Statistica Sinica: Preprint
doi:10.5705/ss.202016.0211

We consider the problem of estimating the region on which a non-parametric response function defined on the plane is at its baseline level in a sampling setting where multiple replicates of the response are available at each location. The baseline level typically corresponds to the minimum/maximum of the function and estimating such regions or their complements is pertinent to several problems arising in edge estimation, environmental statistics, fMRI and related fields. We assume the region of interest to be convex and estimate it via fitting a "stump" function to approximate p-values obtained from tests for deviation of the regression function from its baseline level. The shape of the baseline region and the smoothness of the regression function at its boundary play a critical role in determining the rate of convergence of our estimate: for a response function which is "p-regular" at the boundary of the convex baseline region, our estimate converges at a rate $N^{-2/(4p+3)}$, N being the total budget, which is expected to be optimal in light of existing work in related problems. We end with a discussion of various extensions of our approach, as well as connections to existing approaches.