

AI SKILL ASSESSMENT PORTAL

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Abstract

The AI Skill Assessment and Analytics Portal is an intelligent platform designed to evaluate coding skills, technical knowledge, and problem-solving abilities using Artificial Intelligence. The system provides an online environment where users can take coding tests and technical assessments. After submission, the AI analyzes the solution, checks correctness, evaluates code quality, calculates time complexity, and generates feedback with improvement suggestions.

The platform also provides performance analytics such as scores, skill levels, strengths, and weaknesses, helping users track their progress and improve their skills. Built using modern web technologies, the system ensures scalability, security, and ease of use. By automating evaluation and analysis, the platform reduces manual effort and provides faster and more accurate results.

Key Words: AI, Skill Assessment, Coding, Analytics, Feedback

Introduction

In the modern digital era, technology plays a crucial role in education, recruitment, and skill development. With the rapid growth of the software industry, there is an increasing demand for individuals who possess strong programming skills, logical thinking, and problem-solving abilities. Students and job seekers are expected to continuously improve their technical knowledge to remain competitive in the industry. However, traditional methods of assessing these skills, such as written examinations and manual code evaluation, are often inefficient, time-consuming, and lack detailed feedback. These limitations make it difficult for users to identify their mistakes and improve their performance effectively. To overcome these challenges, there is a growing need for intelligent systems that can automate the process of skill

evaluation and provide meaningful insights. The AI Skill Assessment and Analytics Portal is designed to fulfill this need by offering an advanced platform that combines online assessments with Artificial Intelligence-based evaluation. The system enables users to take coding tests, technical quizzes, and interview-based assessments in a structured and user-friendly environment.

After a user submits a solution, the system performs automated evaluation by executing test cases to verify correctness. In addition to basic evaluation, the system utilizes Artificial Intelligence to analyze the submitted code in depth. It evaluates code quality, identifies logical errors, calculates time and space complexity, and generates detailed feedback along with suggestions for improvement. This

AI-driven approach transforms the assessment process into a learning experience by guiding users toward better coding practices and efficient problem-solving techniques.

Another important feature of the system is its performance analytics capability. The platform continuously tracks user performance and provides insights such as total submissions, average scores, skill levels, strengths, and weaknesses. These insights are presented through interactive charts and reports, enabling users to clearly understand their progress over time. This helps users focus on areas that need improvement and supports continuous skill development.

The system is developed using modern web technologies such as React.js for the frontend, Node.js and Express.js for backend processing, and MongoDB for data storage. These technologies ensure that the platform is scalable, efficient, and capable of handling large numbers of users and data. AI APIs are integrated into the system to enable intelligent evaluation, feedback generation, and performance analysis. Secure authentication mechanisms such as JSON Web Tokens (JWT) are used to protect user data and ensure safe access to the system.

The AI Skill Assessment and Analytics Portal is designed not only for students but also for educational institutions, training centers, and recruiters. It provides an efficient way to conduct assessments, evaluate performance, and identify potential candidates based on their skills. By automating the evaluation process, the system reduces manual effort, minimizes errors, and provides faster and more accurate results.

In addition to its current features, the system has the potential to be expanded with advanced functionalities such as AI-based interview analysis, resume screening, personalized learning paths, and integration with job portals. These enhancements will

further improve the effectiveness of the platform and make it a comprehensive solution for skill development and recruitment.

In conclusion, the AI Skill Assessment and Analytics Portal represents a significant advancement in the field of educational technology by integrating Artificial Intelligence with modern web systems. It provides a smart, efficient, and scalable solution for evaluating technical skills, improving learning outcomes, and supporting data-driven decision-making in education and recruitment.

Review of related literature

The development of online assessment systems has significantly transformed the way technical skills are evaluated in both educational institutions and recruitment processes. Earlier systems primarily focused on manual evaluation methods, which were time-consuming, less efficient, and prone to human error. With the introduction of digital platforms, coding assessments and technical evaluations became more accessible, allowing users to solve problems online and receive instant results based on predefined test cases.

Popular platforms such as HackerRank, LeetCode, and CodeChef have played a major role in providing coding practice environments and conducting technical assessments. These systems evaluate user solutions by comparing outputs with expected results and measuring execution time. While these platforms are effective in checking correctness, they often lack deeper analysis of code quality, logic, and efficiency. Users are not provided with detailed feedback or guidance on how to improve their solutions, which limits their learning experience.

With advancements in Artificial Intelligence, there has been a shift towards intelligent assessment systems that can provide more than just correctness evaluation. AI-based systems are capable of analyzing code structure, identifying logical errors, and calculating time and space complexity. These systems can also generate feedback and suggest improvements, helping users enhance their coding skills. Research indicates that AI-driven feedback

systems improve learning outcomes by providing personalized guidance and immediate insights.

In addition to evaluation, performance analytics has become an important aspect of modern assessment platforms. Analytics tools help track user performance over time, identify strengths and weaknesses, and provide recommendations for improvement. Visualization techniques such as graphs and charts make it easier for users to understand their progress and learning patterns. However, many existing platforms still provide limited analytics and lack comprehensive performance tracking features.

Another important aspect highlighted in the literature is the need for user-friendly and scalable systems. Many platforms are complex to use or do not provide a seamless experience across devices. Security and data privacy are also major concerns, as user data must be protected from unauthorized access.

Therefore, there is a clear need for a system that integrates AI-based evaluation, detailed feedback, performance analytics, and a user-friendly interface into a single platform. The AI Skill Assessment and Analytics Portal is developed to address these challenges by providing an intelligent, secure, and scalable solution for skill assessment and continuous learning.

Existing system

Existing online platforms for coding assessment and technical skill evaluation have become widely popular in both education and recruitment. Platforms such as HackerRank, LeetCode, CodeChef, and HackerEarth provide environments where users can solve coding problems and participate in online contests. These systems are mainly designed to evaluate programming skills by checking the correctness of outputs using predefined test cases.

In these platforms, when a user submits a solution, the system executes the code against multiple test cases and determines whether the output matches the expected result. Some systems also provide additional information such

as execution time and memory usage. This helps users understand the efficiency of their code to some extent. These platforms are widely used by students for practice and by companies for conducting online coding interviews. Many systems also include features such as leaderboards, rankings, and problem difficulty levels to motivate users and encourage competitive learning. Some platforms offer limited feedback, such as highlighting failed test cases or showing expected outputs. However, these features are often not sufficient for users to fully understand their mistakes or improve their coding techniques.

Despite these advantages, existing systems have several limitations. They mainly focus on output correctness and do not provide detailed feedback about code logic, structure, or quality. Users are not guided on how to optimize their solutions or improve efficiency. Time and space complexity analysis is either missing or not clearly explained.

Additionally, performance analytics in existing systems are limited. Most platforms provide only basic metrics such as scores or rankings, without offering insights into strengths, weaknesses, or topic-wise performance. Personalized recommendations for improvement are also generally absent. In many cases, descriptive or interview-based answers still require manual evaluation, which increases time and effort.

Proposed methodology

The AI Skill Assessment and Analytics Portal is developed using a structured and systematic methodology to ensure an efficient, scalable, and intelligent system for evaluating coding and technical skills. The methodology focuses on integrating Artificial Intelligence with modern web technologies to automate the process of assessment, feedback generation, and performance analysis.

Requirement Analysis: The initial phase involves collecting requirements from different types of users such as students, educators, and recruiters. The system identifies key functionalities including online coding assessments, AI-based evaluation,

performance tracking, and feedback generation. User roles such as Admin and User are defined, where Admin manages the system and users perform assessments. This phase ensures that the system meets user expectations and solves real-world problems.

Market Research: A detailed study of existing platforms such as HackerRank, LeetCode, and CodeChef is conducted to understand their working, features, and limitations. This analysis helps in identifying gaps such as lack of detailed feedback, limited performance analytics, and absence of AI-based suggestions. Based on this research, improved features are planned to enhance user experience and learning outcomes.

System Design: The system is designed using a modular architecture to ensure flexibility and scalability. It includes modules such as User Module, Admin Module, Assessment Module, AI Evaluation Module, and Analytics Module. The database is designed to store user information, coding questions, submissions, and performance data efficiently. The user interface is designed to be simple, responsive, and easy to navigate.

Assessment and Submission Process: Users can select coding problems and write solutions using an integrated code editor. After submission, the system executes the code against predefined test cases to verify correctness. The results of execution are stored and passed to the AI module for further evaluation.

AI Evaluation System: The AI module plays a key role in analyzing user submissions. It evaluates code quality, checks logical correctness, and calculates time and space complexity. It also generates feedback, assigns scores, and provides optimization suggestions. This helps users understand their mistakes and improve their coding skills effectively.

Performance Analytics and Reporting: The system generates detailed analytics based on user performance. It tracks metrics such as total submissions, average scores, strengths, and weaknesses. These insights are displayed

through charts and graphs, helping users visualize their progress and identify areas for improvement.

Testing and Implementation: The system undergoes thorough testing to ensure accuracy, performance, and reliability. Bugs and errors are identified and fixed. After successful testing, the system is deployed for users to access and perform assessments.

Deployment and Maintenance: The system is deployed on a web server or cloud platform to ensure accessibility from anywhere. Regular maintenance is performed to improve system performance, update features, and enhance AI evaluation accuracy. Future updates can include advanced analytics and additional functionalities.

Software specifications:

- React.js
- JavaScript
- Node.js
- Express.js
- MongoDB
- Axios
- JWT Authentication
- Chart.js

Conclusion:

The AI Skill Assessment and Analytics Portal provides an effective and intelligent solution for evaluating coding skills and technical knowledge using Artificial Intelligence. The system automates the assessment process by analyzing user submissions, checking correctness, evaluating code quality, and calculating time complexity. It also generates feedback and suggestions, helping users improve their problem-solving abilities and coding practices.

One of the major advantages of the system is its ability to provide detailed performance analytics.

The platform tracks user progress and presents insights such as overall score, skill level, strengths, and weaknesses. These analytics help users identify areas that need improvement and support continuous learning. The system also reduces manual effort in evaluation, making the process faster, more accurate, and efficient.

The system is developed using modern web technologies such as React.js, Node.js, Express.js, and MongoDB, ensuring scalability, reliability, and ease of use. Secure authentication mechanisms are implemented to protect user data and maintain privacy. The user-friendly interface allows easy access to assessments and performance reports across multiple devices.

In the future, the system can be enhanced with advanced features such as AI-based interview analysis, resume evaluation, personalized learning recommendations, and support for multiple programming languages. Overall, the AI Skill Assessment and Analytics Portal serves as a powerful tool for improving technical skills and modernizing the process of assessment and learning.