Dynamical systems, information and time series

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5 lectures, 2 hours long, on Fridays from 15.00 – 17.00

September 18, 25; October 9, October 30; November 6
(a further lecture may be scheduled either on October 3 or on October 23)

Lecture 1: An introduction to deterministic dynamical systems and to time series. Periodic and quasiperiodic motions.

Lecture 2: A priori probability vs. statistics: ergodicity, uniform distribution of orbits. The analysis of return times. Kac inequality. Mixing

Lecture 3: Shannon and Kolmogorov-Sinai entropy. Randomness and deterministic chaos. Relative entropy and Kelly's betting.

Lecture 4: Time series analysis and embedology: can we distinguish deterministic chaos in a noisy environment?

Lecture 5: Fractals and multifractals

References:
Fasano Marmi, *Analytical Mechanics* Oxford University Press, Chapter 13
Benjamin Weiss, *Single Orbit Dynamics*, AMS 2000. Daniel Kaplan and Leon Glass, *Understanding Nonlinear Dynamics*, Springer (1995)
Sauer, Yorke, Casdagli: "Embedology". *J. Stat. Phys.* 65 (1991) 579-616
Michael Small "Applied Nonlinear Time Series Analysis" World Scientific K. Falconer, *Fractal Geometry - Mathematical Foundations and Applications* John Wiley,

The slides of all lectures will be available at my personal webpage:
http://homepage.sns.it/marmi/