

## Use of Gaussian-Euclidean Hybrid Function Based Artificial Immune System for Breast Cancer Diagnosis

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**Abstract :** Due to the fact that there exist only a small number of complex systems in artificial immune system (AIS) that work out nonlinear problems, nonlinear AIS approaches, among the well-known solution techniques, need to be developed. Gaussian function is usually used as similarity estimation in classification problems and pattern recognition. In this study, diagnosis of breast cancer, the second type of the most widespread cancer in women, was performed with different distance calculation functions that euclidean, gaussian and gaussian-euclidean hybrid function in the clonal selection model of classical AIS on Wisconsin Breast Cancer Dataset (WBCD), which was taken from the University of California, Irvine Machine-Learning Repository. We used 3-fold cross validation method to train and test the dataset. According to the results, the maximum test classification accuracy was reported as 97.35% by using of gaussian-euclidean hybrid function for fold-3. Also, mean of test classification accuracies for all of functions were obtained as 94.78%, 94.45% and 95.31% with use of euclidean, gaussian and gaussian-euclidean, respectively. With these results, gaussian-euclidean hybrid function seems to be a potential distance calculation method, and it may be considered as an alternative distance calculation method for hard nonlinear classification problems.

**Keywords :** artificial immune system, breast cancer diagnosis, Euclidean function, Gaussian function

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