Project Summary

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Overview, Key Words, and Subtopic Name

This project will create an interactive online homework system called "SageCloud Interactive Problems" (SCIP) that will initially target students taking courses in advanced computational mathematics. SCIP will provide realtime feedback, analytics, deeper computational problems than are offered by existing systems, and improved interaction between students and instructors.

Pure mathematics, cloud, interactive homework, open source, Python, R, LaTeX, web application

EA6. Computer Science and Information Technology for Education

Intellectual Merit

This Small Business Innovation Research Phase I project will create a completely new homework system that uniquely addresses needs in advanced mathematics, including abstract algebra, number theory, algebraic geometry, combinatorics and differential equations. The main technical hurdles that the team faces are to implement an easy-to-use interface and language for creating problems, a way to automatically test problems, a workflow for peer review of problems, and a marketplace where problems may be shared, purchased, and assembled into homework assignments. Additional hurdles involve dealing effectively with large amounts of user data and detecting cheating. To achieve these goals the team will build on their experiences developing Sage and SageMathCloud to implement minimal usable first versions, then get community feedback from a large community of users that the team has cultivated over many years, and use feedback to iterate on the initial product.

Broader/Commercial Impact

The proposed interactive homework system would increase the value of SageMathCloud, so there will be more paying customers. The resulting revenue could then provide a sustainable source of support for open source mathematical software development, which would make it possible to address quality issues in many open source math projects that are otherwise difficult to address. With open source software, moving beyond a small user base of highly technical users involves addressing a huge number of difficult issues that have little to do with research mathematics.

Our proposed homework system would fill a gaping need in math-related education, especially at the advanced level, which will raise technological capabilities of the workforce. The free version will also be accessible online to people worldwide who are unable to afford advanced mathematical software.