

Inferring causal structure and hidden causes from event sequences

Christopher Lucas

University of Edinburgh

Kenneth Holstein

Carnegie Mellon University

Michael Pacer

University of California, Berkeley

Abstract: Past research has shown that people use temporal information to detect and discriminate between different causal relationships and that timing-based causal inferences are modulated by explicit information and domain-appropriate expectations. Many of these past results suggest that learners make inferences about hidden causes from timing information, but there have been no systematic studies of the ways in which subtle changes in temporal information can shape inferences about the presence and nature of hidden causes. We present new results showing that people make nuanced causal inferences when faced with streams of events, using temporal information to infer the presence of simple generative relationships, independent and common hidden causes, and causal cycles. Interpreted in a Bayesian framework, these results shed light on the cues and tacit temporal expectations that people use to make efficient use of temporal information.