

Extreme value theory and dynamical indicators

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EVT for dynamical systems

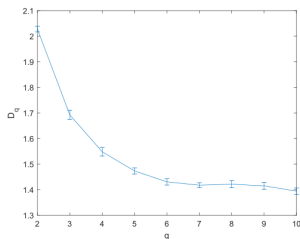
- We generate long trajectories of a chaotic dynamical system and compute at each step a suitable observable.
- By studying the extreme value distribution of this observable, one can extract informations on the system.

Computation of the generalized dimensions

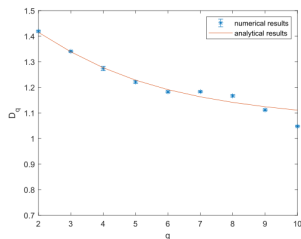
- We introduce a new observable in the q -cartesian product space :

$$\phi_q(x_1, x_2, \dots, x_q) = -\log\left(\max_{i=2, \dots, q} d(x_1, x_i)\right).$$

- The study of the extreme values taken by this observable allows us to compute the spectrum of generalized dimension of the system



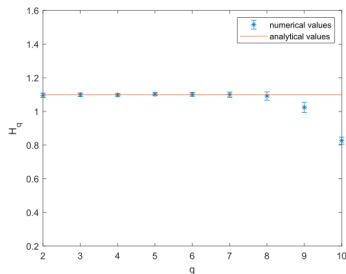
(a) Lorenz system



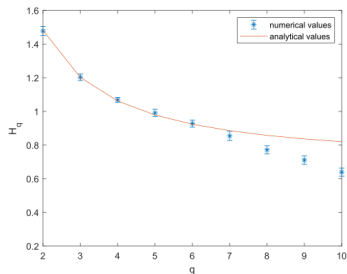
(b) Sierpinski gasket

Computation of the Hyperbolicity spectrum H_q

- We are able to compute, with the same method a spectrum of indicators of the hyperbolicity of the system.



(a) $3x \pmod{1}$



(b) Gauss map

Figure – H_q spectrum of the maps $3x \pmod{1}$ (left) and the Gauss map (right).

Generalized dimensions and local dynamical indicators

- We show the influence of the generalized dimensions on different local dynamical indicators of the system, such as local dimensions, hitting times and return times inside a small ball.
- These relations are stated in the language of large deviation theory.