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Evaluating time series: an ordinal pattern approach

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The Kolmogorov-Sinai entropy is a commonly used measure of complexity of dynamical systems, its determination, however, is not easy. Bandt and Pompe [1] invented the concept of permutation entropy, which has been shown to be close to the Kolmogorov-Sinai entropy and to be an interesting tool for evaluating time series (see Bandt et al. [2], Amigó [3] and Keller et al. [4]). This measure utilizes so called ordinal patterns and their distribution to access information stored in the measurements of an underlying system. These ordinal patterns describe the up and down behavior of measurements, i.e. in this approach the rank order of consecutive values of a time series is considered instead of the values themselves. The question arises weather all relationships between the consecutive values have to be considered or weather, in order to reduce accessing the same information multiple times, the approach can be modified. The aim of this talk is to introduce shortly the ordinal pattern approach and to present modifications, consequences as well as applications with related experimental data.

[1] C. Bandt and B. Pompe, Permutation entropy: a natural complexity measure for time series, *Physical Review Letters* **88**, (2002), doi:10.1103/PhysRevLett.88.174102.

[2] C. Bandt, B. Pompe and G.Keller, Entropy of interval maps via permutations, *Nonlinearity* **15**, (2002), p. 1595-1602.

[3] J. M. Amigó, The equality of Kolmogorov–Sinai entropy and metric permutation entropy generalized, *Physica D: Nonlinear Phenomena* **241**, (2012), p. 789–793.

[4] K. Keller, S. Maksymenko and I. Stolz, Entropy determination based on the ordinal structure of a dynamical system, to appear in *Discrete and Continuous Dynamical Systems - Series B*.