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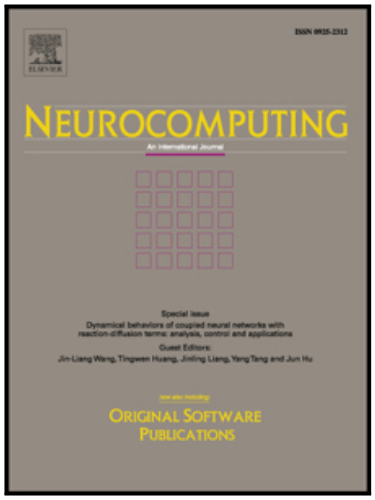


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# Stability Analysis of Opposite Singularity in Multilayer Perceptrons

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**Abstract:** For the bipolar-activation-function multilayer perceptrons (MLPs), there exist opposite singularities in the parameter space. The Fisher information matrix degenerates on the opposite singularity which causes strange learning behaviors. As the stability is the fundamental to analyze the properties of the opposite singularity, this paper concerns the stability analysis of the opposite singularity in MLPs. The analytical form of the best approximation on the opposite singularity is obtained at first, then the concrete expression of Hessian matrix can be obtained. By analyzing the eigenvalues of Hessian matrix on the opposite singularity, the stability of the opposite singularity is investigated. Finally, two experiments are taken to verify the obtained results.

**Keywords:** Stability analysis; Multilayer perceptrons; Opposite singularity; Hessian matrix; Best approximation.