In conclusion, eExamPro revolutionizes the admission process, offering an intelligent, automated, and scalable solution for educational institutions. The system enhances efficiency, accuracy, and fairness in entrance examinations and program selection. Future enhancements include expanded AI capabilities for deeper academic analytics and integration with broader student information systems to support long-term academic planning.

Keywords. *Web-Based Admission, Machine Learning, Entrance Examinations, Real-Time Scoring, Personalized Program Recommendations, Data-Driven Decision Making Student Information Systems*

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1. INTRODUCTION

Background of the Study. The increasing demand for efficient and data-driven admission processes in educational institutions has highlighted the need for innovative solutions that can streamline operations, reduce manual effort, and improve decision-making. Traditional entrance exams, although widely used, often rely on labor-intensive methods such as manual test administration, grading, and result processing. These processes can lead to errors, delays, and inefficiencies that affect both administrators and applicants [1].

This capstone project introduces eExamPro, a web-based admission and program checker system enhanced by machine learning. The system aims to modernize and automate the entrance examination process, offering an efficient, scalable, and data-driven solution for educational institutions. By leveraging machine learning algorithms, the system not only automates exam distribution, scoring, and result processing but also provides personalized program recommendations based on applicants' performance and preferences [2].

The current system for administering entrance exams and course recommendations in most institutions remains relatively traditional, relying on paper-based tests, manual grading, and static course suggestions. As institutions expand, this method becomes increasingly unsustainable, leading to delays and errors in processing applications [3]. To address this, eExamPro integrates machine learning techniques to enhance the admission process, providing students with tailored recommendations and institutions with data-driven insights [4].

The eExamPro system is designed to handle multiple administrative functions, including the secure distribution of entrance exams, real-time grading, and providing immediate feedback to applicants. Its integration of machine learning allows it to offer personalized course recommendations, guiding applicants towards academic paths that align with their strengths, interests, and career aspirations. By streamlining the admission process and enhancing decision-making, this system aims to improve the efficiency, fairness, and accuracy of student placement in educational programs [5].

In the context of ASEAN countries, including the Philippines, where educational access is a growing concern, systems like eExamPro have the potential to significantly impact student success rates. By reducing administrative burden and personalizing student placement, educational institutions can better serve diverse student populations, ensuring that each applicant is aligned with a program suited to their skills and future goals. This study focuses on the design, development, and implementation of the eExamPro system as a modern solution to the challenges faced by higher education institutions in the region [6].

Purpose of the Study. The purpose of this study is to develop eExamPro: A Web-Based Admission and Program Checker with Machine Learning, a system that will assist educational institutions in managing their admission processes more effectively. This study aims to automate the entrance exam procedure, from test distribution and real-time scoring to personalized course recommendations for applicants based on their exam performance and academic interests. By utilizing machine learning algorithms, the system will continuously improve its ability to suggest suitable academic programs, ensuring better alignment between applicants' strengths and the programs they are matched to [7][8].

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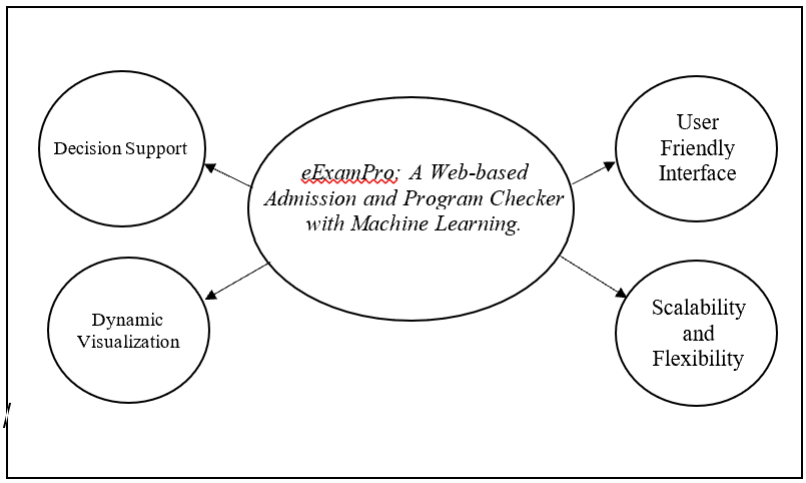
2. PRODUCT DESCRIPTIONS

eExamPro: A Web-Based Admission and Program Checker with Machine Learning is a comprehensive system designed to address the inefficiencies of traditional admission processes in educational institutions. The system automates entrance exam administration, grading, and result processing while offering personalized course recommendations based on applicants' academic strengths, interests, and preferences. Through machine learning algorithms, the system continually improves its recommendations, ensuring better alignment between student capabilities and academic program offerings.

Figure 1.
eExamPro Features Diagram



The system is designed to be scalable, ensuring that it can handle an increasing number of applicants over time without sacrificing performance. Its flexible architecture allows it to integrate seamlessly with existing institutional systems and databases, providing real-time analytics and decision support tools for administrators. eExamPro also ensures a high degree of accessibility by being a web-based solution that works across various devices, including desktops, laptops, and smartphones. This ensures that users can interact with the system no matter their location or device preferences. The system's machine learning model evaluates applicant data and generates course recommendations tailored to each student's performance and aspirations. The adaptive learning feature allows the system to refine its recommendations over time as more data is collected, enhancing both the accuracy and relevance of the suggestions. Additionally, eExamPro provides comprehensive administrative tools, including real-time reporting, applicant performance tracking, and data visualization features, which allow institutions to make more informed decisions about student placement and resource allocation.

Operating Environment. eExamPro operates in a hybrid environment, combining both web-based and offline functionality to meet the needs of diverse institutions. While the system is primarily hosted on a cloud server for scalability and accessibility, it can also function offline for in-person examinations. This ensures that institutions with limited or intermittent internet access can still benefit from its capabilities, offering a seamless experience regardless of the operational context.

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For educational institutions, eExamPro offers a solution that integrates smoothly with existing student information systems (SIS) and learning management systems (LMS), allowing data sharing and system updates to occur in real-time. This integration ensures that administrators, program heads, and students can access the latest information regarding exams, scores, and course recommendations without delay.

Design and Implementation Constraints. The design and implementation of eExamPro come with certain constraints, primarily related to data security, privacy, and scalability. As the system processes sensitive student data, robust security protocols such as data encryption, role-based access control (RBAC), and secure communication channels are critical to protecting user information. Compliance with regulations such as the Data Privacy Act of 2012 is a fundamental design requirement to ensure the system meets legal and ethical standards for data protection. Another constraint is the need for continuous improvement of the machine learning algorithms. While eExamPro starts with a basic recommendation model, the system's effectiveness increases as more data is processed, requiring regular updates to the model. These updates ensure that the system adapts to changes in student preferences, program offerings, and educational trends, maintaining the system's relevance and accuracy over time.

Table 1.
Recommended Hardware Requirements

Hardware Environment	Minimum Requirements
Processor	Core i5 or higher
Memory (RAM)	8 GB RAM or higher
Storage Space	1 TB
Computer Monitor	LED 1280 x 800 minimum screen resolution.

eExamPro is built to support scalability, which requires careful planning for hardware and software resources. As the number of applicants and the amount of data increases, the system must be able to handle higher traffic volumes without performance degradation. The hybrid deployment model also requires that both online and offline components be maintained and synchronized to ensure consistency in system operations.

Table 2.
Recommended Software Requirements

Software Environment	Minimum Requirements
Operating System	Windows
Web Server	Apache
Database	MySQL 5.7 or higher
PHP Framework	Laravel 8. x
Browser Compatibility	Latest Chrome, Firefox, Safari
Documentation	Microsoft Word 2019
Collaboration	Google Hand Outs

Assumptions and Dependencies. For eExamPro to operate effectively, several assumptions and dependencies must be met. It is assumed that educational institutions will have the necessary technological infrastructure to support the system, including internet access, compatible devices, and an existing SIS or LMS for integration. Additionally, the system assumes that students and administrators will receive adequate training on how to use the platform, ensuring a smooth transition from traditional methods to the automated system [9]. The success of **eExamPro** also depends on the availability of high-quality data for machine learning analysis. The system's recommendation capabilities are only as good as the data it processes, making it essential for institutions to maintain accurate and comprehensive records. As more data is gathered, the system will continue to refine its course recommendations, making it increasingly effective over time [10].

3. SYSTEM FEATURES

System Decomposition. eExamPro: A Web-Based Admission and Program Checker with Machine Learning is comprised of several interconnected modules, each designed to address specific aspects of the admission and program recommendation process. These modules include data acquisition, preprocessing, machine learning-based recommendation engines, adaptive learning, user interfaces, and administrative functions. The integration of these modules ensures a streamlined, intuitive experience for all users, including students, administrators, and program heads.

The system’s modular architecture allows for scalability, enabling it to handle growing volumes of user data and increasing numbers of applicants over time. As more data is processed, the system continuously refines its machine learning models, ensuring more accurate and personalized course recommendations. This flexibility makes eExamPro adaptable to the changing needs of educational institutions.

System Functionalities. The system offers several critical functionalities aimed at improving the efficiency and accuracy of the admission process. These features are designed to reduce manual effort, enhance decision-making, and ensure a fair evaluation for all applicants. The primary functionalities of the system include: 1) Automated Entrance Exams: Applicants can access and complete their entrance exams online, and the system automatically scores their responses. This automation ensures fast and accurate evaluation while minimizing the chances of human error. The system supports multiple question formats, such as multiple-choice and short-answer questions, making it adaptable to various testing needs. 2) Real-Time Feedback: Upon completing the exam, students receive immediate feedback on their performance, including detailed scores and personalized course recommendations. This prompt feedback allows students to make well-informed decisions about their academic future, based on their strengths and preferences. 3) Course Recommendation System: Using machine learning algorithms, the system analyzes students' performance data, interests, and preferences to recommend academic programs that best align with their strengths and career goals. This personalized approach enhances the likelihood that students will succeed in their chosen programs, fostering a better educational experience. 4) Dynamic Analytics and Reporting: Administrators and program heads benefit from real-time dashboards and reporting tools that provide insights into applicant performance, program demand, and other critical metrics. These tools support data-driven decision-making, allowing institutions to optimize their admissions processes and allocate resources efficiently. 5) Security and Data Protection: The system incorporates robust security features to protect sensitive student data. These features include encryption, role-based access control (RBAC), and secure authentication methods to prevent

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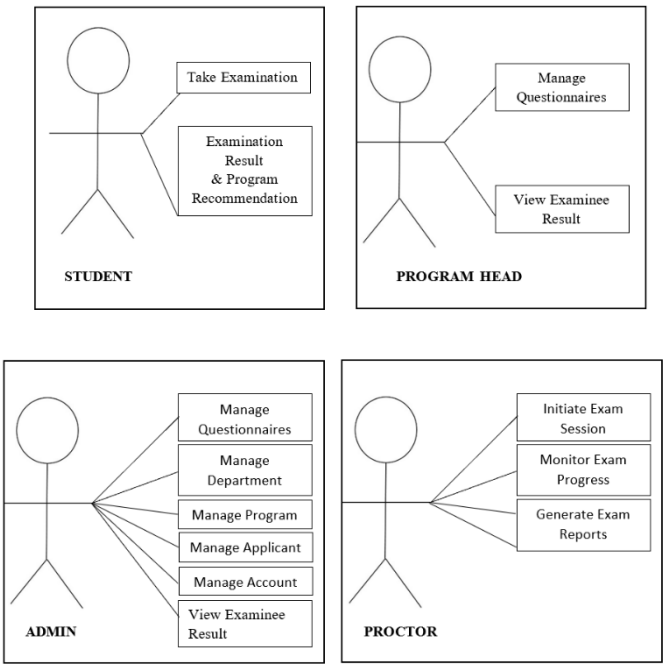
unauthorized access. The system adheres to data privacy regulations, ensuring the integrity and confidentiality of applicant information. 6) User-Friendly Interface: Designed with usability in mind, eExamPro offers an intuitive interface that caters to users with varying levels of technical expertise. The user experience is tailored to the specific role of the user, with students, administrators, and program heads all receiving access to relevant features and functions based on their individual needs.

Figure 2.
Use Case Diagram



System Features. eExamPro integrates several essential features to enhance the admission process. 1) The Entrance Exam Management feature enables institutions to configure, administer, and manage exams, offering flexibility with online and offline modes and providing real-time feedback on results. 2) The Adaptive Learning feature dynamically adjusts exam difficulty based on student performance, ensuring personalized challenge levels and accurate assessment of capabilities. 3) The Course Recommendation Engine analyzes student data to provide tailored academic program suggestions, which improve over time as the system processes more data. 4) Data Visualization tools allow administrators to track key metrics and trends through dynamic, visually engaging reports, aiding in quick decision-making. 5) Multi-role user access ensures that each user can only view data relevant to their role, maintaining data security. 6) Advanced Security and Privacy measures, including encryption and RBAC, protect sensitive information and ensure compliance with privacy regulations such as the Data Privacy Act of 2012.

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4. EXTERNAL INTERFACE REQUIREMENTS

User Interfaces. The eExamPro system provides an intuitive and user-friendly interface designed to meet the needs of various user roles, including students, administrators, and program heads. The student interface allows for easy navigation, with access to entrance exams, results, personalized course recommendations, and application status. Administrators and program heads have access to an administrative dashboard that provides real-time insights into applicant performance, exam results, and system activity. The interface is responsive and optimized for various devices, including desktops, laptops, and smartphones, ensuring a seamless experience regardless of the user's device preference.

Hardware Interfaces. eExamPro is a web-based platform and, therefore, has minimal hardware requirements. Users must have access to a device with an internet connection and a modern web browser (e.g., Google Chrome, Mozilla Firefox, Safari). Institutions will need to ensure that students and administrators have access to devices with adequate processing power and internet connectivity to support smooth interaction with the system. For offline exam capabilities, institutions may need to deploy local servers or devices that can store and process exams until they can be synchronized with the central system.]

Software Interfaces. The system integrates with existing Student Information Systems (SIS), Learning Management Systems (LMS), and Applicant Tracking Systems (ATS) commonly used in educational institutions. Through Application Programming Interfaces (APIs), eExamPro can seamlessly exchange data with these systems to provide a unified view of student performance, exam results, and course placements. Additionally, the system supports integration with cloud-based platforms for data storage and management, ensuring that institutional data is secure and easily accessible for authorized users.

Communication Interfaces. eExamPro communicates with users through web-based protocols (HTTP/HTTPS), ensuring that all data transmitted between the system and users is encrypted for security. The system uses email notifications to inform students about their exam schedules, results, and personalized recommendations. Administrators receive real-time alerts regarding system activity, application statuses, and exam results. In the case of offline functionality, data synchronization with the central server occurs through secure communication protocols to ensure data integrity.

External System Requirements. To ensure smooth operation, eExamPro requires integration with external databases, including institutional data sources (e.g., SIS, LMS) and cloud storage platforms for data storage and backup. The system must also support integration with third-party payment gateways for processing fees related to entrance exams. Educational institutions should have a reliable internet connection to maintain continuous communication between the system and external platforms. In addition, to protect data privacy, eExamPro must comply with relevant legal standards, such as the Data Privacy Act of 2012, and ensure that all data exchanges with external systems are encrypted and secure.

5. OTHER NONFUNCTIONAL REQUIREMENTS

The eExamPro system is designed to handle a large volume of simultaneous users without performance degradation. The system must be capable of supporting at least 1,000 concurrent users during peak admission periods, ensuring that users can access exams, receive feedback, and generate recommendations without delays. Response times for key actions, such as submitting exam answers or generating reports, should not exceed 3 seconds under normal operating conditions. The system should also be optimized for minimal downtime, with 99.9% system uptime expected annually.

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Security is a primary concern for eExamPro, particularly given the sensitive nature of the data involved. The system must implement data encryption for all stored and transmitted data to protect student information. It must also employ role-based access control (RBAC) to ensure that only authorized personnel can access certain functionalities and data. Additionally, the system should be compliant with data privacy laws, including the Data Privacy Act of 2012, ensuring that student data is protected and handled according to legal standards. Regular security audits and penetration testing should be conducted to identify and address any vulnerabilities.

The system must ensure high availability, particularly during peak times such as entrance exam periods and admissions deadlines. The system should be available 24/7, with planned maintenance periods occurring during off-peak hours, if necessary. In the event of system failure, a backup and disaster recovery plan should be in place to restore functionality within 30 minutes. The system must also support data redundancy, ensuring that critical data is backed up in real-time across multiple locations. The system should be designed with ease of maintenance in mind. All source code must be documented thoroughly to enable developers to make future updates, bug fixes, and enhancements efficiently. The system should also support the addition of new modules or features without disrupting existing functionality. Regular updates, patches, and versioning should be supported, with an automated update mechanism to ensure the system is always up-to-date with the latest security features and performance optimizations. eExamPro is intended to be a user-friendly system, accessible to individuals with varying levels of technical expertise. The system should feature a clear and intuitive user interface (UI) for all user roles—students, administrators, and program heads. Comprehensive help guides, tooltips, and onboarding tutorials should be available to assist new users in understanding the system's functionality. The system should be responsive, providing a consistent experience across devices such as desktops, tablets, and smartphones. Additionally, the system must be accessible to users with disabilities, following the Web Content Accessibility Guidelines (WCAG 2.1) to ensure compliance with accessibility standards. Compatibility with the most commonly used web browsers, including Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge. The system should also be able to integrate with existing institutional software, such as Student Information Systems (SIS), Learning Management Systems (LMS), and Applicant Tracking Systems (ATS). The system should support integration via API or other standard data exchange protocols, enabling seamless communication between eExamPro and other software platforms used by educational institutions. The system must comply with all relevant regulatory and legal requirements, including those related to data protection and privacy. This includes adherence to the Data Privacy Act of 2012 (Philippines) and similar international standards, ensuring that personal and sensitive data is handled in accordance with national and global laws. Additionally, the system should comply with education regulations regarding the handling of student data, exam records, and admissions processes.

6. PROJECT MANAGEMENT

The eExamPro system aims to modernize and automate the admission process by integrating web-based exam management and machine learning-driven course recommendations. The project scope includes the design, development, testing, and deployment of the system to ensure its functionality, security, scalability, and user-friendliness. The system will include user interfaces for students, administrators, and program heads, along with backend functionalities such as real-time exam scoring, data processing, and machine

learning-based recommendations. Additionally, the system will integrate with existing Student Information Systems (SIS) and Learning Management Systems (LMS) to streamline data exchange and offer a cohesive experience for educational institutions. The project will be executed in several phases to ensure smooth delivery. The initiation phase will involve gathering requirements, defining the project scope, and identifying key stakeholders. In the planning phase, detailed project plans will be developed, including timelines, resource allocation, budget estimations, and risk management strategies. The design phase will focus on system architecture, UI/UX design, and the creation of machine learning models. The development phase will include coding, database setup, and integrating machine learning models, followed by extensive testing to ensure functionality, performance, and security. Once testing is complete, the system will enter the deployment phase, which will include training for administrators and users, as well as data migration and system configuration. Post-deployment, the project will enter the maintenance phase, where updates, bug fixes, and support will be provided.

Efficient resource management is key to project success, requiring a skilled team. This includes the project manager overseeing the project, software developers responsible for coding and integration, UI/UX designers crafting the user interface, data scientists refining machine learning models, and quality assurance engineers performing testing and validation. System administrators will ensure smooth deployment and post-launch maintenance. The project will be executed according to a defined timeline, with clear milestones and deadlines, monitored using project management tools like Trello, Asana, or Jira. A well-defined budget will cover development costs, infrastructure, and training. Regular budget reviews will ensure financial efficiency, while risk management strategies will address issues like data security, integration challenges, and user adoption. Risks such as data breaches will be mitigated through encryption and compliance with privacy regulations, while integration issues will be tackled through early-stage testing and close collaboration with IT departments. To ensure high-quality outcomes, the project will adhere to best practices, including regular code reviews, extensive testing, and user feedback throughout the development lifecycle.

7. SUMMARY

The system is designed to address the challenges faced by educational institutions in managing the admissions process by leveraging web-based technology and machine learning algorithms. It aims to automate the entire admission process, including exam administration, grading, result processing, and personalized course recommendations based on applicants' performance and preferences. The system's ability to provide immediate feedback to students and offer tailored academic pathways enhances the efficiency and fairness of the admission process. With scalable architecture, eExamPro can accommodate increasing numbers of applicants while ensuring seamless user experiences across devices. The project is divided into several phases, including initiation, planning, design, development, testing, deployment, and maintenance. Each phase is designed to ensure the system meets its functional and nonfunctional requirements while adhering to a clear timeline and budget. Resource management is critical, with a dedicated team consisting of project managers, developers, UI/UX designers, data scientists, and quality assurance engineers. The project will be monitored using project management tools, ensuring that key milestones and deadlines are met. It also emphasizes security, data protection, and compliance with privacy regulations, including encryption and role-based access control. Regular updates and feedback loops will ensure the system evolves over time, incorporating user feedback and addressing any challenges

encountered during its deployment. The successful implementation will not only improve the efficiency of the admission process but also enable educational institutions to make data-driven decisions that better serve the needs of students, ultimately enhancing the overall quality of education and student placement.

8. ACKNOWLEDGEMENT

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