Less is More: Recursive Reasoning with Tiny Networks

Paper: https://arxiv.org/html/2510.04871v1

Abstract

Hierarchical Reasoning Model (HRM) is a novel approach using two small neural networks recursing at different frequencies. This biologically inspired method beats Large Language models (LLMs) on hard puzzle tasks such as Sudoku, Maze, and ARC-AGI while trained with small models (27M parameters) on small data (~ 1000 examples). HRM holds great promise for solving hard problems with small networks, but it is not yet well understood and may be suboptimal. We propose Tiny Recursive Model (TRM), a much simpler recursive reasoning approach that achieves significantly higher generalization than HRM, while using a single tiny network with only 2 layers. With only 7M parameters, TRM obtains 45% test-accuracy on ARC-AGI-1 and 8% on ARC-AGI-2, higher than most LLMs (e.g., Deepseek R1, o3-mini, Gemini 2.5 Pro) with less than 0.01% of the parameters.

Revision #4
Created 15 October 2025 08:50:05 by James
Updated 15 October 2025 09:05:51 by James