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A fresh look at the minimax

Some new non-asymptotic upper and lower bounds for the minimax quadratic risk will be presented both in the problem of estimating restricted normal means and for the White Gaussian Noise model on the real line.

In the latter case, some general ellipsoidal functional classes will be introduced, including classes of entire functions of exponential type, Paley-Wiener classes of analytic functions, and Sobolev classes. A comparison of the minimax risks for these classes will be discussed, based on the proposed risk bounds, as well as some numerical results.

These results demonstrate that the commonly perceived notion of a relation between the smoothness of unknown function and the accuracy of estimation can be misguided. In particular, the notion of optimal rates of convergence, dominating asymptotic statistics for the last three decades, can be misleading and indeed counterproductive.