

Nonlinear time series analysis (4 clases, 45')

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1. Introduction: from dynamical systems to complex systems
2. Methods for univariate time series analysis
 - Return maps
 - Distribution of data values
 - Autocorrelation and Fourier analysis
 - Stochastic models and surrogates
 - Attractor reconstruction, Lyapunov exponents, and fractal dimension
 - Symbolic analysis
 - Information theory measure: entropy
 - Network representation of a time-series
 - Spatio-temporal representation of a time-series
3. Methods for bivariate time series analysis
 - Cross Correlation
 - Mutual Information
 - Event synchronization
 - Causality
4. Methods for multivariate time series analysis
 - Functional networks
 - Network inference

Bibliography:

H. Kantz and T. Schreiber, Nonlinear Time Series Analysis, Cambridge University Press (2004)

G. Datsleris and U. Parlitz, Nonlinear dynamics: a concise introduction interlaced with code, Springer (2022).

Software:

<https://www.pks.mpg.de/~tisean/Tisean3.0.1/>

<http://www.pik-potsdam.de/~donges/pyunicorn/>