William A. Stein ***Project Summary***

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The proposed project is for a group of **40 undergraduate students** at the University of Washington (8 each academic year) to do research and development on **SAGE**, which is an open source mathematics software project started by the PI for research in algebra, geometry, number theory, cryptography, numerical analysis, statistics, and other areas.

By joining the SAGE project, the PI hopes that participants will become involved in mathematical research, gain extensive knowledge about mathematical software, make long-term connections with a vibrant research and development community, and contribute tools that will be used by teachers and expert researchers in numerous fields. They will also learn teaching and writing skills, and really understand some part of mathematics deeply, which will prepare them to apply computational mathematics in graduate school and industry.

Intellectual Merit:

Students will research and implement algorithms, write proposals, and give presentations at seminars and conferences. They will design and implement algorithms for computing with mathematical structures such as groups, rings, fields, graphs, matrix spaces, varieties, manifolds, etc. Their work will be reviewed, commented on, and used by the growing worldwide community of SAGE users.

Broader Impact:

One potential impact of this project would be to provide tools for advanced research mathematics that are more general and modern than anything available today (both free or commercial). In particular, SAGE provides a uniform interface to many different aspects of computation, and this is an attractive feature for its instructional use—learn the interface once, and you have convenient access to all sorts of different software.

Another impact is that instead of students having to pay to buy mathematics software for classroom instruction, they will have the option to use SAGE for free. Many teachers have expressed concern that currently they teach their students to use tools that the students (or their employers) might not be able to afford after they graduate. At many institutions and US high schools, purchasing computer software is a significant burden. SAGE could help address this problem.