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SVM Based Classification of Neurodegenerative Diseases for Salient Brain Patterns

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Abstract: The identification defects in the MRI brain images can save numerous lives. A method to implement the kernel function for feature extraction to identify the neurodegenerative Alzheimer disease in Brain Image is proposed. The input Brain image has converted into gray image and preprocessed and saliency map image is obtained from the preprocessed image. The saliency map obtained gives the intensity related information from the images. After getting the saliency map image we have to normalize the saliency map and applying the kernel fusion to the normalize image to extract the feature of the image. The normalization process refines the images pixels to certain extend and the exact information representing the different portions separately is obtained. The feature extraction process reduces the dimensionality of the image data to make the process more optimized and simple. Finally by using the SVM classifier is fed with features such as intensity, textural and statistical information, binary tissue segmentations or cortical thickness estimations. Overall proposed algorithm used to decrease the computational time and the presence of irrelevant and noisy features. The salient regions found with the proposed approach as systematically relevant for discrimination of AD patients this results completely coherent to what has been reported by clinical studies of AD.

Index Terms ----Alzheimer's disease (AD), automated pattern recognition, magnetic resonance imaging (MRI), support vector machines (SVMs).

I. INTRODUCTION

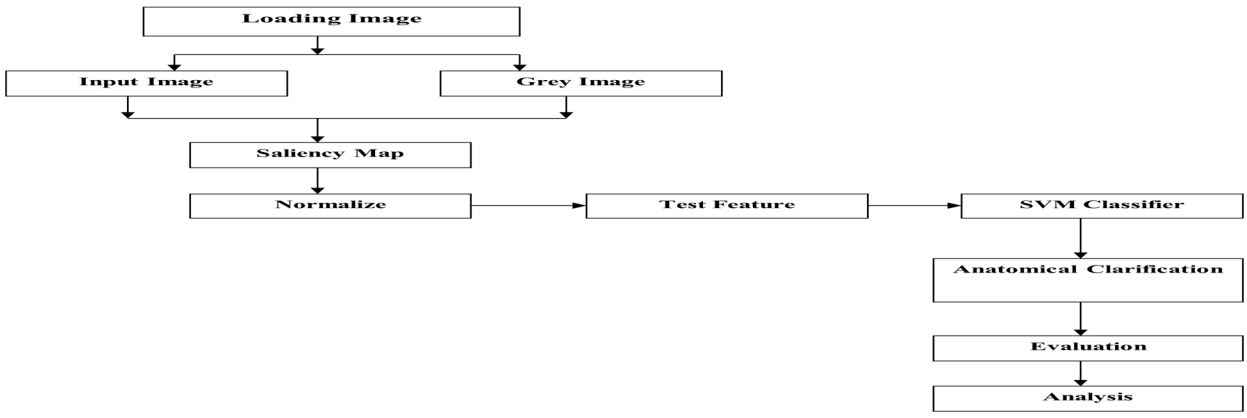
A Neurodegenerative disease is an umbrella term for a range of conditions which primarily affect the neurons in the human brain. Neurons are the building blocks of the nervous system. Which includes the brain and spiral cord? Neurons normally don't reproduce or replace themselves so when they become damaged or die they can't be replacing by the body. Examples of neurodegenerative diseases include Parkinson's, Alzheimer's and Huntington's disease. Neurodegenerative diseases are included and debilitating condition that results in progressive degeneration and death of nerve cells. This causes problems with movement (called ataxias) or mental functioning (called dementias). Dementias are responsible for the greatest burden of disease with Alzheimer's representing approximately 60-70% of cases. Medical imaging is usually recognized to label the set of approach that no invisible produce images of the domestic aspect of the body. The peculiar density of resonance is called the Larmour frequency and is determined placed on the distinct tissue being imaged and the strength of the main hypnotic field. A mechanical brain morphometric reasoning that do perform this evaluation, devote very little to the awareness of the disease. In despite of the importance of these integral sources of medical ability, Medicinal status are rarely further handle in certain clinical practice, so the consultant take resolution only based in the unprocessed data. Here they introduce a new fully automated model study method. That expose discriminate brain arrangement correlate to the existence of neurodegenerative syndrome mining efficient variation and therefore classify objectively any neurological mess. In variation the access here in detailed can be seen as an increment to the state-of-the-art study of sectarian salient appearance much closer to the clinical analysis of a medicinal finding. In terms of the human search discriminate regions found by the prospective access highly combines to what has been expressed in analytic class of AD. Alzheimer's disease develops differently for every individual, there are many common symptoms. Early symptoms are often mistakenly thought to be 'age-related' concerns, or manifestations of stress. In the early stages, the most common symptom is difficulty in remembering recent events, known as short term memory loss. During the final stage of AD, the person is completely dependent upon caregivers. Language is reduced to simple phrases or even single words, eventually leading to complete loss of speech. Despite the loss of verbal language abilities, people can often understand and return emotional signals. Alzheimer is the common form of dementia a general term for memory loss and other intellectual abilities neurological disorder in which the death of brain cell causes memory loss and cognitive decline.

II. EXISTING WORK

In Existing System for analysing the Discriminative Anatomic pattern voxel-based morphometry (VBM) and deformation-based morphometry (DBM) methods were used. In VBM, the patterns were examined by local differences, found in brain tissue segmentations, are voxel-by-voxel statistically analysed voxel-by-voxel statistically. In DBM compared information which from the deformations fields obtained after registration to the template, in these methods one-to-one correspondences between subjects are assumed and statistics are computed for the same voxel across all subjects. Finally the recent approach for Brain Pattern were diagnosed with feature-based morphometry (FBM) technique, In FBM approach is represented by scale-invariant salient features, along with a probabilistic framework that together permit to evaluate the significance and differentiation degree of salient features, Which established differences between normal controls and probable AD patients. These sets of features are considered as group-related anatomical patterns. It recommends neuroimaging may become an important tool in the early analysis of neurodegenerative disorder. By separating structure arrangement and explain hidden relationship from basic magnetic resonance (MR) images. An automated intellect morphometric search that do behave this measure to give very little to the apprehension of the disease. In preceding ROIs portrait are highly time-exhausting and expert-reliant. This approach is able to graph any intellect to a set of optical designs that previously have been studied as they related to the medicinal or normal position. By applying the Voxel Based Morphometry (VBM) for feature selection and extraction of the most relevant features. Finally using this Feature Extraction values classify the values by using the SVM Classifier. The constant checking system is achieved by expert neurologists or radiologists, who are able to figure out complicated structural patterns and slight changes with clinical context. Finally they identify the Alzheimer's disease.

III. PROPOSED WORK

The Proposed method evaluating both its accuracy for discriminating different experimental groups and its capacity of determining the relevant anatomical regions together with their weights. This is accomplished using a fusion strategy that is GBVS implementation which mixes together bottom-up and top-down information flows. The bottom-up approach highlights relevant regions correlated with the AD diagnosis. The top-down scheme identifying patterns associated to pathological stages. In order to highlight the quality of the model is not only given by the quantitative performance measures, but by its aptness to automatically detect highly discriminative brain regions, consistent with those regions that have been described as important in the progression of the disease. The most popular technique has been proposed by support vector machine (SVM), which has been applied to classifying individuals with several neurological disorders. The SVM classifier is usually fed with features such as intensity, textural and statistical information, binary tissue segmentations or cortical thickness estimations. Comparisons between the kernel group and the baseline have shown that the segregation of information into different feature-scale kernels, improves the classification performance in all subject groups. In prospective system they use the kernel function for feature extraction instead of existing method. This based on a two-phase visual saliency miniature that correlate bottom-up and top-down process to get definite analysis of brain MR images as ordinary controls or feasible AD subjects. Extension of the initial data into these various scale spaces attack to sparsify the raw intellect data, promoting the depth contraction. In they suggested model, the input space is the space of saliency maps, so a kernel function measures the affinity between saliency maps. Sparsity is derived by the goal of discover a diminished set of saliency maps that better summarize optical designs to discriminate feasible AD cases from normal restraint. In the prospective access the pre-defined kernels follower the input image into specific feature saliency maps, whose voxels correspond to dimensions of the saliency map space. Finally using this Feature Extraction values classify the values by using the SVM Classifier. This event clarify that the learning technique here in used is able to individually analyze the framework space and to optimally combine or merge each part.



A. Saliency map

Automatic estimation of salient object regions across image without any prior assumption or knowledge of the contents of the corresponding scense. Introduce a regional contrast based salient object extraction algorithm which simultaneously evaluated global contrast different and spatial weighted coherence scores. Proposed algorithm is simple, efficient, and naturally multiscale and produces full resolution high-quality saliency maps. Further used to initialize a novel iterative version of grab cut for high quality salient object segmentation. We evaluated our algorithm using traditional salient object deletion dataset as well as more challenging internet image dataset. Algorithm consistently outperforms existing salient object detection and segmentation methods. Yielding higher precision and better recall rates. Saliency map has its root in feature integration theory and appears first in the class of algorithmic models above it includes the following elements.

1. An early representation composed of a set of feature maps computed in parallel permitting separate representations of several stimulus characteristics.
2. A topographic saliency map where each location encodes the combination of properties across all feature maps as a conspicuity measure.
3. A selective mapping into a central non-topographic representation through the topographic saliency map of the properties of a single visual location.
4. A winner takes all network implementing the selection process based on one major rule conspicuity of location.
5. Inhibition of this selected location that causes an automatic shift to the next most conspicuous locations. Feature maps code conspicuity with in a particular feature dimension.

The saliency map combines information from each of the feature maps into a global measure where points corresponding to one location in a feature map project to single units in the saliency map. Saliency at a given location is determined by the degree of difference between that location and its surround. Saliency typically arises from contrasts between items and their neighborhood, such as a red dot surrounded by white dots, a flickering message indicator of an answering machine, or a loud noise in an otherwise quiet environment. Humans and other animals have difficulty paying attention to more than one item simultaneously, so they are faced with the challenge of continuously integrating and prioritizing different bottom-up and top-down influences.

B. Normalization

In image processing normalization is a process that changes the range of pixel intensity values. Applications include photographs with poor contrast due to glare. Normalization is sometimes called contrast stretching or histogram stretching. In more general fields of data processing such as digital signal processing it is refered to as dynamic range expansion. To changing the Intensity, Coordinates values, etc….In image processing, normalization is a process that changes the range of pixel intensity values. Applications include photographs with poor contrast due to glare. Normalization is sometimes called contrast stretching or histogram stretching. Auto-normalization in image processing software typically normalizes to the full dynamic range of the number system specified in the image file format.

C. Kernel Feature Extraction

Kernel methods have received major attention, particularly due to the increased popularity of the Support Vector Machines. Kernel functions can be used in many applications as they provide a simple bridge from linearity to non-linearity for algorithms which can be expressed in terms of dot products.Each measurement has its own wavelength range of the light spectrum, some of which may be outside the visible spectrum. If the set of possible color values is sufficiently small, each of those colors may be placed on a range by itself; then the histogram is merely the count of pixels that have each possible color. Most often, the space is divided into an appropriate number of ranges, often arranged as a regular grid, each containing many similar color values. The color histogram may also be represented and displayed as a smooth function defined over the color space that approximates the pixel counts. Kernel methods have received major attention, particularly due to the increased popularity of the Support Vector Machines. Kernel functions can be used in many applications as they provide a simple bridge from linearity to non-linearity for algorithms which can be expressed in terms of dot products. Most often, the space is divided into an appropriate number of ranges, often arranged as a regular grid, each containing many similar color values. The color histogram may also be represented and displayed as a smooth function defined over the color space that approximates the pixel counts.

D. Svm Classifier

Support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new

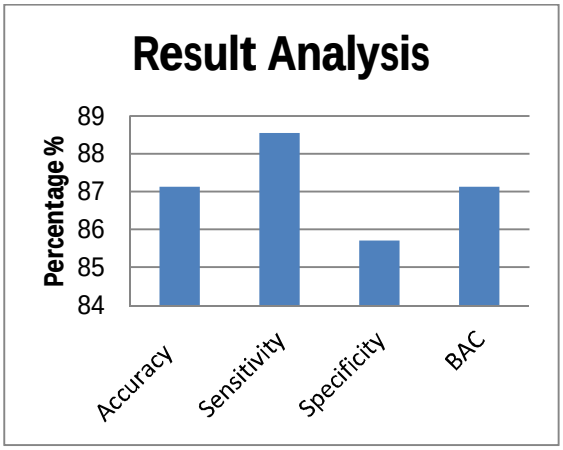
examples into one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. Support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible.

E. Anatomical Interpretation

Red regions are pathology and blue regions are normality identifying the diseases in brain.The discipline of anatomy is divided into macroscopic and microscopic anatomy. Macroscopic anatomy, or gross anatomy, is the examination of an animal's body parts using unaided eyesight. Gross anatomy also includes the branch of superficial anatomy. Microscopic anatomy involves the use of optical instruments in the study of the tissues of various structures, known as histology and also in the study of cells.The history of anatomy is characterized by a progressive understanding of the functions of the organs and structures of the human body. Methods have also improved dramatically, advancing from the examination of animals by dissection of carcases and cadavers (corpses) to 20th century medical imaging techniques including X-ray, ultrasound, and magnetic resonance imaging. Anatomy is the study of the structure of nimals and their parts, and is also referred to as zootomy to separate it from human anatomy.The discipline of anatomy is divided into macroscopic and microscopic anatomy. Macroscopic anatomy, or gross anatomy, is the examination of an animal's body parts using unaided eyesight.The history of anatomy is characterized by a progressive understanding of the functions of the organs and structures of the human body.Red regions are pathology and blue regions are normality identifying the diseases in brain.

F. Performance Analysis

Result analysis of our process accuracy,sensitivity,specificity. To avoid the possible inflated performance estimation on the unbalanced datasets, the balanced classification accuracy was also computed, a simple arithmetic mean of the sensitivity and specificity. The balanced accuracy (BAC) removes the bias that may arise by imbalanced datasets. In a binary classification problem, if the classifier performs equally well on either class, BAC reduces to the ordinary accuracy. If, however, the classifier has taken advantage of an imbalanced dataset, then the ordinary accuracy will be inflated, whereas the BAC will drop to chance (50%), as desired. The time is set aside during the training phase and then classified using the SVM model trained with the remaining subjects. To avoid the possible inflated performance estimation on the unbalanced datasets. The balanced accuracy (BAC) removes the bias that may arise by imbalanced datasets. The balanced classification accuracy was also computed, a simple arithmetic mean of the sensitivity and specificity. Result analysis of our process accuracy, sensitivity, specificity.



IV. CONCLUSION

The thesis has introduced and adapted biologically inspired methods for identification of diagnostic-relevant image regions in a very complex and challenging problem, the Alzheimer's disease (AD). The automatic strategies herein developed have included prior anatomical and medical knowledge within the morpho-metrical analysis. The set of proposed tools constitute an innovative framework in the context of anatomical studies: sparse-based representations and visual attention methods, together with machine learning techniques, provide efficient representations of the image content in terms of visual

features, leading to the discovery of visual patterns directly related with a specific pathology. The present investigation has included an extensive validation and parameter study, evaluating both its accuracy for discriminating different experimental groups and its capacity of determining the relevant anatomical regions together with their weights. Regarding discriminative power, different parameters involved in the top-down and bottom-up information flows, were assessed in terms of classification accuracy, allowing to identify the influence of the different visual features and image scales in the final discrimination between AD and NC classes. The simpler version of our proposal (combining a single saliency-based kernel with a SVM learning) has reached an equivalent performance to a state-of-the-art approach (FBM proposed by. Finally, we want to highlight that the quality of the model is not only given by the quantitative performance measures, but by its aptness to automatically detect highly discriminative brain regions, consistent with those regions that have been described as important in the progression of the disease.

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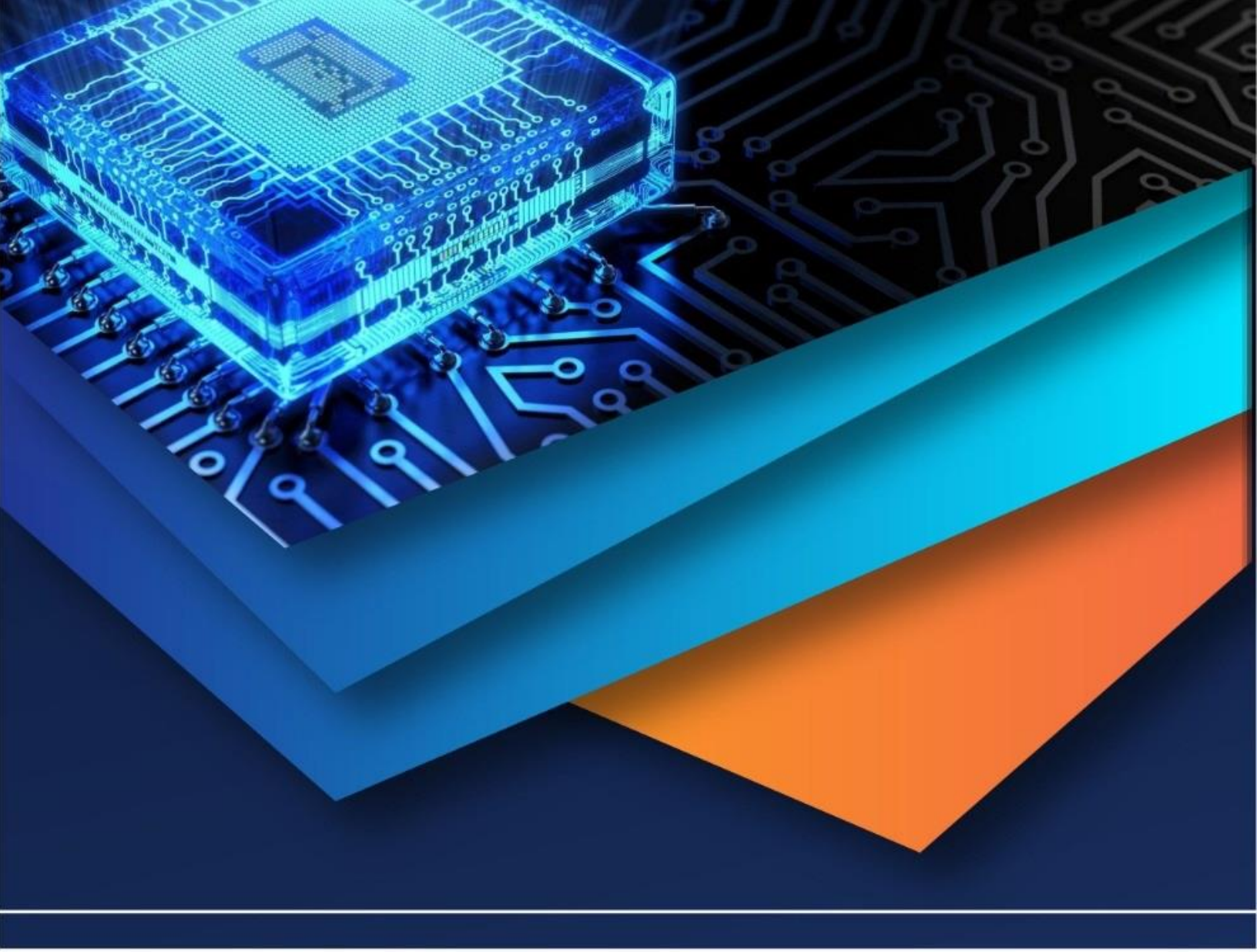

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