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Turbulence and Essential Equivalence of Subspaces

Using Hjorth's theory of turbulence, it can be shown that various equivalence relations induced by operator ideals on the space of bounded operators on a Hilbert space are not classifiable by countable structures. In particular, we examine essential equivalence of closed subspaces of a Hilbert space, realized as equivalence of the corresponding projections operators, modulo the compact operators. Even in this restricted setting, we recover non-classifiability. Similar results for non-reduction to orbit equivalence relations from Polish group actions will be discussed for equivalence modulo finite rank or finite dimension.