Abstract:The enormous impact of Shannon information theory on modern digital communications is widely known and appreciated. Less well known in the engineering community is the impact of Shannon's ideas of entropy and coding on ergodic theory, the theory of measure preserving (and related) transformations on probability spaces. The second most important result in ergodic theory (after the ergodic theorem or law of large numbers) is the Ornstein isomorphism theorem, which shows that Shannon entropy characterizes which random processes are really the "same" in the sense that one can be coded or filtered into the other in an invertible time-invariant way. This talk will survey a few of the many connections between information theory and ergodic theory, old and recent, with an emphasis on the particular example of Ornstein's B-processes - processes which can be modeled as time-invariant (or stationary) codings (or filterings) of independent, identically distributed processes. Also emphasized is the process version of the Monge/Kantorovich optimal transportation distance, which quantifies the goodness of approximation of two random processes that is useful in information theory, ergodic theory, and modeling discrete-time random processes.