GLM-lasso explores the cosmos

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An important problem in Cosmology is to reconstruct the mass distribution of a galaxy cluster based on telescope images for instance using X-ray Multi-Mirror techniques. Such images include point sources spread behind the cluster which although there are of importance, also affect the estimation of the mass distribution. Therefore it is important to robustify the reconstruction of the galaxy cluster by identifying at the same time the point sources, outliers in the response. We cast this challenging problem into a linear inverse problem involving blurring, Abel and wavelet transforms for Poisson counts. Owing to the fact that the high-dimensional (more than two millions) estimands are sparse, we employ GLM-lasso. We address the issues of selecting two regularization parameters and of solving the high-dimensional optimization problem. We show the strength of our method on simulated and real images.