

Title: IGERT: Geographic Information Science

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Project Summary

This project will continue the doctoral education and research training program in Geographic Information Science (GIScience) at the University at Buffalo, and expand it into new research areas. GIScience is an emerging interdisciplinary field that seeks to understand the nature of geographic phenomena and of geographic information, providing theoretical foundations for Geographic Information Systems (GIS). GIScience seeks to formalize geographic principles using logic and mathematics, to explore scientific, educational, and policy-related uses of geographic information, and to elucidate the complex relationships that individuals and society have with GIS. It also provides a framework for scientific and engineering studies of physical and social phenomena. GIScience underpins the multi-billion dollar GIS industry in the United States, including its many applications relevant to national security and to the economy, and to science and engineering.

The scientific core of the project focuses on research in three major interlocking areas. The first research theme is basic geographic information science which includes ontology of the geographic domain, cognitive geography and geographic cognition, human interaction with geographic information and technology, and geographic information, institutions, and society. The second research theme is geographic environmental science, which integrates spatial databases with regional models to forecast the environmental effects of phenomenon such as groundwater contamination and volcanic flows. Geographic social science is the third research theme, and is based on the integration of spatial analysis and spatial statistics with GIS, addressing topics such as the development of new methods for the detection of hot spots in patterns of phenomena such as disease or crime, and of better methods for intelligent highway systems.

The educational and training aspects of the program are centered on four core courses, including a new required core course in ethics and professionalism. Students will also be required to have competence in the use of GIS software, and a basic understanding of the mathematical foundations of the field. The program also includes cross-department research experiences, internships (including international research internships), and an international summer school. The international summer school will be open to early-career scholars in GIScience from other US institutions, broadening the impact of the IGERT-funded graduate research training beyond this institution.

Over the next five years, the program will have a new funding pattern: trainees will be funded for two years as NSF Fellows, and for two years on university-based enriched assistantships. This is an important step toward institutionalization, since toward the end of this funding period we will argue for the long-term continuation of university support. Five additional years of external support will allow completion of the institutionalization of the program, producing a lasting effect on the culture of graduate education within the participating departments and beyond.

The intellectual merit of the proposed activity lies in its attention to innovative research in environmental science, social science, information science, and engineering. The project will continue to foster interdisciplinary sharing of ideas and research methods, and continue to influence the work of both faculty and students involved in the program. This influence will extend well into the future as the trainees enter the workforce.

The broader impacts of the proposed activity will come from the integration of social and natural science research to produce policy recommendations for decision-makers. The program will develop broadly prepared Ph.D.s with multidisciplinary backgrounds who will have a significant impact on the further development of the field both nationally and internationally, in academia, government, and industry.