

Project Summary

The project features a year-long, combined educational and research experience for a cohort of 9–12 students with interests in the mathematical sciences during each of the five project years. Participants are recruited and selected from the five institutions of the Associated Colleges of the Twin Cities (ACTC) and perform their coursework and research under the mentorship and guidance of committed members of the mathematics and engineering faculty at the University of St. Thomas (UST) in St. Paul, Minnesota and faculty colleagues at other ACTC institutions. Student participants benefit from a new course developed to support the learning and use of computationally intensive methods in mathematics and statistics. As a cohort, they participate in a variety of workshops, seminars, conferences, and field trips. In groups of two or three, project students contribute to significant research projects requiring the computational skills acquired in the course and regularly share their progress with fellow students and project faculty. Students periodically present their results in the larger professional community. The intellectual merit of the project is the result of three overlapping achievements. The first is the development of a level of student comfort with the methodological underpinnings of computation that enable them to include computational strategies as realistic options when they encounter a problem. This is one of the results of the new project course. The second achievement is the application by students of those computational skills as serious members of an ongoing research team directed by one or more faculty researchers. Among the specific research projects to which students may contribute are investigations in tornadogenesis, cancer treatment, cell motility, ridgelets, heat and fluid transfer and adaptive backward coupling Metropolis algorithms in statistics. The third achievement is the extent to which student participants see themselves both as part of a small closely-knit team of scholars and researchers advancing the use of recently available methods to solve interesting problems and as part of a much larger community of scientists from industry, business, government and academia whose professional lives emphasize the same kinds of methods and problems. The broader impact of the project is felt at four levels. At UST, many future students in mathematics and related areas will be educated in the role of computation, with a significant number of current faculty having had roles in the project and experience in teaching the new course. Throughout the ACTC institutions, project students will encourage a greater emphasis on computational methods. Local industry and businesses whose scientists are involved in the project will recognize the extent to which some of their goals can be supported by and can, in turn, support a computational emphasis on campuses. Just as importantly, the presentations related to the project and the conferences sponsored by the project over the first three years will promote to a national audience the innovative curricular elements developed as well as the research advancements made with the help of computational mathematics and statistics.