

We propose a methodology for denoising, variance-stabilizing and normalizing signals whose varying mean and variance are linked via a single parameter, such as Poisson or scaled chi-squared. Our key observation is that the signed and square-rooted generalized log-likelihood ratio test for the equality of the local means is approximately distributed as standard normal under the null. We use these test statistics within the Haar wavelet transform at each scale and location, referring to them as the likelihood ratio Haar (LRH) coefficients of the data. In the denoising algorithm, the LRH coefficients are used as thresholding decision statistics, which enables the use of thresholds suitable for i.i.d. Gaussian noise. In the variance-stabilizing and normalizing algorithm, the LRH coefficients replace the standard Haar coefficients in the Haar basis expansion. We prove the consistency of our LRH smoother for Poisson counts with a near-parametric rate, and various numerical experiments demonstrate the good practical performance of our methodology.