CLASSIFICATION OF DENTAL RADIOGRAPHS USING MACHINE LEARNING

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ABSTRACT
Dental diseases like dental anomalies, pericardial and dental caries is increasing day by day in children and adults. Artificial intelligence and neural network with its application in medical imaging is influencing the healthcare industry. X –ray imaging is the commonly employed technique to diagnose diseases of the teeth. Segmentation and classification of differing dental anomalies using neural network is proving to be a boon to the dental field. Application of neural algorithms aids in obtaining images with better detection accuracy. Automated detection reduces the workload of a dentist with classification being accurate. A better penetration of machine learning into these processes highlights its advantages to classify dental X ray images. Different machine learning techniques are deployed to identify and classify the dental abnormalities.

1. INTRODUCTION
Tooth is a dense structure in the human body that decays due to many reasons. Countless conditions like Dental decay, Periodontal disease, Mesioangular impaction, Periapical abscess, Horizontal bone impaction, Vertical bone impaction, Apical periodontitis, Overhanging restoration, Irreversible pulpits, Cast post restoration, Radiopaque restoration, Proximal caries are detected using an X ray. Digital images of human body have gained more attention in the field of medical image analysis research. Numerous image processing techniques are emerging to find solutions to diseases found in human body. Human organs are complex and difficult to diagnose. [1]An easiest imaging modality for dense structure of the body is X-ray. These rays penetrate the bones and produce an image which aids in diagnosis. Once anomalies are detected in an X-Ray, the doctor diagnosis the problem and prescribe the therapy. Digital radio-graphic image is an advanced X-ray assessment technique which produces images immediately on a computer. X-ray sensitive plates capture the images during investigation and transfer it to the computer immediately. The incident x-ray radiation is converted into an equivalent electric charge and by a detector sensor to a digital image. Recognition and analysis of dental images have been made easier with the introduction of digital X ray images. The resolution, luminance, noises, contrast are different when different X ray machines are utilized to capture the images. Analysis of teeth images can be successfully performed by segmentation of the tooth and it forms an important step for treatment planning. Segmentation of the dental images can be done using different techniques like k-means and dual clustering, subtraction of background, methods based on histograms, region growing methodologies,etc. which help to differentiate the normal from the

pathologically affected parts of the teeth. Application of the fundamentals of machine learning in dental imaging is making it easier to segment and classify images. Based on the efficiency and performance of classification algorithms, few of the promising ones like SVM, ANN, KNN are applied on dental data set images.

2. LITERATURE SURVEY

1) History and application of artificial neural networks in dentistry by Wook Joo Park 1, Jun-Beom Park 2

Artificial intelligence (AI) is a commonly used term in daily life, and there are now two sub concepts that divide the entire range of meanings currently encompassed by the term. The coexistence of the concepts of strong and weak AI can be seen as a result of the recognition of the limits of mathematical and engineering concepts that have dominated the definition. This presentation reviewed the concept, history, and the current application of AI in daily life. Applications of AI are becoming a reality that is commonplace in all areas of modern human life.

Efforts to develop robots controlled by AI have been continuously carried out to maximize human convenience. AI has also been applied in the medical decision-making process, and these AI systems can help nonspecialists to obtain expert-level information. Artificial neural networks are highly interconnected networks of computer processors inspired by biological nervous systems. These systems may help connect dental professionals all over the world. Currently, the use of AI is rapidly advancing beyond text-based, image-based dental practice. This presentation reviewed the history of artificial neural networks in the medical and dental fields, as well as current application in dentistry. As the use of AI in the entire medical field increases, the role of AI in dentistry will be greatly expanded. Currently, the use of AI is rapidly advancing beyond text based, image-based dental practice. In addition to diagnosis of visually confirmed dental caries and impacted teeth, studies applying machine learning based on artificial neural networks to dental treatment through analysis of dental magnetic resonance imaging, computed tomography, and phallocentric radiography are actively underway, and some visible results are emerging at a rapid pace for commercialization.

2) Dental R-Ray Image Segmentation Using Texture Recognition by Pedro Henrique Marques Lira; Gilson Antonio Giraldi; Luiz Antonio Pereira Neves; Raul Antonino Feijoo

Panoramic x-ray images are very popular as a first tool for diagnosis in ontological protocols. Automating the process of analysis of such images is important in order to help dentist procedures. In this process, teeth segmentation of the radio-graphic images is an essential step. In this paper, we propose a segmentation approach based on a supervised learning technique for texture recognition. Firstly, feature extraction is performed by computing moments and statistical features. The obtained data are the input to a Bayesian classifier that, after training, can distinguish two classes of pixels: active (inside the target texture) or inactive (outside the teeth). In the experimental results we show that the methodology is a promising one for teeth segmentation in panoramic x-ray images and discuss its limitations.

3) Fuzzy Clustering with Level Set Segmentation for Detection of Dental Restoration area by Anuj Kumar; H. S. Bhadauria; Nitin Kumar

In dentistry, dental X-ray images play an important role in the detection of the different type of abnormalities presents in the teeth. In medical image processing,

various image enhancement and segmentation techniques have been used to identify the tooth structures for the classification of the type of abnormalities like tooth fracture, proper root canal treatment, caries identification and periodontal diseases etc. Medical diagnosis can be done manually for dental X-ray images but it is very time consuming and complex. In this paper, we proposed a method to extract the restoration part from the dental X-ray image by combining the Fuzzy clustering with the iterative level set active contour. Here firstly we use the Preprocessing using median filtering to remove the noise present in the X-ray image so that it can be used for further processing. Secondly, we used Fuzzy clustering image segmentation to identify different clusters. At last, Level set active contour method is applied to extract the restoration area from the teeth. The accuracy of the proposed method is more than 98%.

4) Classification and detection of skin cancer using hybrid texture features by Bethanney Janney

This paper depicts a novel image processing approach for skin cancer detection on dermatoscope images. The main objective of this work is to classify the skin lesion as malignant or benign using Hybrid texture features. Materials and Methods: The different stages of detection involve: a collection of data images, filtering the images for removing unwanted details and noise, segmenting the images using Region based segmentation. Two types of feature extraction methods have been used to perform classification. ABCD features and Gray Level Co-Occurrence Matrix (GLCM) features have been extracted at various angles as hybrid texture features. An Artificial Neural Network (ANN) has been used as a classifier to classify the skin lesion as malignant or benign. Results: Based on the hybrid texture features our proposed technique is able to better classify skin cancer images into Benign or Malignant with high precision. Conclusion: Hence the proposed method will enhance the effectiveness of early detection for skin cancer. In future, this method offers a chance for doctors, where the application can be prolonged to different forms of skin malignancy and other skin ailments.

3. EXISTING SYSTEM:

Tooth is a dense structure in the human body that decays due to many reasons. we used an algorithm based on a decisional tree representation to classify and recognize dental images. This hierarchical representation can be interpreted as a set of hierarchical types stored in leafs tree structure. By using several extracted features from orthodontic images, Such as facial features and skin color using YCbCr color space.

In existing system It takes more consume time and got less accuracy. Using decision tree algorithm we cannot identify the proper dental abnormalities. X-ray Image-based medical diagnosis is not possible.

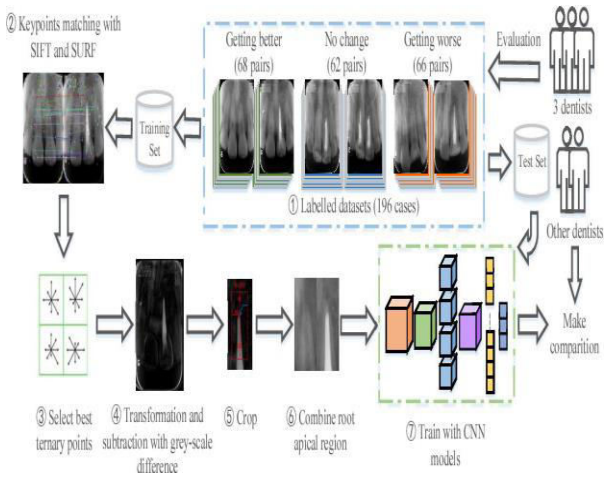
4. PROPOSED SYSTEM:

This project describes the experimental results of the classification methods using digital dental X ray images for different classes of dental diseases. Dental images, belonging to various dental diseases like vertical impaction, periodical abscess, distal pulp horn caries, missed canal in root canal, etc are stored in the dental image database. The images were collected from dental clinics and hospitals. Our work consists of a total of 500 images belonging to assorted set of dental caries and normal tooth images. One half of the images were used for training and the other half for the testing.

Support Vector Machine (SVM), Artificial Neural Network (ANN) and KNN (Kernal Nearest Neighbour) classification algorithm

determines whether there are pathological signs of dental diseases in the analyzed image. Image-based medical diagnosis is possible the user has to give the X-ray image to the model, then our model will predict where the person viral-infected or not.

5. SYSTEM ARCHITECTURE



6. IMPLEMENTATION

User

The User can register the first. While registering he required a valid user email and mobile for further communications. Once the user register then admin can activate the user. Once admin activated the user then user can login into our system. User can upload the data-set based on our data-set column matched. For algorithm execution data must be in float format. Data-set made use of in this work is a group of dental X-ray images gathered from dental hospitals, dental clinics and web source dental datasets. Different classes of dental caries and normal images are obtained and stored as database. for testing purpose. User can also add the new data for existing data-set based on our Django application.

Admin:

Admin can login with his login details. Admin can activate the registered users. Once he activate then only the user can login into our system. Admin can view the overall data in the browser. All algorithms execution complete hence it is able to produce results.

Data Preprocessing:

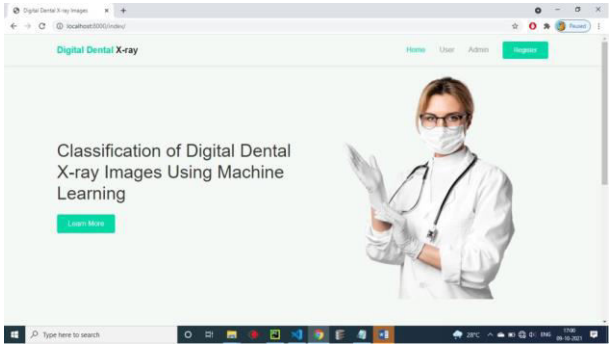
A data-set can be viewed as a collection of data objects, which are often also called as a records, points, vectors, patterns, events, cases, samples, observations, or entities. Data objects are described by a number of features that capture the basic characteristics of an object, such as the mass of a physical object or the time at which an event occurred, etc. Features are often called as variables, characteristics, fields, attributes, or dimensions. The data preprocessing in this forecast
uses techniques like removal of noise in the data, the expulsion of missing information, modifying default values if relevant and grouping of attributes for prediction at various levels.

Machine learning:

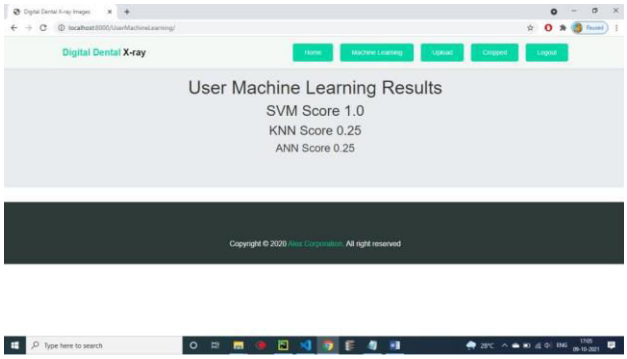
Based on the split criterion, the cleansed data is split into 60% training and 40% test, then the data-set is subjected to machine learning in dental imaging is making it easier to segment and classify images . Based on the efficiency and performance of classification algorithms, few of the promising ones like SVM, ANN, KNN are applied on dental data set images.

7. SCREEN SHORT

Home Page



Results



8. CONCLUSION

In this work, it is suggested that by utilizing GLCM features and SVM, KNN and ANN classifiers, the teeth affected by dental caries can be set apart from the normal teeth in a more detailed manner. The automated teeth segmentation and classification provide radiologists with a faster and second opinion by reviewing medical images, increasing the sensitivity of disease detection. Hence it is able to produce results in a more precise manner efficiently.

9. FUTURE ENHANCEMENT

Further the images are classified from the data set fed for training Nd testing. Classification aids us to differentiate the various classes of dental diseases and strategically diagnose the type of dental disease. Support Vector Machine (SVM), Artificial Neural Network (ANN) and KNN (Kernal Nearest Neighbour) classification algorithm determines whether there are pathological signs of dental diseases in the analyzed image. SVM generated an optimal classified model by obtaining data from an existing trained set. A promising approach by the application of ANN in the field of dentistry to classify dental caries and impacted teeth created a big influence in image analysis. By considering the best match of new records with an already trained record system, a supervised classification algorithm like KNN is found to reduce complexity.[12] The newest neighbour is found by the Euclidean distance and helps to classify accord.

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