Concentration Inequalities, Oracles, and Applications

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Outline: Week 7
1) Introduction to basic terminology in density estimation; kernel density estimates, histograms in Euclidean spaces;
2) Errors of density estimates; $L_1$ and $L_2$ errors; convergence properties;
3) Expected $L_1$ and $L_2$ errors; concentration of actual errors near their expected values;
4) Miscellaneous delicate phenomena in nonparametric density estimation;
5) Introduction to the idea of an oracle; illustration with density estimates;
6) Performance of an oracle in parametric estimation; Youden’s angel; asymptotic expansions for the mean $L_1$ and $L_2$ error of Youden’s angel;
7) Empirical counterpart of Youden’s angel; proof that empirical counterpart cannot match Youden’s angel (collaboration with Jon Wellner).