Dimension free L^p estimates for Riesz transforms via an H^∞ joint functional calculus

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In 1983 E. M. Stein proved dimension free L^p bounds for classical Riesz transforms on R^d. Since then many authors studied the phenomenon of dimension free estimates for Riesz transforms defined in various contexts. In this talk we present a fairly general scheme for deducing the dimension free L^p boundedness of d-dimensional Riesz transforms from the L^p boundedness of one-dimensional Riesz transforms. The crucial tool we use is an H^∞ joint functional calculus for strongly commuting operators. The scheme is applicable to all Riesz transforms acting on 'product' spaces, e.g.: Riesz transforms connected with (classical) multi-dimensional orthogonal expansions, Riesz transforms in the 'product' (rational) Dunkl setting, and discrete Riesz transforms on products of groups having polynomial growth.