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Neural Network Modeling of Learning to Actively Learn

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Abstract

Humans are not mere observers, passively receiving the information provided by their environment; they deliberately engage with their environment, actively participating in the information acquisition stage to improve their learning performance. Despite being a hallmark of human cognition, the computational underpinnings of this active (or self-directed) mode of learning have remained largely unexplored. Drawing on recent advances in machine learning, we present a neural-network model simulating the process of learning how to actively learn. To our knowledge, our work is the first neural-network model of learning to actively learn. Extensive simulations demonstrate the efficacy of our model, particularly in handling high dimensional domains. Notably, our work serves as the first computational account of the recent experimental finding by MacDonald and Frank (2016) showing that prior passive learning improves subsequent active learning. Our work exemplifies how a synergistic interaction between machine learning and cognitive science helps develop effective, human-like artificial intelligence.