

## Variable Selection and Estimation Using Nonlocal Prior Mixtures for Data with Highly Dispersed Effect Sizes

**Nilotpai Sanyal**

Department of Mathematical Sciences, University of Texas at El Paso, 500 W. University Ave., El Paso, TX 79968, USA

### **Abstract:**

Different nonlocal priors are seen to provide better support for smaller and larger effect sizes. Motivated by this observation, we focus on mixtures of nonlocal priors that should provide a better fit compared to the individual priors for sparse data where effect sizes vary considerably in magnitude, such as in public health data with biological, clinical, and environmental features. Particularly, we examine the use of a mixture prior which is a sum of a point mass and two nonlocal prior components. In addition to considering existing alternatives, we propose a novel objective way to set the tuning parameters of the nonlocal priors so as to allow maximum support to diverse effect sizes. Following a full Bayes approach, we develop a joint selection and estimation procedure based on Gibb's sampling and Laplace approximation. A preliminary data analysis based on sensible hyperpriors shows a competitive performance of our method when compared to established methods like LASSO and horseshoe prior analyses. We demonstrate the utility of our method through real-data applications.

### **Keywords:**

Nonlocal prior; mixture prior; Gibb's sampling; Laplace approximation.