Estimation of the Weighted Integrated Square Error of the Grenander Estimator by the Kolmogorov–Smirnov Statistic

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We consider in this report the Grenander estimator of unbounded, in general, nonincreasing density functions on the interval $[0,1]$ without any smoothness assumptions. For fixed number n of i.i.d random variables $X_1, X_2, \ldots, X_n$ with values in $[0,1]$ and the nonincreasing density function $f(x)$, $0 \leq x \leq 1$, we prove an inequality bounding the weighted integrated square error of the Grenander estimator $\widehat{f}_n(x)$ with probability one by the classical Kolmogorov–Smirnov statistic. Further, we consider some interesting implications of the latter inequality.