Stephane P Jaffard* (jaffard@u-pec.fr). New exponents for multifractal analysis.

The purpose of the multifractal analysis of a function $f$ is to determine the Hausdorff dimensions of the sets of points where a pointwise regularity exponent $h_f(x)$ takes a given value. The corresponding collection of dimensions is referred to as the multifractal spectrum. In applications, it is estimated through a Legendre transform of averaged quantities, computable on data. Multifractal analysis developed in the setting where the exponent is the Hölder exponent; this only applies to locally bounded functions, an a priori hypothesis which is seldom met in real-life.

We will present an alternative, where the pointwise Hölder regularity is the $T_{\alpha}^p$ regularity introduced by Calderón and Zygmund. The a priori assumption is that the data locally belong to $L^p$. We will set the mathematical framework supplied by this $p$-exponent based multifractal analysis, extend it to $p < 1$ and show that comparing the informations supplied by different values of $p$ allows to infer additional knowledge on the nature of the singularities. We give applications to stochastic processes, random fields and real-life data.

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