

An Approach to Identify Human based upon Teeth Recognition using ANN

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Abstract: Neural networks are highly being used in the dentistry field. The purpose of this paper was to visualize the state of the art of artificial intelligence in dental applications. Here, a model of teeth acknowledgment has been proposed to distinguish an individual and recover the subtleties of the individual. The person's teeth image will be taken as input and it will be matched against the database of teeth images. Artificial Neural networks algorithm has been used to train and recognizing the person to whom the teeth image belongs to. When person visit to dental hospital for the first-time doctor will capture ten images of his teeth and creates a new user in model to store his name, medical related issues, age etc. For further visiting he should just show his teeth to get his details. Testing Set accuracy is maintained to be 81.69 percent with the test set.

Keywords: ANN, CNN, prediction, dental structure

1. Introduction

This is an approach we will be using dental biometrics[1] in order to uniquely identify the person and retrieve their medical history. Biometrics can be utilized for individual ID for protections, for example, door entrance, bank ATM, versatile framework, and PC framework. This model proposes an individual recognizable proof strategy utilizing teeth pictures. The technique is made out of teeth picture obtaining and teeth acknowledgment in which there are teeth district extraction and example acknowledgment systems in a successive advance. In the teeth acknowledgment, an info design is contrasted and each example of the teeth data set to which individual teeth picture has a place with. Teeth pictures can be obtained with the computerized camera, in spite of the fact that without high goal, of a committed individual ID framework, a PC, or different gadgets.

2. Working

The existing system is based on file system for storing the details of the patient by using the patients name which may result in confusion if there are more than one person with the same name or similar record. If a person is in a condition where he is unable to talk, existing file system could not help to know his previous record if any. Using the teeth image to store the details would be more effective. The teeth images are classified based on the teeth structure which may differ from person to person. Maintaining the Integrity of the Specifications

2.1. Disadvantages

- . May result in redundancy of the patient details.
- . If the patient is suffering from pain, he/she cannot convey the basic details.

The proposed system will uniquely identify the person by using the dental image which are classified based upon the teeth structure. A model is known to be neural network layers which is trained in such a way that, it can be used to detect object in image and can also be used to find to which class the object in the image belongs to. New pictures of new patients will be appended and trained to the same neural network layer for expansion of user base. Existing patient image can be compared with this model to predict the class of teeth image and to tell to which person the image belongs to in the model. After identifying the person, the details of the patient which include the prescription, treatment, problems, and so on will be displayed to the dentist on the monitor screen. Artificial Neural Network are applied for training and prediction of the dental structure to which patient it belongs to.

2.2. Advantages

1. The unique identification of person will be achieved.
2. Easy to retrieve the details of the person.
3. If the person is unable to convey the details due to pain it would be easy to get the details using the teeth images.
4. Dental Biometric can be achieved.

Methodology

Artificial Neural Network (ANN) Algorithm:

We will begin with understanding plan of a basic secret layer neural organization. A straightforward neural organization can be addressed as demonstrated in the figure underneath

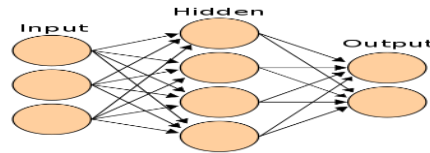


Fig 3.1: Formulating a Neural Network

The linkages between nodes are the most significant finding in an ANN. We will return to "how to discover the heaviness of every linkage" in the wake of examining the wide structure. The lone known qualities in the above graph are the information sources. Lets call the contributions as i_1, i_2 and i_3 , Hidden states as h_1, h_2, h_3 and h_4 , Outputs as o_1 and o_2 . The weights of the linkages can be meant with following notation: $W(i_1h_1)$ is the weight of linkage between i_1 and h_1 nodes.

Following is the structure in which artificial neural networks (ANN) work:

1. Assign irregular weights to all the linkages to start the algorithm.
2. Using the input and the(input->hidden node)Linkages find the activation rate of hidden nodes.
3. Using the activation rate of hidden nodes and linkages output, find the activation rate of output nodes.
4. Calculate the error rate at the output node and recalibrate the linkage between hidden nodes .and Output Nodes.
5. Using the Weights and error found at output node, cascade down the error to hidden nodes.
6. Recalibrate the weights between hidden node and the input nodes.
7. Repeat the process till the convergence criterion is met.
8. Using the final linkage weights score the activation rate of the output nodes.

Every linkage calculation in an Artificial Neural Network (ANN) is similar. In general, we assume a sigmoid relationship between the input variables and the activation rate of hidden nodes or between the hidden nodes and the activation rate of output nodes. Let's prepare the equation to find activation rate of h_1 .

$$\text{Logit } (h_1) = W(i_1h_1) * i_1 + W(i_2h_1) * i_2 + W(i_3h_1) * i_3 + \text{Constant} = f$$

$$\Rightarrow P(h_1) = 1/(1+e^{(-f)})$$

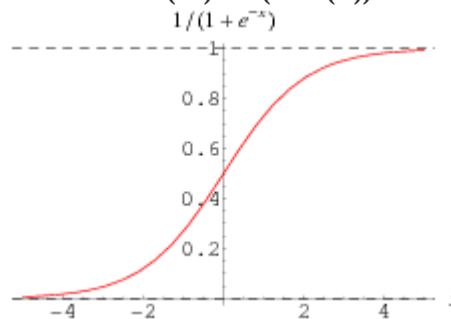


Fig 3.2 Sigmoid function

An approach for recognition Person using tooth structure

In this research work, a model of teeth recognition has been proposed to identify a person. The persons' teeth image has been matched against the database of teeth images. An algorithm has been developed to recognize the teeth image by using the image processing methods[3] as shown in Fig 3.1.

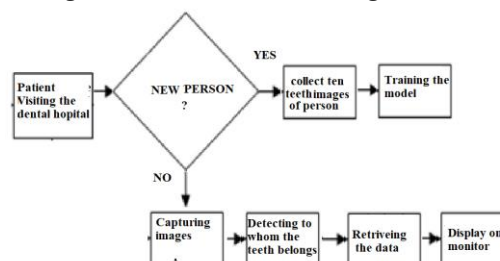


Fig 3.3.:Flow Diagram

As shown in Fig 3.3 it describes about the flow diagram of teeth recognition module

Modules

1 Capturing the images

If the patient is new to hospital then he as to give ten to fifteen images of his teeth to train the ANN model as he has to be a new class object to the algorithm. For the next visit, it is not required to give images for training. For prediction and to get his data one image is enough.

2 Training the model

In ANN any image which has to be trained should be in neural layers. First, we capture multiple of teeth images of different persons visiting the hospital, and train to neural network model, we provide a unique name to each and every person which acts as a classification name between the persons teeth images, and then we can use the model to predict the dental images[2] of persons on the later visits as we already trained their image to the model.

3 Detecting to whom the teeth belong to

Teeth area in the image is a rectangular bounding as shown in figure 3.4 tells on which part of the teeth image the algorithm focuses on. The main motto of the paper is about bio-metricity of the person using the teeth structure.

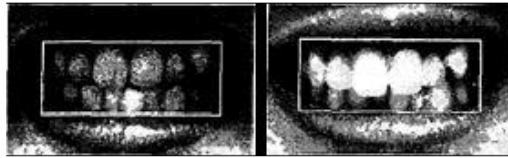


Figure 3.4: Teeth region, depicted as the white rectangle as where is focus on the image.

As shown in Figure 3.3 it describes about in the image: in which part of the image does the algorithm focus on. The image provided may not be in standard form so first we perform object detection in image, where the teeth is located in image, after doing object detection we perform prediction to which class or person the image belongs to. Artificial Neural Networks compares the input image and the dataset images to detect teeth in the input image, after detecting teeth in image it predicts to which person in the model the teeth image belongs to base on the dental structure. We will train the Neural Network layers accordingly based the images given for training. This algorithm gives the unique class to which the input image belongs to, after predicting the image we can get the data from local files located in the computer. Artificial Neural Network (ANN) is a Deep Learning algorithm [6] which can take in an input image, assign importance to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required is much lower as compared to other classification algorithms.

4 Retrieving the data

Once we detect to whom the teeth image belongs to ANN give a unique class object name, the name which is given during the training process. As we have a unique name to which the teeth belong to, we can use this as a primary attribute to search the data in our model.

5 Displaying on monitor

Once the data is retrieved from the model, we need a mode of display to show the data. The data will be in the form of a string, so the string can be displayed in a monitor or any other simple display systems.

4. Conclusion

This paper presents a human identification approach using teeth images. The approach uses person dental images for training the Artificial Neural Networks algorithm about the teeth structure pattern. After training if any new images come for classification, we can append the training images to the algorithm, that provision is given in future scope. If the person teeth is already trained then he directly be predicted by the model in this paper. Teeth images give merits for recognition teeth structure, because teeth structure cannot be affected in shorter period of time. So, we have taken teeth structure into consideration. If we use file system it may cause redundancy, he might confuse between the details stored with same name, but if we consider dental biometrics as his dental structure is unique, we can find if he is in the records.

5. Future Scope

In the near future, we will be training the system with large datasets to suggest the type of treatment to be done if the similar problem faced by the patient previously. The complete performance of the system can be improved using 3D Convolutional Neural Network.

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