

Nonparametric Density Estimation via the Root-Unroot Transform; with an Adaptive Wavelet Block Thresholding Implementation

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Nonparametric density estimation has traditionally been treated separately from nonparametric regression. Here, we propose an approach that first transforms a density estimation problem into a nonparametric regression problem. The algorithm for this involves suitably binning the observations and then transforming the binned data counts via a carefully chosen square-root transformation. Then any suitable nonparametric regression procedure can be used.

Here, a wavelet block-thresholding rule is used for the transformed regression problem, and this produces an estimated nonparametric regression function. Finally an adjusted un-root transform is applied to yield the final nonparametric density estimator.

The procedure is easy to implement. It enjoys a high degree of asymptotic adaptivity and is shown in numerical examples to perform well for standard density estimation settings. As time permits, we will also discuss a corresponding procedure to produce confidence bands to accompany the nonparametric regression and density estimators.