Transfer entropy of continuous time stochastic processes

Chris Edgar[1]

In 2001, Transfer Entropy (TE) was introduced as a special case of conditional mutual information to measure information transfer in coupled time series indexed over a countable set taking values in $\mathbb{R}$. We consider the case of TE for stochastic processes indexed over a finite interval $\mathbb{T}$ taking values in a Polish state space. We provide a definition for TE over $\mathbb{T}$ motivated by the Radon-Nikodym Theorem, random measures, and projective limits of probability spaces. Furthermore, we provide necessary and sufficient conditions for when the continuous time TE can be obtained as a particular limit of the discrete time TE. We also define the Transfer Entropy rate and give some results specific to the TE rate between stationary processes. An application using the Poisson Point Process will also be presented.

[1]) University of South Carolina
     edgarc@math.sc.edu