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A backward ergodic theorem and its forward implications

A pointwise ergodic theorem for a transformation T on a probability space equates the global property of ergodicity of the transformation to its pointwise combinatorics. Our main result is a backward (in the direction of T^{-1}) ergodic theorem for countable-to-one probability measure preserving (pmp) transformations T. We discuss examples of such transformations, including the shift map on Markov chains, which yields a new (forward) pointwise ergodic theorem for pmp actions of finitely generated countable groups. This is joint work with Anush Tserunyan.