Improved Clonal Selection- based RBF Neural Network Classifier for Feature Selection

Aye Mya Thandar, _Myo Kay Khaing
University of Computer Studies, Yangon,Myanmar

***Abstract*— Many researchers have been working in data mining for improving the predictive accuracy of statistical classifiers by applying the techniques of feature selection methods. They found that the clonal selection theory can be used as the inspiration for a classification algorithm. A disadvantage of artificial neural networks is that they cannot deal effectively with irrelevant features. Neural networks require long training times for high-dimensional datasets. To overcome this limitation, feature subset evaluation could use a simpler learning algorithm. Clonal Selection Algorithm (CSA) is one of the most famous artificial immune algorithms which are designed based on the clonal selection principle of adaptive immunity and it can filter features leading to reduce dimensionality of the feature space. This paper is a first attempt to apply the clonal selection principle to the training of RBF neural network for feature selection. Our paper is different from others because functions of CSA are used to select relevant attributes of medical datasets for better performance and network architecture of RBF neural network. Clonal search is embedded feature selection which can search relevant features by using data evaluated by Consistency evaluation method.**

The training is typically done in two phases, first fixing the width and centers and then the weights. The position of the center can be selected from the training dataset in a random way. In this paper, Gaussian function is used as radial basis function.

$$y(\mathrm{x}) = \sum_{i=1}^{M} w_i \exp\left(-\frac{(\|\mathrm{x}-\mathrm{c}_i\|)^2}{2\sigma^2}\right) \qquad (1)$$

The least square error is denoted by e and it is used as evaluation criterion (affinity) for the better choice of weight units to reduce error rate in network training.

$$e = \sum_{i=1}^{N} (y_i - x_{ij})^2 \qquad (2)$$

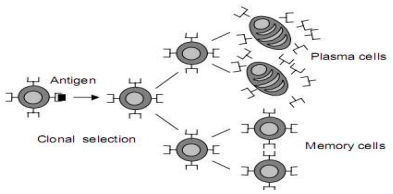

Figure1. Clonal Selection principle

*Research supported by UCSY.

Aye Mya Thandar is with the University of Computer Studies, Yangon,Myanmar(: 959-5680120; e-mail: ayemyathandar7@ gmail.com).

Myo Kay Khaing, is with the Department of Mathematics, UCSY, Yangon,Myanmar(e-mail: ucsy.edu.com.mm).

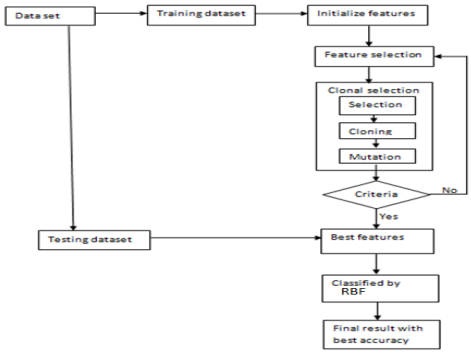

Figure2. Proposed Clonal Selection- based RBF Neural Classifier

Table1. Performance comparison between RBF and Clonal Selection based RBF

Dataset	RBF				ClonalRBF(feature selection)			
	Accuracy (%)	Time (seconds)	Attributes	Network structure	Accuracy (%)	Time (seconds)	Attributes	Network structure
hypothyroid	92.2853 %	6.57 seconds	30	30-16-2	92.3118 %	3.77 seconds	16	16-9-2
hepatitis	79.3548 %	1.67 seconds	20	20-11-2	81.2903 %	1.18 seconds	12	12-7-2
Breast cancer	77.8462 %	8.32 seconds	13	13-9-5	83.0769 %	7.32 seconds	7	7-6-5
heart-disease	70.4082 %	27.69 seconds	14	14-8-2	73.8095 %	24.01 seconds	11	11-6-2
echocardiogram	80.303 %	3.29 seconds	12	12-7-2	83.3333 %	2.99 seconds	6	6-4-2
lymphography	60.8108 %	6.01 seconds	19	19-10-2	64.8649 %	7.84 seconds	10	10-6-2
Appendicitis	81.1321 %	0.22 seconds	8	8-5-2	85.8491 %	0.2 seconds	3	3-2-2

ACKNOWLEDGMENT

First of all, I wish to express my sincere thanks to Professor Dr.Mie Mie Thet Thwin,Rector of University of Computer Studies,Yangon, for allowing me to submit this paper . I would like also to express my respectful gratitude to my supervisor Professor Dr. Myo Kay Khaing for her guidance and support.

REFERENCES

[1] A.Lanaridis ,V.karakasis and A.Stafylopatis, " Clonal Selection-based Neural Classifier", Eighth International Conference on Hybrid Intelligent Systems, 978-0-7695-3326-1/08,IEEE,2008.

[2] Jasmina Novakovic,"RBF Network with Genetic Algorithm for feature selection", 17th Telecommunications forum TELFOR 2009.

[3] J.Bronlee,"Clonal Selection Theory& Clonalg, the Clonal Selection Classification Algorithm(CSCA)", Technical Report No.2-02,January 2005.