



Humanwissenschaftliche Fakultät

Workshop: A Complex Systems Approach to Study Human Nature: An introduction to the analytical toolbox of Complexity Science

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This workshop will provide an introduction to some of the formal models, research methods and analytical techniques that allow for the study of human behaviour from a complex systems perspective.

Complexity research transcends the boundaries between the classical scientific disciplines and is a hot topic in physics, mathematics, biology, economy and psychology. Its focus is a description and explanation of behaviour based on *interaction dominant dynamics*: Many processes interact on different temporal and spatial scales and behaviour emerges out of those interactions through physical processes such as self-organization or soft assembly. Contrary to what the name might suggest, complexity research is often about finding simple models or collective variables with which a wide range of different behavioural modes can be described. This approach differs fundamentally from the more classical approaches in which behaviour is considered the additive result of many independent, component processes (*component dominant dynamics*) and the goal of research is to identify efficient causes of behaviour.

The main focus of the workshop will be hands-on experience with data analysis using the R statistical computing environment. No special background knowledge is required to participate.

Tentative program:

1. Introduction to the mathematics of change

- Modelling (nonlinear) growth
- Predator Prey dynamics and Deterministic Chaos
- Basic timeseries analysis

2. Quantifying Recurrences in State Space

- Takens' Theorem and State Space reconstruction
- Recurrence-Quantification Analysis of continuous and categorical data
- Cross-Recurrence Quantification Analysis of dyadic interaction

3. Fractal Scaling, Network Topology and Early Warning Signals

- Scaling phenomena in time and trial series of human behaviour and physiology
- Small-world and Scale-free networks
- Early Warning Signals in clinical interventions

The number of participants is limited to 18 persons. Please register **until May 5th** using: Graduierenschule-HF@uni-koeln.de.

Participants will be asked to bring their laptops with them. Participants will receive an email with further information about the software which should be installed about a week before the workshop starts.

Date:

12th May 2017, 10 am to 5 pm

Venue:

Seminar room of the Graduate School
"City-Passage Lindenthal", 2nd floor, Dürener Straße 89, 50931 Cologne

Registration:

Graduierenschule-HF@uni-koeln.de