Weighted D-T moduli revisited and applied

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We introduce weighted moduli of smoothness for functions $f \in L_p[-1,1] \cap C^{r-1}(-1,1)$ $r \geq 1$, that have an $(r-1)$st absolutely continuous derivative in $(-1,1)$ and such that $\varphi^r f^r \in L_p[-1,1]$, where $\varphi(x) = (1-x^2)^{1/2}$. These moduli are equivalent to certain weighted D-T moduli, but our definition is more transparent and simpler. In addition, instead of applying these weighted moduli to weighted approximation, which was the purpose of the original D-T moduli, we apply these moduli to obtain Jackson-type estimates on the approximation of functions in $L_p[-1,1]$ (no weight), by means of algebraic polynomials. We also have inverse theorems that yield characterization of the behavior of the derivatives of the function by means of its degree of approximation.

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