Simulating the potential of applying recurrence quantification analysis on ecological momentary assessment data

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Introduction

Ecological momentary assessment has made it possible to construct time series from self-report scales. This means that it has the potential to capture the dynamics of psychological constructs over time. While this type of data comes with its own set of severe challenges, there is also the potential to gain a better understanding of how these measures actually operate. Recurrence quantification analysis is one of the methods to analyse time series data. This method aims to capture repeating patterns in time series by quantifying which observations x_{t+y} are equivelent to x_t, where t refers to the time of an observation, x to an observation, and y is the distance to t where that point recurs. The method results in several summary statistics that can be used to understand patterns in the data.

Recurrence quantification measures were developed under the assumption that measurements can be retrieved at great frequency and at high resolution. However, measures in ecological momentary assessment rely on the admission of ordinal self-report questionnaires taken several times a day, limiting the set of possible states that the measuring device can capture. Moreover, the psychological constructs that are measured using EMA cannot be measured without relying on self-report questionnaires. This necessitates that research methods that are developed or adapted from the physical to the behavioural sciences take these difficulties into account.

The current project

This project aims to find out at what point course-graining data limits the usability of recurrence quantification analysis. We present an analysis pipeline consisting of multiple stages, in which each stage c. We will use the `DynamicalSystems.jl` Julia-package to implement the

toy-model, and the `Statistics.jl` and `RecurrenceQuantification.jl` packages to perform the analysis.

Stage 1: Generating data

We use a toy model developed to simulate the data based on a 3+1 dimensions model, which captures clinical observations found in psychiatric symptomology by modeling internal factors, environmental noise, temporal specificities and sympomatology. By changing these variables systematically, we aim to model a large variety of possible psychological constructs. For the purpose of our study, we redefine "symptomatology" as any naturally occurring dynamical development of psychological constructs.

Stage 2: Course-graining data

To simulate the effects of ordinalization, we bin the data into n segments of equal size, where n stands for the number of . We set the minimum and maximum value of

Stage 3: Analysis strategy

We will look if there is a change