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Mean cohomological independence dimension and radius of comparison

I will report on joint work in progress with N. Christopher Phillips.

In 2010, Giol and Kerr published a construction of a minimal dynamical system whose associated crossed product has positive radius of comparison. Subsequently, Phillips and Toms conjectured that the radius of comparison of a crossed product should be roughly half the mean dimension of the underlying system. Upper bounds were obtained by Phillips, Hines-Phillips-Toms and very recently by Niu, however there were no results concerning lower bounds aside for the examples of Giol and Kerr. In the non-dynamical context, work of Elliott and Niu suggests that the right notion of dimension to consider is cohomological dimension, rather than covering dimension (notions which coincide for CW complexes). Motivated by this insight, we introduce an invariant which we call "mean cohomological independence dimension" (more precisely, a sequence of such invariants), for actions of countable amenable groups on compact metric spaces, which are related to mean dimension, and obtain lower bounds for the radius of comparison for crossed products in terms of this invariant.