

CodeNest: A Comprehensive Platform for Coding Performance Tracking and Learning Assistance

Objective

The primary objective of CodeNest is to develop a scalable, user-friendly platform that consolidates key coding resources—performance tracking, interactive coding space, error assistance via chatbot, and analytic reporting—into a single system. The platform aims to empower students to improve their coding skills through data-driven insights and guided learning, while enabling faculty and trainers to effectively monitor and support their cohorts.

Abstract

In the increasingly competitive field of software development and technical education, students require a unified platform that consolidates coding practice, real-time learning support, and detailed performance analytics. CodeNest addresses this need by offering an integrated dashboard that tracks student progress across multiple competitive programming platforms such as LeetCode and HackerRank. Additionally, it includes a built-in coding environment where students can write, execute, and debug code, enhanced by real-time error explanations and customizable test cases. To support deeper learning, CodeNest incorporates an interactive chatbot that provides personalized guidance, explains error messages, and clarifies programming concepts to facilitate mastery of key topics. The platform presents a comprehensive performance analytics dashboard, delivering topic-wise strengths, weaknesses, trends, and progress reports for both students and educators. Role-based login functionality distinguishes between students and faculty/trainers, enabling personalized student views and group performance monitoring.

Problem Statement

Currently, students often rely on fragmented tools and platforms for coding practice, lacking a centralized system that effectively tracks progress, provides immediate error assistance, and supports pedagogical oversight. Existing educational platforms seldom integrate real-time coding with intelligent tutoring and detailed performance analytics, limiting students' ability to self-assess and educators' capacity to provide targeted guidance. This gap undermines efficient learning and slows skill acquisition in coding disciplines.

Scope

The scope of the project includes integration with popular coding challenge platforms, development of a secure coding execution environment with test case support, implementation of a conversational chatbot for error handling and concept explanation, and creation of a role-based dashboard system for students and educators. The solution focuses on web-based deployment with scalability to support varying user volumes. The project does not extend to mobile app development or advanced AI-driven personalized learning beyond chatbot guidance in the initial phase.

Existing System

Typical coding education tools provide either isolated coding practice environments or static performance reports. Many lack real-time error feedback, interactive tutoring, or cross-platform performance aggregation. Faculty typically use external tools for evaluation, leading to fragmented data and inefficient student progress tracking.

Disadvantages of Existing Systems

- Lack of integration across coding platforms and tools, requiring students to navigate multiple sites.
- Absence of real-time guidance and error explanation, causing frustration and slower learning.
- Limited analytics that do not provide actionable insights on topic-wise strengths or weaknesses.
- No role-based access control for students and educators, limiting collaborative coaching.

Proposed System

CodeNest proposes a unified solution that integrates multi-platform tracking with an embedded coding environment and an intelligent chatbot assistant. It features a comprehensive analytics dashboard exposing detailed insights into students' coding competencies and progress trends. The role-based access system differentiates student and educator views, facilitating efficient mentorship and progress monitoring. This approach addresses existing gaps by delivering a seamless, supportive, and data-driven coding education experience.

Advantages

- Centralized performance tracking consolidating data from multiple coding platforms.
- Real-time code execution with instant error detection and detailed guidance through an intelligent chatbot.
- Comprehensive analytics offering granular topic-wise insight and overall progress visualization.
- Role-based login ensuring personalized access for students and scalable monitoring capabilities for educators.
- Enhances student engagement, accelerates skill acquisition, and supports evidence-based pedagogical interventions.