ICPSR Summer Program in Quantitative Methods of Social Research

Dynamical Systems Analysis | June 17 – 21, 2019

Instructors: Jonathan Butner and Brian Baucom

Day and Time: 6/17 (Monday) – 6/21 (Friday), 9:00 AM – 5:00 PM

Location: Gardner Commons Building, Room 1825 (GC1825) University of Utah campus

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Course Description

Research focused on how individuals, families, groups, and communities grow and change over time is increasingly recognizing the vast potential of dynamic systems models for advancing understanding of complex temporal phenomena. Dynamic systems models provide a unique lens for studying change over time; the focus in these models is on how fluctuations about the mean form patterns that emerge over time, how stable these patterns are, how stability is affected by different variables in the system, and how these patterns change under different conditions. This course provides an applied introduction to the statistical methods used in dynamic systems modes, including discussion of how to think about research questions from a dynamical systems perspective, how to generate dynamical systems hypotheses, and how to interpret results of dynamical systems analyses. This workshop includes a balance of didactic instruction in background material, introduction to constructing different types of dynamical systems models that correspond to different hypotheses, and guided practice in data preparation, data set construction, model estimation, and interpretation. No previous experience with dynamical systems modeling is necessary.

The five day course consists of morning and afternoon sessions each day, both of which involve a combination of lecture and hands-on application. Students are strongly encouraged to bring their own data sets to assist with generalization of course ideas to individual projects. Scheduled, one-on-one consultation time with course instructors will be available each evening of the course; additional one-on-one consultation with course instructors will be made available via phone and web conference on an as needed basis. Hands-on course examples will utilize SPSS and R software packages (both of which will be provided to all students at no cost for the duration of the workshop); code for conducting course examples in Stata and SAS will be provided. No specialized statistical knowledge or training is needed beyond a basic understanding of linear regression. Course instructors welcome questions from potential students regarding course appropriateness for potential student’s research designs/questions, readiness for the course, additional specifics of course content, etc.
Schedule

Monday, 6/17
Morning (9am – 12:30pm) – Welcome and review of key concepts in linear regression
Afternoon (1:30pm – 5pm) – Introduction to dynamical systems theory

Tuesday, 6/18
Morning (9am – 12:30pm) – Estimating 1 dimensional dynamical systems models in Ordinary Least Squares (OLS) regression, assumptions of 1 dimensional models
Afternoon (1:30pm – 5pm) – Introduction to multi-stability, adding control parameters to 1 dimensional models

Wednesday, 6/19
Morning (9am – 12:30pm) – Estimating 1 dimensional dynamical systems models for multiple time series in Multilevel Models, brief introduction to MLM in R
Afternoon (1:30pm – 5pm) – Centering in MLM, individualized consultation

Thursday, 6/20
Morning (9am – 12:30pm) – Estimating 2 dimensional dynamical systems models in OLS regression
Afternoon (1:30pm – 5pm) – Estimating 2 dimensional dynamical systems models for multiple time series in MLM

Friday, 6/21
Morning (9am – 12:30pm) – Intermediate and advanced topics including estimating and calculating derivatives, estimating 1 and 2 dimensional dynamical systems models in Structural Equation Modeling
Afternoon (1:30pm – 5pm) – Individualized consultation