

Detection of Genetic Disorder for Children using Facial Features by CNN Model

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ABSTRACT: Around 6-8% of people are affected by special genetic disorders in the world-wide. Due to deficient availability of proper finding of gene variants causing these rare disorders, the genetic tests for many of them do not exist with an exception to some common conditions like Down's syndrome. A limited number of one-on-one have the decent training and knowledge to recognize these disorders and have to depend on the noticeable facial features which occur in about 30-40% of these diseases. Fine-tuning of real data set to identify 3 classes like Apert, Progeria and Treacher from facial features of genetic disorder children using Convolution Neural Network. This could be used to screen for rare genetic diseases in newborns.

Keywords

Convolutional Neural Network, Apert, Progeria, Treacher

1. INTRODUCTION

Genetic disorder is the umbrella term used for diseases or syndromes caused by variants affecting nuclear or mitochondrial genes, aggregation of different genes and environmental factors, or relation in the number or structure of one or more chromosomes or chromosomal regions.

There are three types of genetic disorders:

- Single-gene disorders, where a mutation affects one gene. Sickle cell anemia is an example.
- Chromosomal disorders, where chromosomes (or parts of chromosomes) are missing or changed. Chromosomes are the structures that hold our genes. Down syndrome is a chromosomal disorder.
- Complex disorders, where there are mutations in two or more genes. Often your lifestyle and environment also play a role. Colon cancer is an example.

1.1 Objectives

Which mainly aims to find a solution to the problem of classification of facial recognition by an action units. The scope includes not only two problems may indicate either type of unit is off, and the share is over, but the difficulties of multi-user with more results to inform the unity of action and at the same time. Because of that, other methodologies and techniques of extraction, standardization, and selection grade features. The inclusion of a lion, make-up and that the solutions to the problems to be easy. This type of facial recognition system can be integrated into everyday life, widely used in a variety of

circuits disconnected. We hope that the human mind can be greatly helped in this technology.

The scope of this paper is Genetic disorder Child facial recognition system is implemented using convolution neural network. Facial images are classified into two facial categories namely affected Genetic disorder Child facial list and normal child.

In this paper section I explain about introduction of genetic disorder and objectives of this system, Section II reviews about Literature Survey, Section III explains about existing system, Section IV explain about proposed system, Section V explain about results and discussion and Section VI concludes with conclusion.

2. LITERATURE SURVEY

Expression-Identity Fusion Network for Facial Expression Recognition:

As a crucial subfield of face recognition, facial expression recognition has drawn increasing attention from the computer vision community. It makes a wide array of applications ranging from fatigue surveillance, distance learning, human computer interaction to medical treatment. Although significant progress has been made for facial expression recognition the current main challenge comes from the great inter-subject variations introduced by age, gender, race and other person-specific characteristics. Specifically, it is difficult to distinguish whether a certain appearance of face is attributed to the identity of a person or his expression. Thus, the influence of identity deserves more attention. Research shows that the facial expression recognition is strongly related to the person's identity [1,2].

Face Expression Recognition Based on Deep Convolution Network:

It used deep convolutional neural network model in deep learning to extract facial features and uses Soft max classifier to perform facial expression classification. The algorithm used in this paper does not require human participation in guided learning, and provides an automated feature extraction method, so that the identified effect is better. It carried out experiments on JAFFE and CK+ database and compares it with other methods. The experimental results show that this method is indeed more effective than other hand-extraction facial feature recognition methods. A method based on depth volume and network for facial expression recognition was proposed. This method takes the facial expression image as the input of the CNN and trains the CNN network, and then uses the trained network to perform facial expression recognition [3,4,5].

A Comparative Study of Face Recognition Algorithms under Facial Expression and Illumination:

The experiments have been carried out against the two datasets of faces reflecting considerable facial expression and illumination. From the conducted experiments, it has been observed that LBPH algorithm is more robust to illumination factor in general; while LDA has been proven more robust to facial expression factor. With this work, now it is clear that the classical facial recognition algorithm is not performing so well against illumination effects. So deep learning model needs to be tested against this challenge with various types of available face datasets. Face recognition algorithms enable computational devices to automatically recognize human faces and have been adopted by many big tech companies. These algorithms have shown fairly acceptable performance in criminal identification, healthcare, advertisement, access and security, payments and other different areas [6,7,8].

Performance Analysis of Human Face Recognition Techniques: Face recognition plays an important role in the numerous fields such as to authenticate the users, security of homeland, smart home access security, identify the criminal, identifying the user in small scale applications. It is mainly used for authentication purpose. Recent technology development enables the IOT system generates the real-time data which need to process and analyses the data instantaneously. The detection of object in an image is related to computer technologies and image processing. The main objective of face recognition is to reduce the miscategorization rate. Face recognition has been thought-provoking task in object detection, digital image processing and pattern recognition [9,10].

Face recognition plays a significant role in real-time surveillance systems. In this paper, we present a comprehensive overview of the state of the art research work on face detection and recognition.

Emotion Recognition from Micro-Expressions: Search for the Face and Eyes. The most known specialist in the field of psychology of emotions Paul Ekman discovered that from the point of mime people from any culture express their feelings and emotions the same way. Many investigations carried out in this field showed that a human could not control his micro-expressions and is not able to suppress them. Therefore, the one who can recognize them always can get the trustworthy information about the interlocutor state at present moment. There are seven universal emotions which are usually could be recognized [11].

3. EXISTING SYSTEM

Face is incredibly a crucial part of human body that is visually used for recognition purpose. The animation or expressions produced on faces is one of the main contributions of FAPS (**Functional Abdominal Pain Syndrome**) in face recognition technology. It has not focused on increasing the recognition rate, accuracy of severity of face expression and classification of different types of genetic disorder facial recognition.

Secondly determines the look of real-world experience in a variety of applications. Despite its importance, and it has many problems of the face of the process by looking for changes, changes in pose and lighting occlusion. For a very crucial part of the body, from the face of the human, the use of which is proposed for reconnaissance, to decide that there is. A facial

expression is not the image of the exchange of communications media, which plays a vital role for them. For when it is in general a very strong force is increased, the face of When once the news. The look is further divided into the local area and are global. Another one looks different inbred adopts different cultures ancestors or rather because of the unique character of each of the facial muscles. Studies reveal that it is paralyzed patients lack the ability to judge the facial muscles to produce and analyze the external appearance of the faces trial, and the face of interpersonal aspect is used. With facial recognition, the character of the facial muscles is controlled using the settings in the coding skills to muscle activity. There are two basic skills parameterization (FACS) and (FAPSE)[13,14].

The facial muscles to relax, while the contract with the emergence of movement on the face of those who are in balance, so that the movements of the face. Basically, because of the research FACS. Each facial expression is represented by the work of 44 units (AU) defined in the standard FACS. These are generally operated standard marketing AU art form, according to the checkpoints face. The share units are further classified into 12 so that the upper part and the face 18 so that a fiduciary points on the face of it, the underside, with the remaining units AU additive. Li al-ying in 2001 and showed fleeting and perishable graduate AU AU features such characteristics as low. AT Ashish Kapoor of which is located on the pupil of the eye. Ponticum recognize facial features into static and face to face in the past. Likewise for Yongmian Qiang combined Dynamic Bayesian Network (DBN) with CAF. FAPSE the MPEG-4 standard used to synthesize images. The animation product or expressions on the faces look the FAPSE one of the main contributions of information technology. Traditionally, the hexagonal image processing is used to enhance the edges of any objects. In most applications, the data is processed in the form of square elements, and they are, but with modern image processing allows the use of hexagonal image to improve the image appearance [15].

4. PROPOSED SYSTEM

Facial images are classified into two facial categories namely affected Genetic disorder Child facial list and normal child. A baseline classifier with one convolutional layer. A CNN with a fixed size of five convolutional layers. A deeper CNN with a parameter number of convolutional layers, filter dimensions, and number of filters. For each of these models, we tuned parameters including learning rate, regularization, and dropout.

The recent success convolutional neural networks (DLSUITE.COM) in the office as the object class is open to question, "Expression of human knowledge. At these places, and we are considering our question as to present the human face images into categories of discrete move. Many established and extracted facial features recognition systems use standard machine learning, which is not significant when applied to performance data previously invisible. We implemented immediately by three different classifiers;

From the baseline classifier layer convolutionary.

A five gotten just CNN layers convolution.

A CN is a higher level layers of the foot out of the many lakes convolutiva CNN, filter continuous quantity, and many filters. For each of these models for you, to set the parameters of the, between the known in the rate of: the regularization and of the herd.

We have also pioneered the use of standardization in batches split will be implemented mainly in the constitution, and then rolled into the classifiers used in many different ways retained the number of layers, and the number of layers, and the initial use of the network.

4.1 Methodology

The patient of the facial recognition system is implemented by means of a convolution of the neural network.

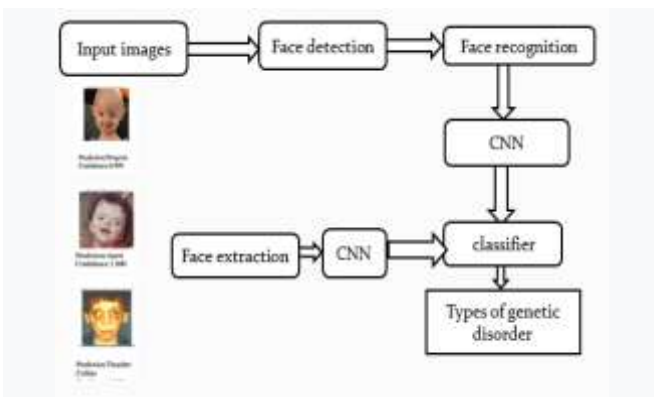


Fig 1: Classification of genetic disorder architecture using facial image from children

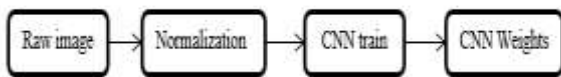


Fig 2: Training model

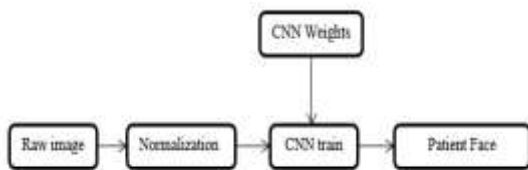


Fig 3: Testing model

During the training system of the data received training grayscale images of their faces, and learns to label a set of weight limit for the network. The training stage it appears the image of the face of it. Then, the arrangement of its intensity is applied to the image. Standard images are convolutional to form a network. When the program performance that is not affected by the order of the models, the validation data set of the final set of weight is used to select the best set of training was conducted and presented examples of different orders. Figure 4,5 and 6 are sample input image of Apert, Progeria and Treacher. The output for a set of steps to achieve the best training effect of weight learning data. Through the experience of having received the gray balance test data generated by the mouth of the ratio of the image on the set of the predicate of

the weight of it very end of it, and received instruction. The output is a single number that represents one of the seven basic expressions.



Fig 4: Apert image



Fig 5: Progeria image



Fig 6: Treacher image

4.2 CNN Model steps

Conv2D: This is the layer of the image can be transformed into various images. The activation function activation.MaxPooling2D, especially for the group to value the data on the same size, and they did it for the next 2 layers.Cast, according to an image obtained after up. Dense, is used as a model fully connected to the hidden layer. Delete, that is to say, to the purpose of taking away a great multitude, and falling back into the thick of the dispensation of the data set, the output of the image of a single cell there was a layer is related to the race in order to this he concludes that it belongs to. Figure 1 shows classification of genetic disorder architecture using facial image from children

Reproduction generating resizes the image to apply shear certain range zooms in a horizontal motion picture image. Image generator includes data from all possible orientations of the image. The training process, information is to prepare for the role train datagen. Flow from directory train dataset target size directory gives a specific image of the target size. Is none like it used to be to prepare for the test data test datagen flow from directory as an example, and the things that inclusion as above. Fit generator was given as an example for this is to adjust the above, the use of which is other than the things étapes_per_epochs factors, the number of the times, in order to show an example, to run, and there was given of being trained. Figure 2 and 3 shows training and testing model of CNN.

Their ages are not told many times, for example, and formatted in and out.The validation process for the validation data is supplying the data / test as an example. Validation steps indicates the number of models of the root / test.

4.3 Architecture of CNN

A typical architecture of the convolutional neural network approach contains a layer convolutionnelles layers to fully interconnected orders and output layer. CNN has a lot of changes in the architecture boys. There are six layers regardless of its input and output.

4.4 Input layer

Beginning reliable measuring ordered, so that the image may be pretreated before being introduced into the layer. 48 x 48 standard size images of gray steps a set of data elements used given the training, validation and testing,. Since warned laptop webcam images are also used, in which the face is detected, the branch and Epicritica emperor Haar classifier standardized.

4.5 Convolution and Pooling (ConvPool) Layers

Up and sharing are made on the basis of a batch. Each batch CNN images of the N filters and weights are updated on the lots. The color of the images of each of the four rows of the dimensions of the channel 10 by the convolution of the input x the width of the height x is great. Filter or on board the four feature by reducing the quantity (Outbound matters incoming card number of cards being spread widespread pitch). Convolution of the single layer, reducing the mass of the four dimensions that feature images of the bill. The width of change

of the height of the module is the image of the revolution of the day, after so.

- ✓ New image width = old image width - filter width + 1
- ✓ New image height = old image height - filter height + 1

After each layer by reducing the sampling / under-sampling is done to reduce the dimensionality. This process is called the pooling of resources. After their counsel, it is a pooling of their resources that is the strongest are the two modes on the average, the pooling of the famous. In this project, in consultation with the most complete and up. The lake in bulk, (2x2) 12 was taken, and, that the image of 2x2 in the columns, and the size of the hoof; he receives from himself and wills from among the most important of the four elements. , When compared with the breadth and depth, and so far he is affected by. And in consultation with two rows reducing layer in the architecture. The first batch of images entered Nx1x48x48 reducing the size layer. Here, the size of the batch of images is n, the number of color was brought down to 1, and the height and width of the picture elements 48. Card batch of images by reducing properties 1x20x5x5 results of the Nx20x44x44 size. When compared with the convolution, 2x2 banks, which have a lot of Nx20x22x22 size. It follows, according to NS gives the magnitude of the layer in the table of marks of the 20x20x5x5 Nx20x18x18 a lot of the figures. 2x2 size pools and lakes, followed by layer, the amount of Nx20x9x9 a lot of images.

4.5 Output layer

The output of the second layer is to impart to the output of seven distinct classes, and each of the output is obtained by using the probabilities seven classes. The kind of the kind used in the highest probability.

5. RESULT & DISCUSSION

Efficiency of CNN method in terms of time and the response is much faster in the facial recognition. The below figure shows Down syndrome children faces input, sample output of children images.Increasing throughput & reducing subjectiveness arising from human experts in detecting the face expression.Face expression natural non-verbal emotional communication method.Figure 7,8and 9 shows the screen shots of Aper, Progeria and Treacher

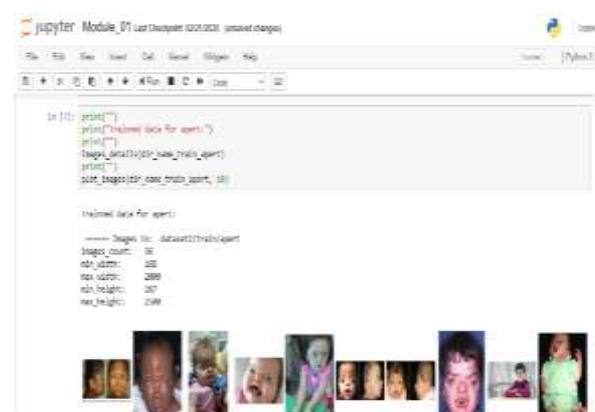


Fig7Aper



Fig8 Progeria



Fig 9 Treacher

6. CONCLUSION

Due to deficient availability of proper finding of gene variants causing these rare disorders, the genetic tests for many of them do not exist with an exception to some common conditions like Down's syndrome. By using convolution neural network, this work is classified and recognized genetic disorder child face with normal child face. So far this work classified child face of Apert, Progeria and Treacher. Genetic counselling, the appropriateness and quality of the test, the credibility of the provider, and the most important information of the context of the genetic disorder child symptoms and family history are essential for the interpretation of genetic testing results and for the best management of patients with neuropaediatric disorders and their families under multifaceted process

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