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Threshold methods for Poisson processes with unknown or infinite support

The first problem is to estimate the intensity of a Poisson process with unknown or infinite support. The intensity is assumed to be L^1 and L^2. We propose a complete data-driven threshold that we calibrate in an almost optimal way and this from a theoretical and practical point of view. The maxiset of the procedure is the intersection of a classical Besov space and a weak Besov space. The weak Besov space corresponds to sparse functions: a very small number of wavelet coefficients are significant but their location is not fixed. Our procedure is minimax on these sets with the correct power of the logarithmic term.

The second problem is to test whether a Poisson process is homogeneous or not on a finite interval. Let us suppose that the alternative belongs to a weak Besov space. This corresponds, roughly speaking, to the case where there are a small number of locations where the alternative is different from the uniform, but the position of these locations are unknown. Then, surprisingly, the separation rate is the same as the minimax estimation rate, meaning that it is as difficult to test as to estimate. Moreover a threshold procedure achieves this rate.

The first problem is a joint work with V. Rivoirard. The second problem is a joint work with M. Fromont and B. Laurent.