Title

Connecting the dots: a comparative and developmental analysis of spatiotemporal pattern learning

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 46(0)

Authors

Mills, Tracey
Coates, Nicole
Silva, Alessandra A.
et al.

Publication Date

2024

Peer reviewed

Connecting the dots: a comparative and developmental analysis of spatiotemporal pattern learning

Tracey Mills
MIT, Cambridge, Massachusetts, United States

Nicole Coates
Massachusetts Institute of Technology, Cambridge, Massachusetts, United States

Alessandra Silva
University of Wisconsin-Madison, Madison, Wisconsin, United States

Stephen Ferrigno
University of Wisconsin-Madison, Madison, Wisconsin, United States

Laura Schulz
Massachusetts Institute of Technology, Cambridge, Massachusetts, United States

Josh Tenenbaum
MIT, Cambridge, Massachusetts, United States

Samuel Cheyette
MIT, Cambridge, Massachusetts, United States

Abstract

Humans learn and generate languages, music, games, and seemingly limitless varieties of other structures across domains. Unlike many AI systems, we often do so from little data. How do we learn such large varieties of richly structured representations so efficiently? One possibility is that people "learn by programming," synthesizing data-generating algorithms to explain what we observe. We examine the nature and origins of this learning mechanism in adults, children, and nonhuman primates (macaque monkeys), using a highly unconstrained sequence prediction task. Although adults and children quickly learn many richly structured sequences, monkeys learn only the simplest sequences (e.g. lines). We test multiple learning models, finding that adults are best explained by a "Language of Thought"-like program-learning model and monkeys by a simpler extrapolation strategy. Children exhibit varied learning strategies but are best fit in aggregate by an intermediately expressive model. Paper available at https://sites.google.com/view/patternlearning.