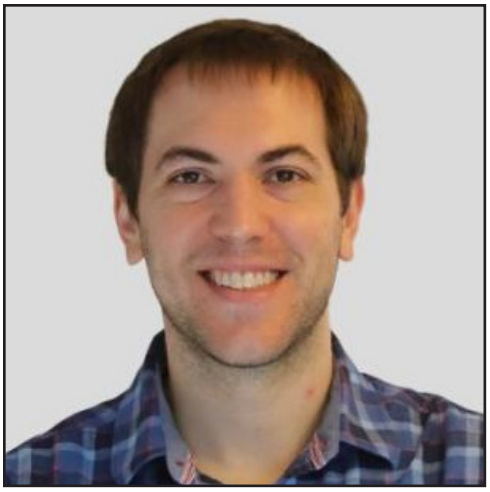
STATISTICS
COLORADO STATE UNIVERSITY

Spring 2026 Departmental Seminar



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Monday, March 30, 2026
12:00 PM
Wagar Building Rm 232

Facilitating heterogeneous effect estimation via statistically efficient categorical modifiers

Abstract

Categorical covariates such as race, sex, or group are ubiquitous in regression analysis. While main-only (or ANCOVA) linear models are predominant, linear models that include categorical-continuous or categorical-categorical interactions are increasingly important and allow heterogeneous, group-specific effects. However, with standard approaches, the addition of categorical interactions fundamentally alters the estimates and interpretations of the main effects, often inflates their standard errors, and introduces significant concerns about group (e.g., racial) biases. In this talk, I will advocate an alternative parametrization and estimation scheme using abundance-based constraints (ABCs). First, ABCs induce a model parametrization that is both interpretable and equitable. Second, I will show that with ABCs, the addition of categorical interactions 1) leaves main effect estimates unchanged and 2) enhances their statistical power, under reasonable conditions. This surprising result suggests that analysts can and arguably should include categorical interactions in linear models to discover potential heterogeneous effects—without compromising estimation, inference, and interpretability for the main effects. I will illustrate the practical benefits of ABCs with an analysis of the demographic heterogeneities among the effects of social and environmental factors on STEM educational outcomes for children in North Carolina.