

A Local Learning Rule for Independent Component Analysis

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Humans can separately recognize independent sources when they sense their superposition. This decomposition is mathematically formulated as independent component analysis (ICA). While a few biologically plausible learning rules, so-called local learning rules, have been proposed to achieve ICA, their performance varies depending on the parameters characterizing the mixed signals. Here, we propose a new learning rule that is both easy to implement and reliable. Both mathematical and numerical analyses confirm that the proposed rule outperforms other local learning rules over a wide range of parameters. Notably, unlike other rules, the proposed rule can separate independent sources without any preprocessing, even if the number of sources is unknown. The successful performance of the proposed rule is then demonstrated using natural images and movies. We discuss the implications of this finding for our understanding of neuronal information processing and its promising applications to neuromorphic engineering.