Modeling Observational Learning with Recurrent Hopfield Neural Networks

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Abstract

Observational learning is the process by which an observer learns the behavior of a role-model through observations. Observational learning has important implications for children's acquisition of social norms and language. We propose an observational learning model based on training a recursive Hopfield neural network with McCulloch-Pitts neurons. In this model, a Hopfield neural network trains with Backpropagation Through Time (BPTT), and it learns to imitate the behavior of a role-model recurrent neural network, without knowing the hidden connectivity of the model neural network. We call this observational learning model a learning Hopfield neural network. We make two main observations. Given further training first, the network improves its predictions of the role model and, second, the learning network recapitulates the network connectivity of the model network. These observations have interesting consequences on the study of observational learning in humans and animals. Furthermore, the learning Hopfield neural network can be considered as a pseudo-inference method to recover the hidden neural connectivity from magnetoencephalography (MEG) date.

Keywords: **Recurrent Neural Networks, Backpropagation Through Time, Observational Learning, Hopfield Neural Networks**