Title: Workshop: Heterogeneity of Behavior: Order-Constrained Modeling and Data Analytics

Instructor: Michel Regenwetter

Abstract:

Synopsis: Conceptual, mathematical, and statistical framework to model heterogeneity of behavior and better understand the scope of psychological theory. Workshop participants will learn to move beyond a psychology of averages and think of variability of behavior as a source of information for scientific inquiry rather than mere noise. This workshop provides a basic introduction to order-constrained models and associated statistical inference methods, including frequentist and Bayesian approaches. No advanced mathematical modeling or quantitative analytics skills are required. The workshop aims to speak to a broad audience with a broad range of scientific interests. If you are willing to think deeply about variability and heterogeneity, this workshop should have something to offer.

Motivation: What is noise in scientific data and how could it come about? Consider an analogy: A bunch of pianists playing many pianos at once can generate a cacophony of sounds because, even though they all play the same Bach fugue, every one of them makes countless mistakes. Alternatively, each single pianist in the room might play flawlessly, but switch around different Bach pieces at random moments, leading to seemingly chaotic collective sound that emerges from very structured individual performance. What is "noise" in psychological data? Are we all "playing the same tune?" Is a given person consistently playing one tune? Is the noise caused by "mistaken" behaviors? Is it inaccurate measurement? Or rather, are we playing different tunes and/or changing tunes, while, all along playing tunes of the same composer? Behavioral science faces the formidable task of having to determine simultaneously what is deterministic (constant and same), while also determining what is probabilistic (uncertain and variable). These questions arise both between and within individuals. Workshop participants will learn about state-of-the-art modeling of heterogeneity and about pertinent order-constrained statistical inference methods.

Assignment: Active participation

Credits: 2 workshop days

References:

Davis-Stober, C. & Regenwetter, R. (2019). The `paradox' of converging evidence. *Psychological Review*, 126, 865-879.

Regenwetter, M. & Cavagnaro, D.R. (2019). Tutorial on Removing the Shackles of Regression Analysis: How to Stay True to Your Theory of Binary Response Probabilities. *Psychological Methods*, 24, 135-152.

Regenwetter, M., Dana, J. & Davis-Stober, C. (2011). Transitivity of preferences. *Psychological Review*, 118, 42-56.

Regenwetter, M. & Davis-Stober, C. (2012) Behavioral variability of choices versus structural inconsistency of preferences. *Psychological Review*, 119, 408-416.

Regenwetter, M., Davis-Stober, C.P., Lim, S.H., Cha, Y.-C., Guo, Y., Messner, W., Popova, A., & Zwilling, C. (2014). QTEST: Quantitative Testing of Theories of Binary Choice. *Decision*, 1, 2-34.

Regenwetter, M. & Robinson, M. (2017). The construct-behavior gap in behavioral decision research: A challenge beyond replicability. *Psychological Review*, 124, 533-550.

Zwilling, C.E., Cavagnaro, D.R., Regenwetter, M., Lim, S.H., Fields, B., & Zhang, Y. (2019). QTEST 2.1: Quantitative Testing of Theories of Binary Choice Using Bayesian Inference. *Journal of Mathematical Psychology*, 91, 176-194.