

Distributed Algorithms as a Gateway To Deductive Learning

Roger Wattenhofer   

ETH Zurich, Switzerland

Abstract

With the book *Thinking Fast and Slow*, Daniel Kahneman popularized the idea that the human brain can think in two different modes. The fast mode is instinctive and automatic, while the slow mode is deliberative and logical. As of 2023, one can argue that machine learning understands how to think fast. Deep neural networks are remarkably successful in rapidly classifying and regressing data. Thinking slow on the other hand is still a mystery. Large language models may provide an illusion of being able to think slow. However, prompts that need multiple deductive steps are generally beyond the capabilities of large language models. Distributed algorithms have the potential to help understanding deductive reasoning. Distributed algorithms usually consist of several little steps, iteratively applied, each step being easily learnable. As such distributed computing may provide an interesting bridge towards understanding deduction, extrapolation, reasoning, and everything else needed to think slow. In the talk, we will discuss some exciting case studies from graph generation to origami folding.

2012 ACM Subject Classification Theory of computation → Machine learning theory; Computing methodologies → Distributed algorithms

Keywords and phrases abstract visual reasoning, agent-based reasoning, classic algorithm benchmarks, differentiable status registers, explainable graphs, graph generation algorithms, integer sequences, neural combinatorial circuits, recurrent network algorithms, origami folding, Tatham's puzzles

Digital Object Identifier 10.4230/LIPIcs.OPODIS.2023.3

Category Invited Talk



© Roger Wattenhofer;

licensed under Creative Commons License CC-BY 4.0

27th International Conference on Principles of Distributed Systems (OPODIS 2023).

Editors: Alysson Bessani, Xavier Défago, Junya Nakamura, Koichi Wada, and Yukiko Yamauchi; Article No. 3; pp. 3:1–3:1



Leibniz International Proceedings in Informatics

LIPICs Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany