

A Model of Language-Guided Concept Formation using a Common Framework for Unsupervised and Supervised Learning

Paul Munro
University of Pittsburgh

Abstract: A general learning rule, “BCM- δ ”, is proposed that subsumes both unsupervised learning as a form of the BCM rule (Bienenstock, Cooper, Munro, 1982; Munro, 1984) and the delta rule (Rosenblatt, 1958; Rumelhart, Hinton, and Williams, 1986). The “BCM- δ ” unit is composed of two subunits, T and L, each integrating distinct input streams across distinct sets of synapses. The two subunits follow a common Hebb-like learning procedure that reduces to an unsupervised rule for the T subunit and a supervised rule for the L subunit in which the T response is the training signal. This model suggests a neurally plausible mechanism for the shaping of concepts by labels. More generally, stimuli from one modality can shape the response properties of a unit to another modality using a framework that is biologically plausible and gives clues to the source of a teaching signal for supervised learning.