CoCo Seminar Series Spring 2025

Multi-Perspective Agent-Based Modeling Unifies and Tests the Dynamics of Leadership Emergence

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Wednesday January 29, 2025 12:00-1:00pm EST
Hybrid (EB-T1 & Zoom; meeting link available on
http://coco.binghamton.edu/)

Human groups reliably transition from initial unstructured states to stable leadership configurations, yet the precise mechanisms driving this emergence remain disputed. While current organizational theories agree that leadership emerges through iterative claiming and granting behaviors, theoretical proliferation and methodological limitations have impeded systematic comparison of competing explanations. Recent advances in agent-based modeling (ABM) and machine learning now enable rigorous computational testing of these theoretical mechanisms.We develop an expanded multi-perspective ABM that formalizes core assumptions from Social Interactionist, Social Cognitive, and Social Identity theories into explicit behavioral rules. Using a modular Python-based architecture, we implement key theoretical parameters—including claim-grant sequencing, schema structures, and identity update dynamics—as configurable toggles. Our computational experiments reveal how varying fundamental assumptions about interaction dynamics shapes collective outcomes, with machine learning techniques identifying which parameter combinations reliably reproduce empirically observed phenomena across contexts. Analysis of convergence rates and leadership distribution demonstrates how different theoretical components predict emergence patterns under varying conditions. Results show how subtle variations in mechanisms generate diverse configurations—from unstructured high-entropy states to stable hierarchies or shared leadership. By combining ABM with machine learning optimization, we provide both a reproducible methodology and unified theoretical framework for studying leadership emergence, establishing falsifiable predictions for future empirical validation.

Dr. Bryan Acton is an Assistant Professor in the School of Management at Binghamton University. He obtained his Ph.D. in Industrial/Organizational Psychology from Virginia Tech in 2020. Prior to joining Binghamton in Fall 2022, he was a postdoctoral research associate at Durham University Business School, UK. His research interests include leadership emergence, team dynamics, identity processes, and computational methods in organizational science. His work integrates dynamic, process-oriented approaches with advanced methodological techniques such as agent-based modeling and computational social science.

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