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The Small Ball Inequality. Preliminary report.

The small ball inequality has formulations in probability theory, discrepancy, and approximation theory. It has a combinatorial expression as an inequality on Haar functions in high dimensions: One sums Haar functions, adapted to a cubes of a fixed volume, in the unit cube in n dimensions. The orthogonality of the Haar functions provides an easy lower bound on the L^∞ norm of the sum. The small ball inequality is an improvement on this easy bound. It is true in dimension 2, a Theorem of Talagrand, and is conjectural in higher dimensions, although there are better than trivial estimates known, due to Bilyk, Vagharshakyan, and the speaker. We will survey the small ball inequality, its ranges of applications, what is known, and why it hard. (Received August 21, 2013)