CS4530 Final Project: Collaborative Development Environment - Group 508

Abigail Swanson, Harrison Eckert, Isha Venkatapathy, Ariel Park

Our Feature: Collaborative Editing

Our project, Collaborative Development Environment (CDE), addresses a key challenge faced by developers: the limitations of traditional Q&A formats when discussing complex code problems. Current platforms create communication barriers, causing misunderstandings and delays in problem resolution. Most importantly, there's no efficient way to collaboratively edit code in real-time, forcing teams to juggle multiple external tools and slowing down their workflow.

CDE is our solution - a browser-based platform that enables real-time collaboration on Python, Java, and JavaScript code. The application allows multiple users to share, edit, and execute code files in a dedicated workspace, eliminating communication gaps between explanation and execution. Users can see each other's changes instantly. This streamlines the troubleshooting process and accelerates problem-solving.

We've implemented a permission system with three distinct roles: Owners, editors, and viewers. The project dashboard gives users easy access to all their projects, invitations, and basic project management functions.

Key features we've built include real-time collaborative editing where multiple users can work simultaneously on the same code; language-specific syntax highlighting and auto-indentation; a navigable project tree to browse files; code execution capabilities for supported languages; and project backup functionality.

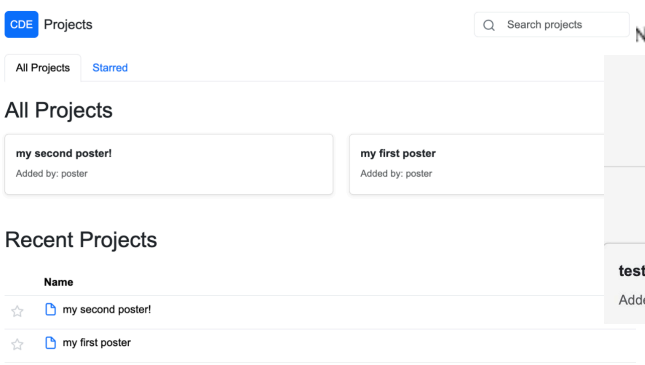
Our Technology Stack & Design

We built our application using modern web technologies that make it responsive and easy to use. The visual part that users interact with is created using React, which helps us build a smooth and interactive interface. For the behind-the-scenes operations, we use Axios to handle communications between different parts of our system, including running code and connecting to other services. All user information and project files are stored in MongoDB. The real-time collaboration feature - where multiple people can edit code at the same time - works through WebSockets, which creates direct connections between users' browsers. For the code editing experience, we integrated the Monaco editor (the same technology that powers Visual Studio Code), which provides helpful features like syntax highlighting and language-specific tools for Python, Java, and JavaScript. We designed everything with separate, interchangeable components so that the system can grow and change easily in the future, making it simpler for other developers to add new features.

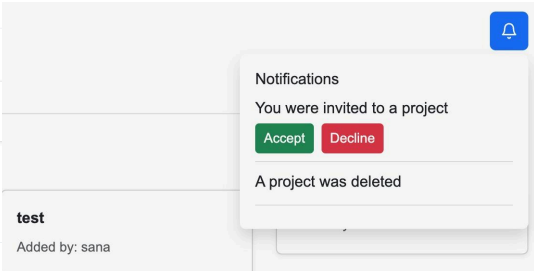
Future Work

Our project has strong potential for future growth in several exciting directions. One key area for expansion is language support—we could broaden the platform to include additional programming languages such as C++, Go, or Rust. To enhance collaboration, we could introduce features like conversation-style comments, a shared command-line interface for real-time commands, and improved tools for pair programming. Additional improvements could include automatic saving to prevent data loss, project sharing via messaging, and intelligent code suggestions powered by AI to help developers work more efficiently. These enhancements would significantly increase the functionality of CDE and make it even more valuable for real-world development teams.

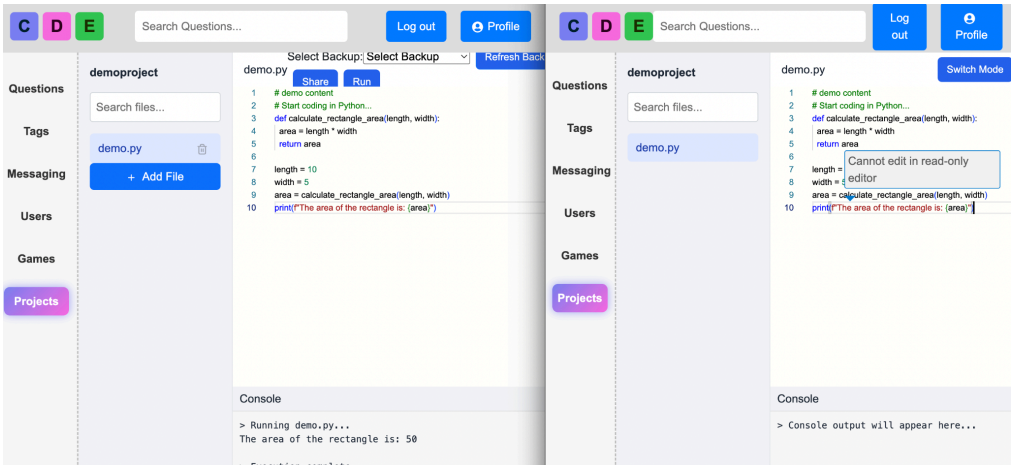
Project Dashboard



Notification Center with Project Invites



Shared Project with a Viewer, Featuring Python Code Execution



Demo and Source

You can explore our working prototype by visiting the public demo site here. The full source code is available on GitHub here. If the repository is still private, it can be made public as needed