

Classification Algorithms of Alzheimer Disease using SVM and KNN

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Article Info

Volume 83

Page Number: 9963 - 9966

Publication Issue:

March - April 2020

Article History

Article Received: 24 July 2019

Revised: 12 September 2019

Accepted: 15 February 2020

Publication: 11 April 2020

Abstract: Alzheimer's disease (AD) plays an important role in the medical image processing. It is a kind of memory loss which occurs at the age of 65. It related with thinking and behavior of people's day to day lives. Further, experts are taking more efforts to find proper treatment and improve the quality of patient's life. Therefore, lot of researches is focused on AD with appropriate results. Hence, this paper organizes 160 subjects with normal and abnormal images in cognitive model using two types of classification algorithms like SVM and KNN. Beyond this, KNN gives 10% accurate results than SVM algorithm.

Keywords: Alzheimer's disease, Support Vector Machine, K – Nearest Neighbor

I. INTRODUCTION

Brain is one of the important and complex organs in our human body which is located at the center of the nervous system. It consists of several billions of cells to communicate trillion connections like synapses. The brain includes some major task such as visualization, thinking, language processing, emotional response and learning. As it locates at the center of the nervous system, is there any abnormal behavior inside the cells it may affect our entire functionalities of the body which leads to Alzheimer's disease (AD). It is otherwise known as dementia that occurs often at the age of 65. It is a kind of memory loss with improper thinking and behavior, also in current progress there is no treatment for dementia. Thus, the experts are taking more effort to find the proper treatment and improve the quality of patient's life. To achieve this, some of the automatic development was progressed for the early detection of AD. It is one of the top 10 diseases in America that affects more than 5

million people of Americans and it may exceed up to 16 million people in 2050. The Alzheimer's disease was developed in the plaques and tangles of the brain, which leads to block the communication among the nerve cells, reduce its function and respective cells will die. Hence, the death of the nerve cells and distraction may cause memory failure and problem of changes in personal and daily activities [1].

In recent reviews, the segmentation based on different methods of aspects and it can be concluded in different ways. Following that, Jose Vicente Manjon, et.al, contributes some segmentation results using tissue classification in TMS method. It highlights the biomarker key in AD, temporal lobe atrophy are the early path physiological event that associated with early life of patients risk factors [7]. Pier rick Coupe, et.al proposes methods of segmentation in life span analysis of brain trajectory using inferred models in AD that exhibits the early divergence between

normal and pathological models [8]. The MRI images are used to detect the Alzheimer's disease with the help of neuroimaging Initiative (ADNI) dataset which obtains high accuracy with new biomarker images [9]. The following results are evaluated by ADNI datasets and determine the ability of the suggested biomarker with SVM algorithm for better results [10]. Then the limitations of previous analysis of neuroimaging in biomarkers were concluded in [11]. The evolution of brain Atrophy subtypes includes all types of segmentation methods that predict long-term cognitive decline and future clinical syndrome of Alzheimer's disease [12]. Frank de Vos, et.al, proposes anatomical measurements of MRI to increase the classification of AD into two different methods for combining the different measures of features [13]. The measure of all weighted combination is better than concatenated combination. These results may be to concatenate with the study of early diagnosis AD and other neurodegenerative diseases.

This paper represents the review and classification of Alzheimer's disease using SVM and KNN algorithm. Also, it organizes several datasets which consists of 160 subjects with AD and

normal patient's datasets. Finally, the results and graph are drawn with accurate results.

II. CLASSIFICATION ALGORITHMS

Support Vector Machine (SVM)

SVM is a supervised algorithm which consists of two stages: training and testing. The basic SVM takes a set of input data and predicts for each given input which of two classes forms the output, making it a non-probabilistic linear classifier as shown in the fig.1. It has ability grouping of all the classes in two disjoint groups of classes. This grouping is then used to train a SVM classifier in the root node of the decision tree, using the samples of the first group as positive examples and the samples of the second group as negative examples.

K-means clustering (KNN)

The k-nearest neighbor classifier is a non-parametric supervised classifier that performs for optimal values of k. k-NN algorithm consists of two stages of training and testing. In training stage, data points are given in n-dimensional space. These training data are labeled so their classes can be specified. In the tested stage, unlabeled data are given as input and the classifier generates the list of the k nearest data points (labeled) to the testing point.

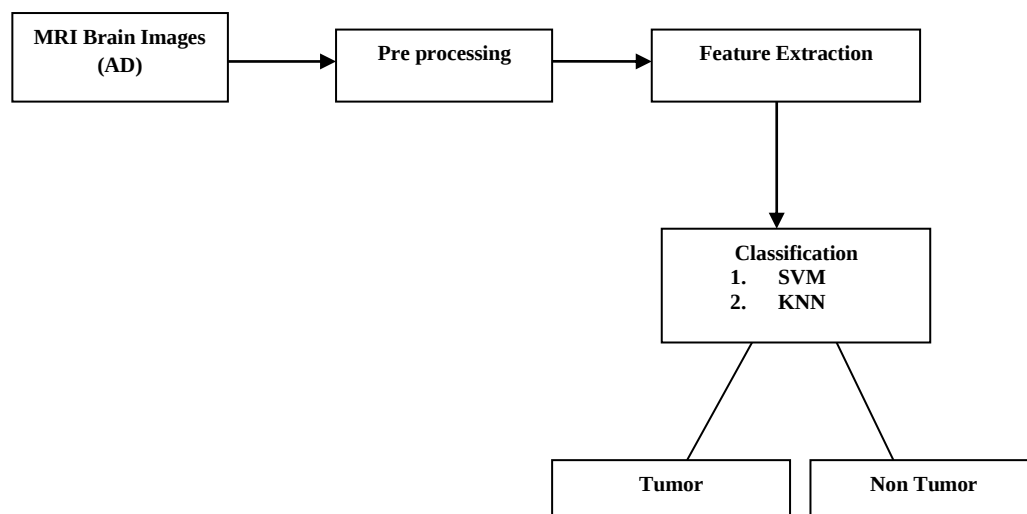


Fig.1 Block diagram using SVM and KNN

Table 1: Classification result analysis of AD using SVM and KNN algorithm

Classifiers	TN	FP	TP	FN	Sensitivity	Specificity	Accuracy
SVM	45	10	52	12	78.5	85	90.2
KNN	47	8	54	10	8.1	86	92

1. Define a suitable distance metric.
2. In training step, all the training data set P are put in pairs $P = (Y_i, C_i)$, $i = 1, \dots, n$

Y_i - training pattern in the training data set

n - Number of training patterns.

3. In testing step, the distances between testing feature vector and training data are computed.
4. The k - nearest neighbors is chosen and the class of the testing example is specified.
5. The result of classification in testing stage is used to evaluate the precision of the algorithm. If it was not satisfactory, the k value can be change till achieving the desirable results.

III. RESULT AND DISCUSSION

In order to develop a generalized network model, the training samples are randomly selected from the total samples of 120 datasets. In that, 60% of dataset has been used for training the neural network and the remaining 40% of dataset has been used to test the performances of the neural network using confusion matrix. The performance analyses as shown in Table.1. It observes the values of accuracy, sensitivity, and specificity which obtained from both SVM and KNN algorithms.

IV. CONCLUSION

Alzheimer's disease (AD) is otherwise known as Dementia which is most vulnerable disease in our human brain. Totally it consists of 120 subjects with normal and abnormal images in cognitive model. In that, KNN gives sensitivity as 8.1%, specificity 86% and accuracy as 92%. Hence, it can

be concluded that KNN achieves 10% accuracy than SVM algorithm.

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