

NATIONAL SCIENCE FOUNDATION
Proposal Abstract

Proposal:1937095

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Proposal Title: Convergence Accelerator Phase I (RAISE): Network Science of Census Data
Institution: Tufts University
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The NSF Convergence Accelerator supports team-based, multidisciplinary efforts that address challenges of national importance and show potential for deliverables in the near future.

This Convergence Accelerator Phase I project is focused on a central goal of structuring and pre-processing data from the U.S. Census (as well as the American Community Survey and state and local government data) to make it maximally accessible to the research techniques of network science, machine learning, and artificial intelligence that are currently at the forefront of scientific inquiry into complex systems. The broader impacts and social benefit of this project will emerge from leveraging the large, elaborate, and expensively collected public resource of census data for research, with strong applications to policy, planning, public health, and other topics. The ability to apply sophisticated artificial intelligence and complex networks techniques to Census data - a blend of demographic, geographic, and socioeconomic information arranged in an integrated hierarchy - will serve the national interest by providing opportunities to better understand the nation's population and communities, with both snapshots and trendlines. Phase I of the project also includes tool development to provide the processed demographic and civic data to scholars, legislators, public-sector officials, and the general public through open-source apps and other interfaces.

The project is a convergence research effort, bringing theoretical mathematicians and computer scientists (from combinatorics, probability, geometry, dynamics, and algorithms) together with applied mathematicians and network scientists, buttressed by meaningful interdisciplinary collaboration in the social sciences. The project seeks to understand census geography in both graph and network terms, developing new multi-layer network structures as well as efficient algorithms for clustering, partitioning, and feature identification. The team plans in phase I to also expand collaborative relationships between academia, industry, government, and public-sector organizations. A particular emphasis will be placed on the further development of techniques for discrete Markov chains on graph partitions, an area in which the project team already has significant expertise and anticipates progress on both rigorous and heuristic results about mixing times and stationary distributions.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.