

Comparing the Performance of SVM & RBF Models for Diagnosis of Bipolar Disorder

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Abstract: With regard to the development of human societies and industrial affairs, actual psychological problems caused by busy people, which is hidden within each person there is potential, it can be causes irreparable damages to increase anomalies society. However, the development of computer science and application of neural networks in the diagnosis of various diseases, trying to ease the diagnosis of mood disorders - including bipolar disorders - a collection is often perceived as. In this paper implemented neural network by using the RBF and SVM model. For both model use the different percentage training, and compared the error of models for selecting suitable model in diagnosis bipolar disorder.

Keywords: ANN, SVM, RBF, Bipolar Disorder.

1. INTRODUCTION

Due to the increasing use of neural networks in different areas of science, engineering, including biomedical engineering [1], and since depression is a mood disorder is important categories [2]. So far things have been done in the diagnosis of depression, which we have here is a brief overview of some of them: In [3], to provide a classification algorithm based on fuzzy neural approach with the ability to remove 95% of patients with depression and healthy using the two-phase (NEWFM) with weighted fuzzy membership function deals. In [4], the author proposed an ontology model to build the terminology of depression and utilized the bayesian networks to infer the probability of depression. In addition, the paper also proposed an agent based platform and addressed the implementation issue. This paper is an effective step in the diagnosis of bipolar disorder using neural networks models of neural networks can be used as a simple model of MLP neural network is noted that this model has at least three layers [5]. Other model that used in this paper, is SVM, this model is a discriminative classifier formally defined by a separating hyper plane. In other words, given labelled training data (supervised learning), the algorithm outputs an optimal hyper plane which categorizes new examples [6]. In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces [7].

2. BIPOLAR DISORDER

Bipolar Disorder Type I is according to one or more courses or mixed Mania usually associated with major depressive episodes are characterized. Bipolar disorder II is according to one or more periods of major depression associated with at least one course Hypo mania be determined. Periodic disturbance: According to multiple periods Hypo mania symptoms for at least 2 years Mania not match the criteria of diagnosis and the presence of numerous periods with depressive symptoms that do not meet the criteria for a diagnosis of major depression, is by characterized [8][9], bipolar disorder, which otherwise is specified for encoding is used for bipolar disorder with features that none of the diagnostic criteria for bipolar disorder specifically mentioned by the these sections do not match (or bipolar symptoms is insufficient or conflicting information exists about them.). Diagnostic criteria for bipolar disorder II:

- There is (or history) of one or more periods of major depression.
- Presence (or history) of at least a Hypo mania.
- Never Mania a period or periods there has been mixed.
- Symptoms, clinically significant distress or impairment in social functioning, occupational, or other important areas of the cause. [10][11].

3. PROPOSED METHOD

After examining the records and interviews with psychiatrists parameters such as depressed mood, loss of pleasure, loss of energy, feelings of guilt, thoughts of suicide, worthlessness, insomnia, psychic anxiety, somatic anxiety, lack of decision making power, lack of hope for the future lack of life satisfaction, decreased libido, dysfunction, slow motion and the like that is a total of 47 basic parameters, we have achieved. Also, all of the experiments were implemented using MATLAB 8.1. The "Fig.1" show the proposed method. And the details are as follows:

- All data divided to two part, "train" of training network and "test" for testing of models.
- ANN models with train part and parameters of BD, training for models.
- The error of RBF model calculated for test part, and save in "E1".

- Error of SVM shows with “E2”, that calculated by using data of test part.
- For select the better model, compare the error of models.
- If “E1” greater than “E2”, select SVM model, otherwise select the RBF model.

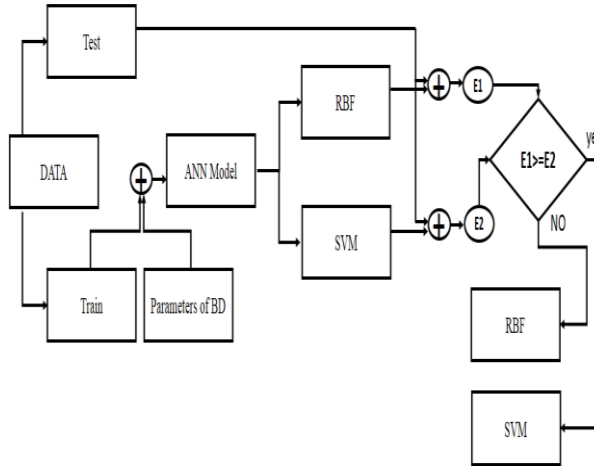


Fig.1 .Proposed Method

4.RESULTS OF IMPLEMENTED RBF MODEL

This model uses the coefficient of expansion (spread) the first one, add the number of neurons to display the target amount equal to 25 times the mean square error is zero, default values are the model has been implemented, as well, the percentage of data that Learning networks are used, are determined by the user. The data selected for training the network with respect to the user input, the command rand perm are determined. In “Fig.2”, the percentage error with respect to the training of the network stated. as can be seen for 70% data for training, have the minimum error (0.24), and for 40 or 60 % data for training, we have the maximum error, this value of this error is 0.28.

The performance graph of this model show in “Fig.3” as can be seen, in epoch 6 have the best validation, this validation is 0.04.

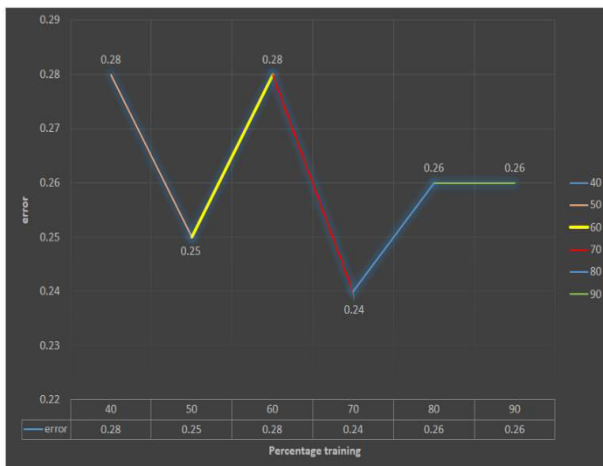


Fig.2 .Error of RBF Model

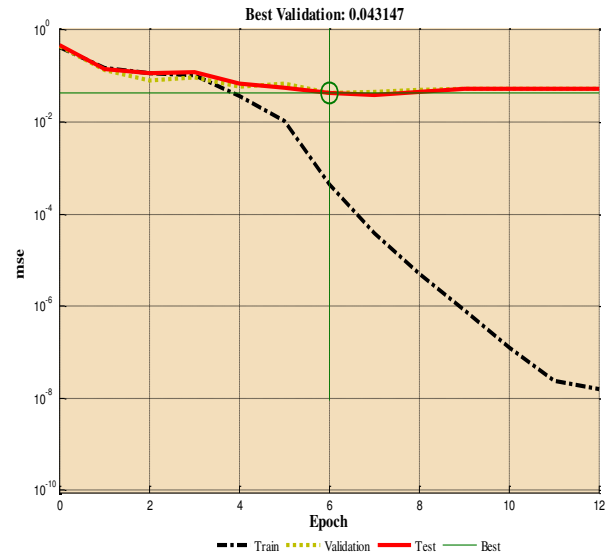


Fig.3 .Performance of RBF Model

5.RESULTS OF IMPLEMENTED SVM MODEL

This model uses a linear kernel function type (Linear) is implemented. Also, the percentage of data that are used to train the network, are determined by the user. The data selected for training the network with respect to the user input, the command rand perm are determined. In “Fig.4” the percentage error with respect to the training of the network stated. as can be seen, by using 70% of data for training of network have the minimum error, this error is 0.11, and for 40 or 60 % data for training, we have the maximum (0.29).

The performance graph of this model show in “Fig.5” as can be seen, in epoch 5 have the best validation, this validation is 0.07.

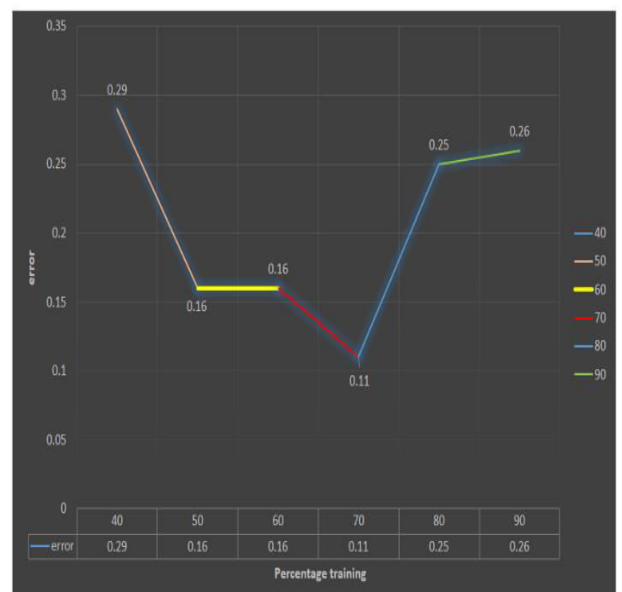


Fig.4 .Error of SVM Model

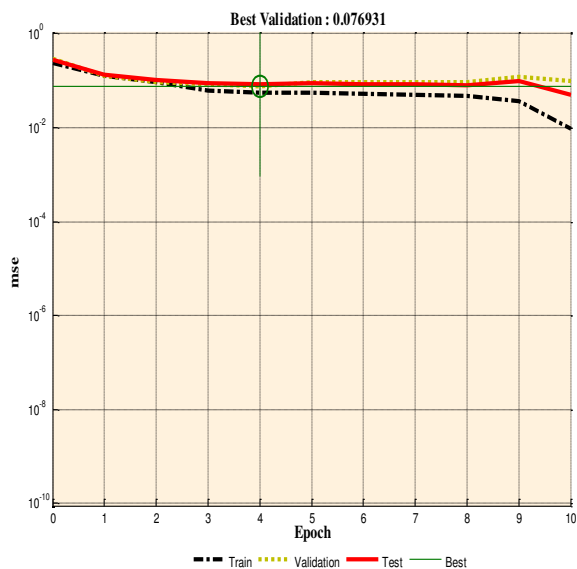


Fig.5 .Performance of SVM Model

6. CHOOSE THE BEST MODEL

For choosing the best model for select to diagnosis bipolar disorder, we comparing the results of models. The “Fig.6” show this compare. As can be seen with the SVM model we have the better error.

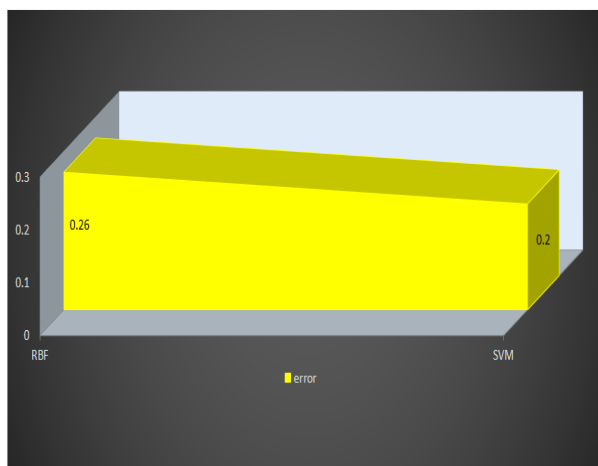


Fig.6 .Compare the Models

7. CONCLUSION

In this paper an attempt is made to use the parameters required for the diagnosis of bipolar disorder, deal to implementation of neural network model (RBF & SVM). With the available data to train and test the models discussed. With using the RBF model for diagnose have the 26% error and with using the SVM model have the 20% error. With compare the error of models, concluded the SVM model is better than RBF model for diagnosis bipolar disorder.

REFERENCE

- [1] Fukushima, K., "Neocognitron: A self-organizing neural network model for a mechanism of pattern recognition unaffected by shift in position". *Biological Cybernetics*, vol. 36 (4), 2014, pp. 93
- [2] Podgornik, N, 'Depression - a sociocultural way of manifesting women's psychological crises', *Anthropological notebooks*, vol. 18, no. 2, 2013, pp. 55-67.
- [3] Zhen-Xing.Zhang, IT Coll., Kyungwon Univ., Sunnam, South Korea, Xue-Wei Tian, Lim, J.S." New algorithm for the depression diagnosis using HRV: A neuro-fuzzy approach", *Bioelectronics and Bioinformatics (ISBB)*, 2011 International Symposium on, DOI. 10.1109/ISBB.2011.6107702, 2011.PP. 283-286.
- [4] Filippo Amato, Alberto Lopez, "Artificial Neural Network in Medical Diagnosis", *Journal of Applied Biomedicine*, Vol. 11, Issue. 2, 2013, pp. 47-58
- [5] phil.picton, "introduction to neura network", macmilan publishers limited,1994, pp.145-150.
- [6] Xiaolin Huang; "support Vector Machine Classifier With Pinball Loss"; *Pattern Analysis and Machine Intelligence*, IEEE Transactions on; DOI. 10.1109/TPAMI.2013.178; ISSN. 0162-8828; 2013; pp. 984-997.
- [7] Yogachandran Rahulamathvan; Raphael, C. ; "privacy-Preserving Multi-Class Support Vector Machine for Outsourcing the data calssification in cloud"; *dependable and secure computing*, IEEE Transaction on; DOI. 10.1109/TDSC.2013.51; 2013; pp. 1.
- [8] timothy.J.E.Jerry.Phares,etc. "clinical psychology concepts,methods,& profession", 6thed , belmont. calif.wadsworth/thomas learning, 2001, pp.280-334.
- [9] Pfennig.A, Bschor.T, Baghai.T, etc. "S3 guidelines ondiagnostics and therapy of bipolar disorders: developmentprocess andessential recommendations", Vol.83(5), *Nervenarzt*, 2012, pp.568-586
- [10] American.Psychiatric.Association, " Diagnostic and statistical manual of mental disorder",4th edition,American. Psychiatric.Association . 2000,pp:525.
- [11] Zimmerman. M. "Would broadening the diagnostic criteria for bipolar disorderdo more harm than good? Implications from longitudinal studies of subthreshold conditions",Vol. 73(4), *J Clin Psychiatry*, 2012, pp.437-443.