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Studying Complex Adaptive Systems with Internal States:
A Recurrence Network Approach to the Analysis of Multivariate Time Series Data
Representing Self-Reports of Human Experience

Many recent papers in which multivariate time series of self-reports are analyzed (EMA/ESM data in the context of psychopathology), conceptualize the behavioural phenomenon of interest (e.g. a mental disorder) as a complex system of many coupled processes, which can display structure and dynamics that are often very specific to the internal and external environment of an individual patient. This conceptualization is excellent; however, it is unlikely that common analytic approaches based on nomothetic science (i.e., linear, additive statistical models, generalization to population parameters) can quantify any of the interesting structural complexity, or, nonlinear dynamics associated with complex systems and networks with internal degrees of freedom.

In this talk I will briefly discuss formal, theoretical and practical issues with the statistical analysis of multivariate time series data that represent self-reports of human experience, such as information loss due to aggregation and dimension reduction, problems with measurement invariance and interpretation of measurement outcomes. The goal is, however, to present possible solutions for at least some of these issues, such as the use of multi-variate nonlinear time series analyses and multi-layer recurrence networks (cf. Hasselman & Bosman, 2020; Olthof et al. 2020).

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