

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Predicting the Time and Place of Critical Transitions in Socio-Cognitive Systems

Permalink

<https://escholarship.org/uc/item/6jf8t3zm>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 47(0)

Authors

Niehorster-Cook, Leo

Dohnke, Isabella Marilia

Smaldino, Paul

et al.

Publication Date

2025

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

Predicting the Time and Place of Critical Transitions in Socio-Cognitive Systems

Leo Niehorster-Cook

University of California, Merced, Merced, California, United States

Isabella Dohnke

University of California, Merced, Merced, California, United States

Paul Smaldino

University of California, Merced, Merced, California, United States

Tyler Marghetis

University of California, Merced, Merced, California, United States

Abstract

Collective behavior can change rapidly. Individuals can align their behavior suddenly, opting to cooperate or coordinate, such as in revolutions or riots. Can we predict when and where such collective shifts are about to occur? In many physical and biological systems, critical transitions from one regime to another are preceded by a variety of “early warning signals,” including increased relaxation time, variance, and autocorrelation. We investigate whether these early warning signals also prefigure sudden shifts in large-scale socio-cognitive systems. Using agent-based models, we demonstrate the existence of early warning signals of both the onset (when) and origin (where) of critical transitions in social interaction. These results were robust across social networks that varied in size and structure (i.e., random vs. small-world networks). We speculate that these signals may occur for many collective social-cognitive phenomena, including transitions in teamwork, norms, and communication systems.