

The increasing size and complexity of biomedical data could dramatically enhance basic discovery and prediction for applications. Realizing this potential requires analytics that are simultaneously selective, accurate, predictive, stable, and scalable. However, current methods do not generally achieve this. Here, we introduce the Union of Intersections method, a novel, modular paradigm for recovering accurate, interpretable and predictive parameters in regression and classification. We briefly summarize new theoretical results proving superior performance of our method under less restrictive conditions than previous methods, conclusions supported by extensive simulations. We further demonstrate: increased prediction accuracy on a variety of benchmark biomedical data; extraction of meaningful functional networks from human electrophysiology recordings; and dramatically more parsimonious prediction of behavioral and physiological phenotypes from genetic data. As our methods are broadly applicable across domains, we provide several open-source implementations to improve data prediction and discovery across science and medical fields.