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Maximal Subspace Averages

We study maximal operators associated to singular averages along finite subsets of the Grassmannian of d-dimensional subspaces of the n-dimensional Euclidean space. The well studied $d = 1$ case corresponds to the usual directional maximal function. We provide a systematic study of all cases $1 \leq d < n$ and prove essentially sharp L^2 bounds for the maximal subspace averaging operator in terms of the cardinality of the finite subset without any assumption on the structure. In the codimension 1 case, that is $n = d + 1$, we prove the precise critical weak $(2, 2)$-bound. Our estimates rely on Fourier analytic almost orthogonality principles, combined with polynomial partitioning, but we also use spatial analysis based on the precise calculation of intersections of d-dimensional plates. Joint work with Ioannis Parissis, University of Basque Country and IkerBasque.