

Project Title: Surveys at Scale: Laplace Approximation and Hamiltonian Monte-Carlo for Multilevel Regression and Poststratification

Awardee: Columbia University

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Principal Investigator: Andrew Gelman

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Abstract:

We will produce an efficient Laplace approximation algorithm that will be embedded in Stan's dynamic Hamiltonian Monte-Carlo (HMC) sampler, which will provide scalable computation for the sorts of hierarchical models used in survey adjustment. We will develop methods for checking and validating these approximations, and use simulated-data calibration to compare the use of survey weights and post stratification techniques. The new algorithm will be tested on an application of respondent-level modeling techniques to employment estimates from the Current Employment Statistics (CES) survey. The application is appropriate because it includes complexities of design, weighting, and adjustments to populations of interest that are applicable for Federal surveys in general. Our final result will be to provide efficient, scalable estimation methods for latent Gaussian models, with the immediate target being those hierarchical linear mixed effects models used for small domain estimation and respondent-level data modeling.