Building Bridges between Neural Models and Complex Decision Making Behavior
Jerome R. Busemeyer, Ryan K. Jessup, Joseph G. Johnson, James T. Townsend

Diffusion processes, and their discrete time counterparts, random walk models, have demonstrated an ability to account for a wide range of findings from behavioral decision making for which the purely algebraic and deterministic models often used in economics and psychology cannot account. Recent studies that record neural activations in non-human primates during perceptual decision making tasks have revealed that neural firing rates closely mimic the accumulation of preference theorized by behaviorally-derived diffusion models of decision making.
This article bridges the expanse between the neurophysiological and behavioral decision making literatures; specifically, decision field theory (Busemeyer & Townsend, 1993), a dynamic and stochastic random walk theory of decision making, is presented as a model positioned between lower-level neural activation patterns and more complex notions of decision making found in psychology and economics. Potential neural correlates of this model are proposed, and relevant competing models are also addressed.