

Radboud University Nijmegen



- **Iterative processes** - (coupled) difference / differential equations that represent autocatalytic change processes, the time-evolution of a system observable

• **Time series** - a record of values generated by an iterative / changing process

- **Solution** - if available, actual iterations of the function are not necessary. Only available for a very limited set of (coupled) equations.

• The `returnplot` - a scatter plot of Y_i vs. $Y_{i+1:n}$

The state / phase space - A space spanned by M observable dimensions of the system.

Depending on parameter settings a system can be attracted to just a few states: Attractors

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- **The phase / bifurcation diagram** - diagram representing the parameter space of a system. Its dimensions represent the possible values of the control parameter(s) of the system. Stable regions are often labelled by an order parameter (solid, liquid, gas).

Today: Potential Functions - A function describing the relative stability of



Story so far - Assignments session 1:

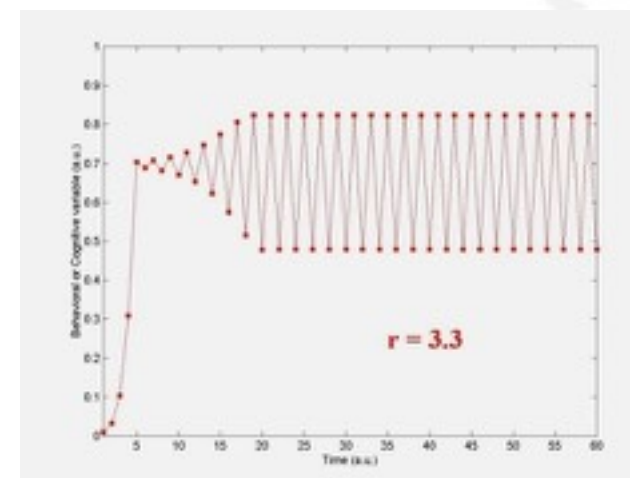
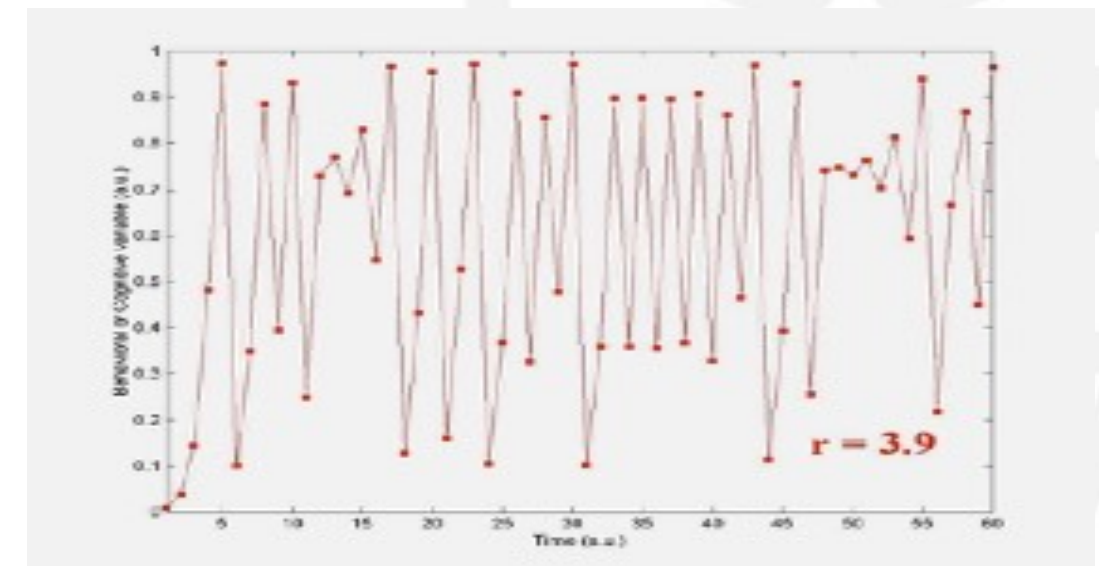
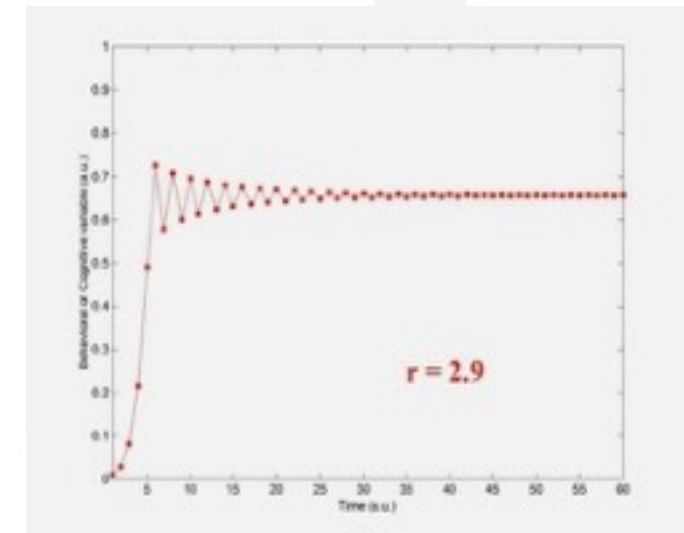
Different ways to represent characteristics of change processes

Story so far - Assignments session 1:

Different ways to represent characteristics of change processes

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- **Timeseries** - a record of values generated by an iterative / change process
- **Solution** - if available, actual iterations of the function are not necessary. Only available for a very limited set of (coupled) equations.
- **The return plot** - a scatterplot of Y_i vs. $Y_{i+1..n}$
- **The state / phase space** - A space spanned by **M** observable **dimensions** of the system.
 - Depending on parameter settings a system can be attracted to just a few states: *Attractors*
 - *Not discussed: The cobweb method*

Story so far - Assignments session 1: Return plot of the logistic map



$$L_{i+1} = r L_i (1 - L_i)$$