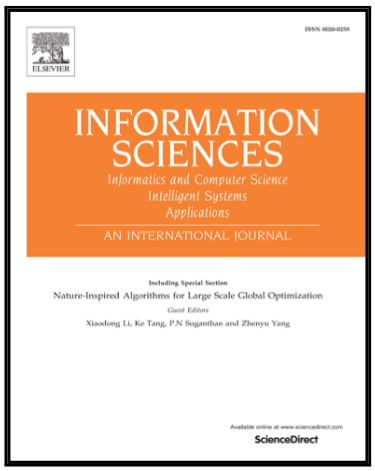

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Randomized Mixture Models for Probability Density Approximation and Estimation

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Abstract

Neural networks (NNs) with random weights are an interesting alternative to conventional NNs that are used more for data modeling. The random vector functional-link (RVFL) network is an established and theoretically well-grounded randomized learner. A key theoretical result for RVFL networks is that they provide universal approximation for continuous maps, in expectation, with respect to the square-integral norm. We specialize and modify this result, and show that RFVL networks can provide functional approximations that converge in Kullback-Leibler divergence, when the target function is a probability density function. Expanding on the approximation results, we demonstrate the RFVL networks lead to a simple randomized mixture model (MM) construction for density estimation from sample data. An expectation–maximization (EM) algorithm is derived for the maximum likelihood estimation of our randomized MM. The EM algorithm is proved to be globally convergent

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