Emergent Compositionality in Signaling Games

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Abstract

Understanding the origins of linguistic compositionality is a fundamental challenge in evolutionary linguistics. Prior work has explored this topic through dynamical computational modeling and experiments in iterated learning. We explore these questions using RL agents tasked with developing cooperative communication strategies in a signaling game. We analyze how various mechanisms (such as Bayesian pragmatic reasoning) and constraints (such as limited memory) may affect compositionality and generalizability in the invented communication protocols. In particular, our preliminary results suggest that incremental pragmatic reasoning induces a bias towards lexical compositionality. To evaluate the extensibility of our model, we compare the behavior of the RL agents to the behavior of humans on the same task. That is, we ask humans to coordinate in a reference game task by repeatedly composing non-linguistic symbols. We discuss ways in which the resulting protocol mirrors and differs from that produced by the RL agents.