

Human Attribute Prediction using Deep Face

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Abstract:- Face Attribute Prediction including Age, Gender is an interesting topic among many researchers and is one of the most interesting activities in pattern recognition, personal computer interaction. Most applications use this process because a person's face is considered a very rich source of information. This paper not only predict Age and Gender but also predicts Emotions and Racism from a featured image using a deep face method. Dataset used for training the system is FER (face emotion recognition) from kaggle. Fer2013 contains approximately 30,000 facial RGB images of different expressions with size restricted to 48x48 and the main labels of it can be divided into 7 types of classes namely angry, disgusted, fearful, happy, neutral, sad, and surprised.

For testing IMDB and Wikipedia data set are used. IMDB WIKI data set is the largest publicly available facial data with gender, age, and name. IMDB contains 460,723 images and Wikipedia contains 62,328 images. The overall accuracy achieved by the model is 97.23 percentage which was considerably high as compared to the previous models.

I. INTRODUCTION

A person's face contains a lot of information about a person's age, gender, race, feelings etc. Face markers are biological features that represent facial features with strong natural stability and individual variability, therefore useful in identifying individuals. Significant variables include gender, skin tone, age, and expression.

Facial features are one of the strongest descriptors of personality traits. In the field of computer vision, researchers are working on extracting and utilizing features for face recognition.

An average person has a variety of facial features such as age, facial expression, shape, and gender. Since humans are the most developed and most advanced species of the species, these characteristics can be detected fairly easily. For

example, most people can identify key characteristics consisting of age, gender, and race by indicating whether a character is female or male. They can also tell if man or woman is younger or older just by looking at him/her with her naked eye.

Its miles recognized to us that feelings play a totally vital and useful function in our lifestyles as people. Our face displays how we feel or what temper we are in at specific moments and conditions. As our throughout conversation, we've the ability to provide hundreds of facial reactions and moves which vary in which means and a range of complexity and its intensity.

In standard, facial attribute prediction is a tough task: it includes face localization first, after which attribute prediction.

Furthermore, faces are inherently hard to investigate due to their complicated appearance. The aspect of a face may be altered, being even more complex, due to some face variations. The most common form of face deformation are Occlusions, Illumination, Expression, and Pose. Hence, it's very important that a convolutional model is need to trained on tough exemplars of faces in order to generalize faces that are captured in the wild (faces captured under any type of situations).facial attribute prediction is not only existing as an academic project, but additionally a manner to improve current applications.

II. RELATED WORK

Studies on facial attribute recognition which includes age, gender, ethnicity and facial emotions have been began almost a decade in the past. But still there are only a few studies introduced for the prediction facial attributes from facial images. So it is crucial to introduce new approaches with better accuracies for facial attributes from facial photos. In step with the literature, maximum of the studies solutions are primarily based on classifying the pictures into one of the attributes however not for an aggregate of attributes.

Title	Dataset	Author	Method	Accuracy
Age, Gender Prediction and Emotion recognition using Convolutional Neural Network	IMDb-WIKI for age-gender classification and Fer2013 dataset for emotion recognition	Arjun Singh, Nishant Rai, Prateek Sharma, Preeti Nagrath and Rachna Jain	wide resnet architecture , Convolutional Neural Networks	For age and gender 96.26% For Emotion 69.5%
Emotion Recognition from Facial Expression using Deep Learning	FER dataset and live feed image	Sujit Tilak, Ankit Gupta, Rahul Arekar, Ankita Arondekar	Deep Learning and Image Classification Methods	85%
Neural Network based Age and Gender Classification for Facial Images	FERET and FGNET	Thakshila R. Kalansuriya and Anuja T. Dharmaratne	Convolutional Neural network	70.5%
Human Age And Gender Classification using Convolutional Neural Network	IMDB and WIKI	Mohammed Kamel Benkaddour , Sara Lahlali, Maroua Trabelsi	Convolutional network	85%

Fig 1. Related works

III. METHODOLOGY

The main goal of the proposed algorithm is to identify corresponding age, gender, emotion and racism from human face images using a specific set of facial features.

A. DeepFace

Facial popularity has been a warm subject for numerous decades. And whilst there are so many special facial recognition libraries to be had, deepface has come to be widely famous and is utilized in several face recognition applications.

A team of artificial intelligence researchers at Facebook developed Deepface, a framework for facial recognition and attribute analysis, for Python in 2015. The primary inspirations for this library's components are Keras and Tensorflow. Generally speaking, it was a hybrid facial recognition framework that used various models for analysis, including VGG-Face, Google Facenet, Facebook Deepface, etc. More than 97 percent of faces can be correctly identified using deepface, which has proven to be more successful at

identifying faces than traditional face popularity frameworks. Deepface is a tool that Facebook uses to stop impersonation and identity theft on its network.

Deepface is one of the most portable tools for human face recognition and facial attribute prediction. It was designed for Python and is an open-source library. Consequently, a typical deepface library contains all leading AI models that are utilized for face recognition, and it absolutely manages all processes and operations for facial identification in the background.

As mentioned earlier deepface is created for python, it needs only a few lines of code to run. And while on the running process, DeepFace requires just a few lines of code, there is no need to gain in-depth knowledge of all the processes behind in it .Only need to simply import all the appropriate libraries that are needed and just pass the path of the image as an input.

When using DeepFace for facial recognition, it provides access to a number of features:

➤ *Face Verification*

Face verification task refers to comparing one face with another to confirm that whether a face matches. Therefore, face verification is commonly used to compare one candidate’s face to another.

➤ *Face Recognition*

The task refers to finding a face in an image database. To perform face recognition it needs to require running face verification multiple times.

➤ *Face Feature Analysis*

The task of face feature analysis refers to identifying the features of facial images. Facial feature analysis is used to extract facial attributes like age, gender classification, sentiment analysis, or race prediction.

➤ *Real-Time Face Analysis*

It includes testing face detection and facial attribute analysis with a real-time video that feed on your webcam.

B. VGG16

The VGG model or VGGNet is a convolutional neural network model which supports 16 layers hence it referred as VGG16 model. On ImageNet, the VGG16 model achieves top 5 test accuracy of about 92.7 percent. ImageNet is a dataset on which consist of more than 14 million images belonging to close to 1000 classes. Furthermore, it was one of the most famous models submitted to ilsvrc-2014. It replaces the massive kernel-sized filters with numerous 3x3 kernel-sized filters one after the opposite, thereby making sizeable enhancements over alexnet. The VGG16 model was trained using Nvidia Titan Black GPUs for several weeks. As mentioned above a typical VGGNet-16 supports 16 layers and it can easily classify images into 1000 object categories, which includes keyboard, animals, pencil, mouse and so on. Moreover, the model has an image input size of 224-by-224.

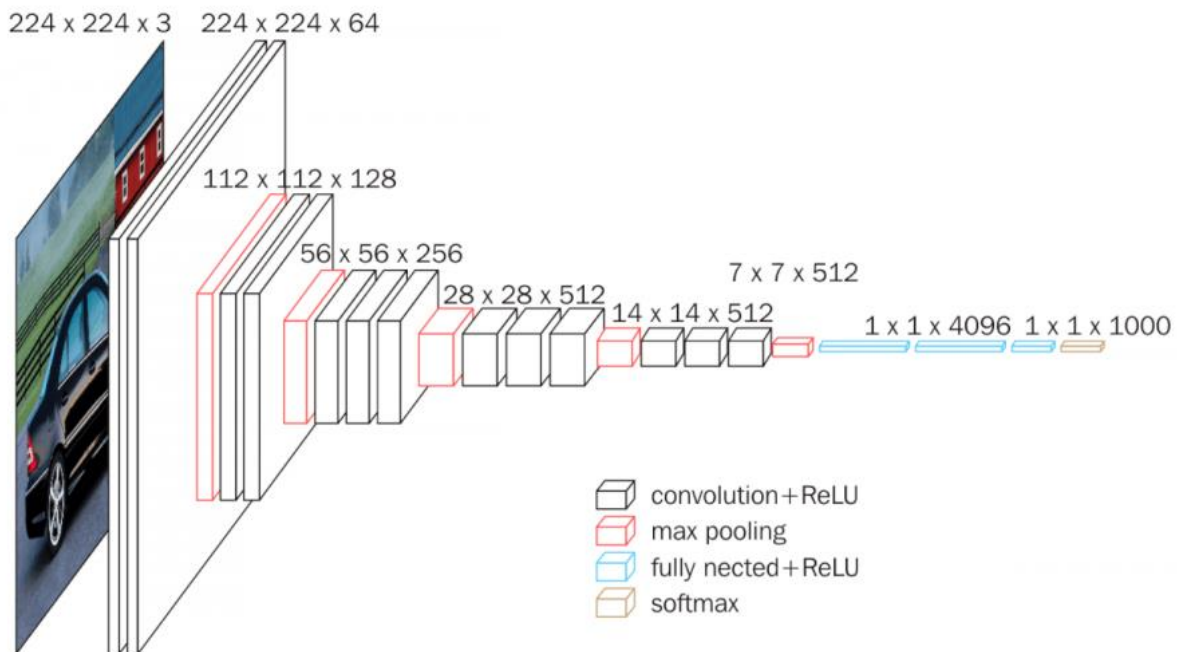


Fig 2. VGG16

There are 138 million parameters exists in VGG16 model, which may be a bit hard to deal with. Where in the version is pretrained on a dataset and the parameters are up to date for higher accuracy and you can use the parameters values. The 16 layers are Convolution using 64 filters, Convolution using 64 filters + Max pooling, Convolution using 128 filters, Convolution using 128 filters + Max pooling, Convolution using 256 filters, Convolution using 256 filters + Max pooling, Convolution using 256 filters + Max pooling, Convolution using 512 filters, Convolution using 512 filters + Max pooling, Convolution using 512 filters+Max pooling, Convolution using 512 filters, Convolution using 512 filters+Max pooling, Fully connected with 4096 nodes, Fully connected with 4096 nodes, Output layer with Softmax activation with 1000 nodes.

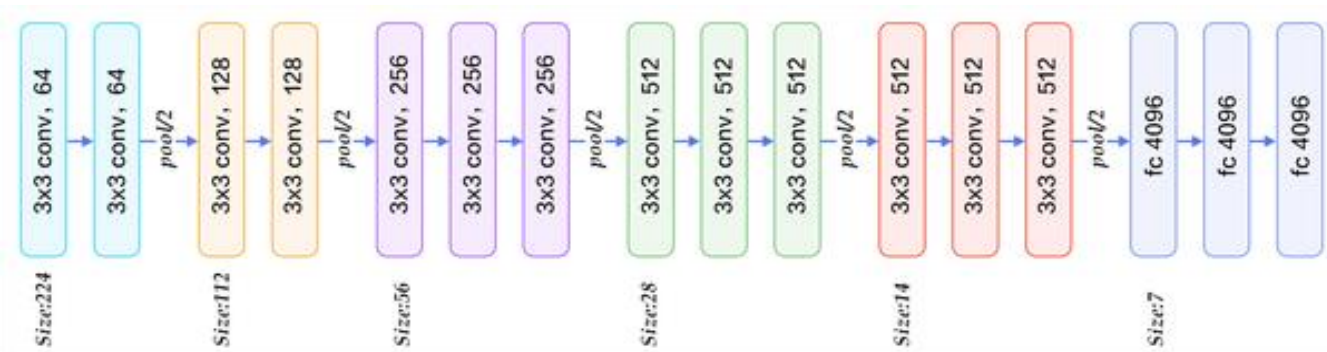


Fig 3. VGG16 layers

C. Dataset

Dataset is collected from kaggle. Kaggle, a company owned by Google LLC, is an online community of data scientists and machine learning students. Kaggle allows users to discover and publish data sets, test and build models in the web-based data science, work with other data scientists and machine learning engineers, and enter contests to solve data science challenges.

Dataset used for training the system is FER (face emotion recognition) from kaggle. Fer2013 contains

approximately 30,000 facial RGB images of different expressions with size restricted to 48×48 and the main labels of it can be divided into 7 types of classes namely angry, disgusted, fearful, happy, neutral, sad, and surprised.

For testing IMDB and Wikipedia data set are used. IMDB WIKI data set is the largest publicly available facial data with gender, age, and name. IMDB contains 460,723 images and Wikipedia contains 62,328 images.



Fig 4. FER dataset

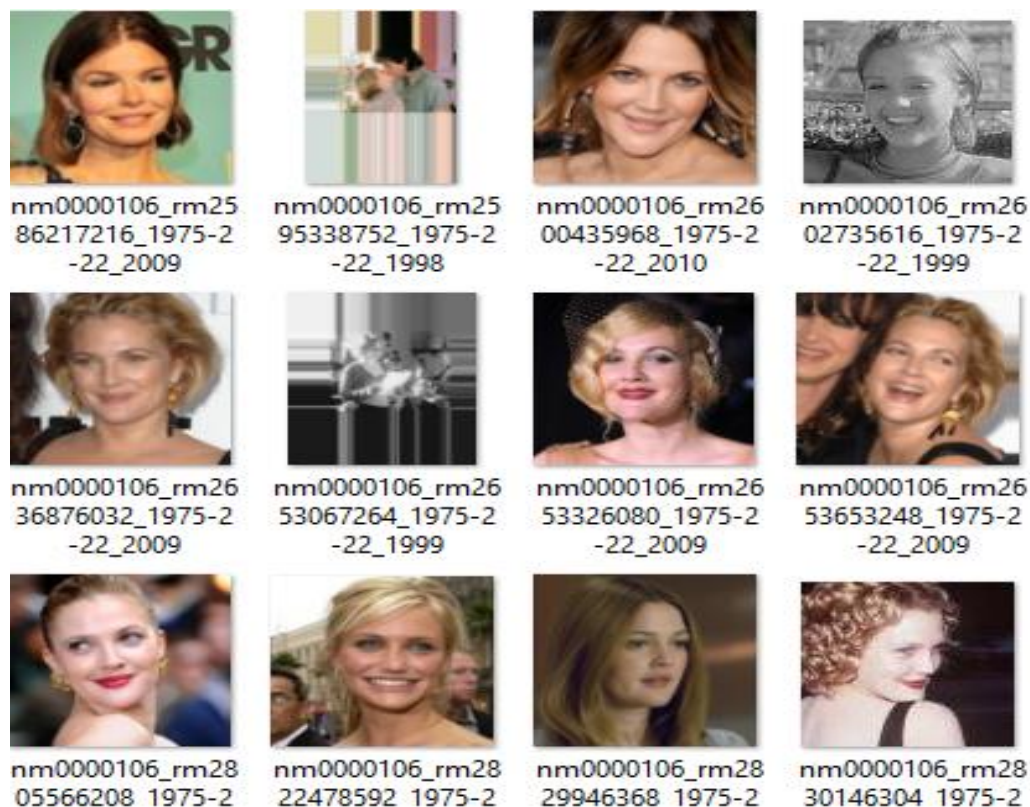


Fig 5. IMDB and Wiki dataset

IV. SYSTEM ARCHITECTURE

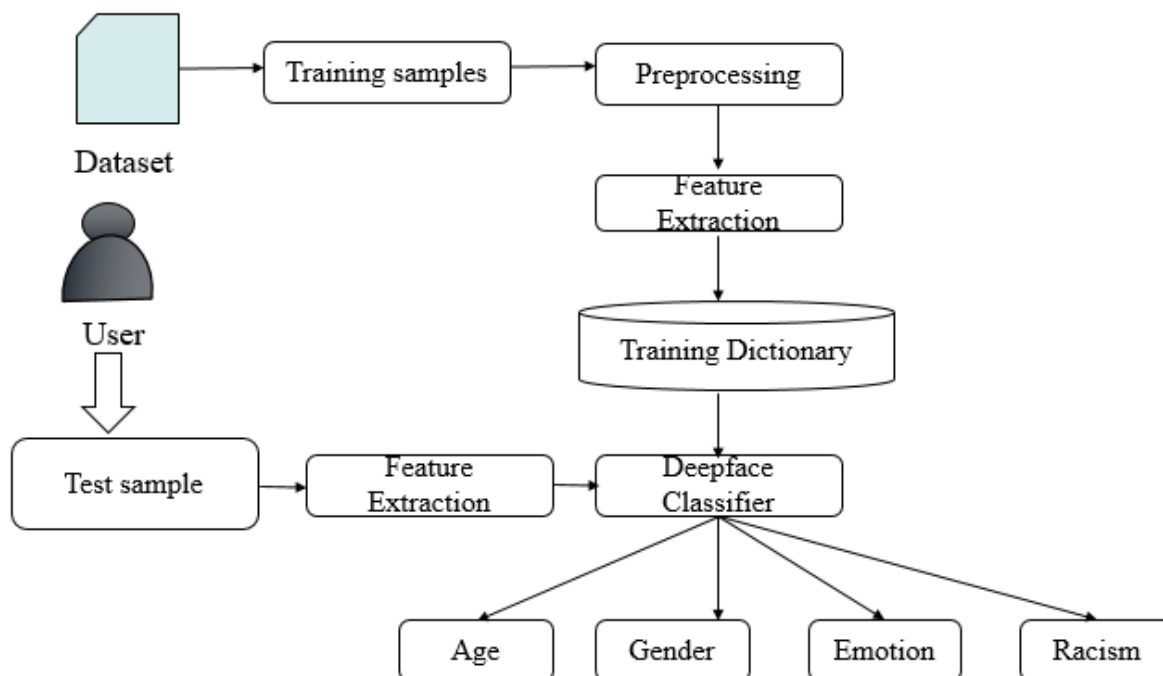


Fig 6. Architecture

➤ *Dataset*

The given data set is divided into train samples and test samples.

➤ *Training samples*

Include set of face images used to train the model

➤ *Preprocessing*

In the pre-processing process, it involves rotation, scaling, and translation of the image. This process is called normalization.

➤ *Feature Extraction*

Feature extraction involves reducing the image size but the features of the images remain the same. Used for facial expression classification. High pixel image is used for depiction for expression of face.

➤ *Classification*

Classification is performed by a classifier. It involves accepting input face images and produces corresponding output classification.

➤ *Classifier*

Deepface Classifier is used to identify the age, gender, emotion and racism from corresponding facial images.

For emotion recognition mainly seven emotions are recognised namely; angry, disgusted, fear, happy, neutral, sad, surprised.

For racism, only six category are recognised such as Indian, Asian, Black, White, Middle Eastern, Latino Hispanic.

For age above 20 to 100 are recognised.

V. RESULTS

We have used DeepFace method for the prediction of human facial attributes such as Age, Gender, Emotion and Racism. The overall accuracy of human attribute prediction is 97.23 percentage using batch size 150 which was very high as compared to previous models.

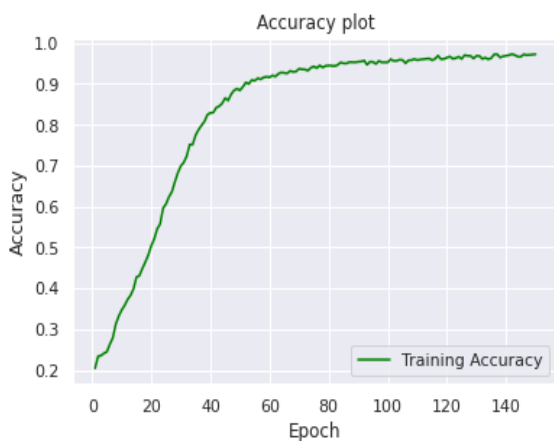


Fig 7. Accuracy plot

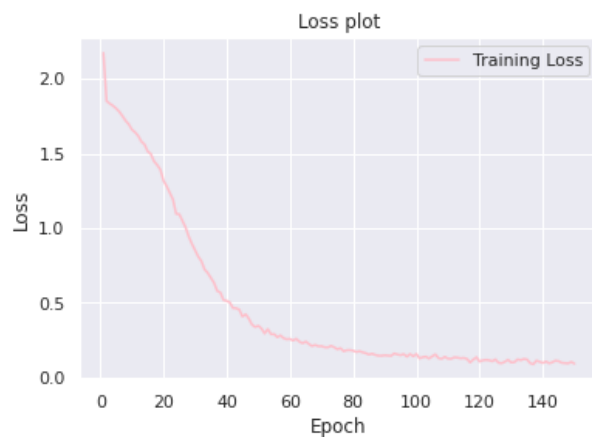


Fig 8. Loss plot

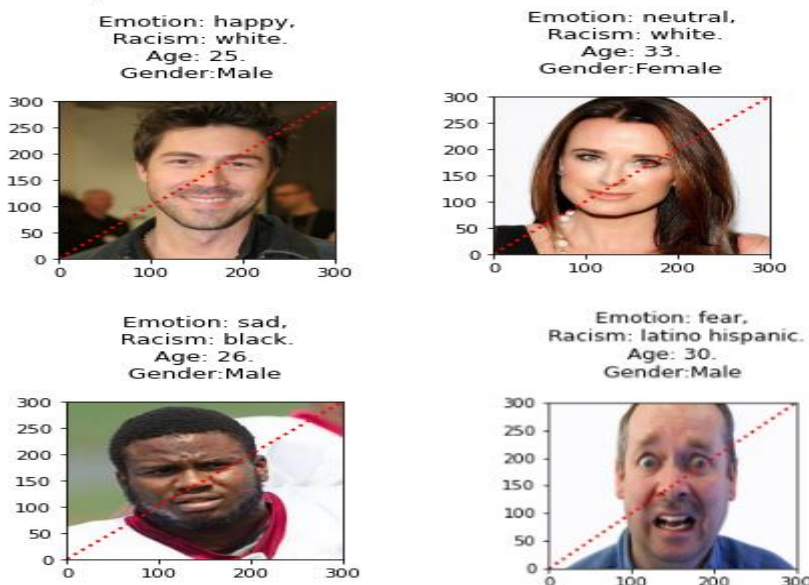


Fig 7. Result 1

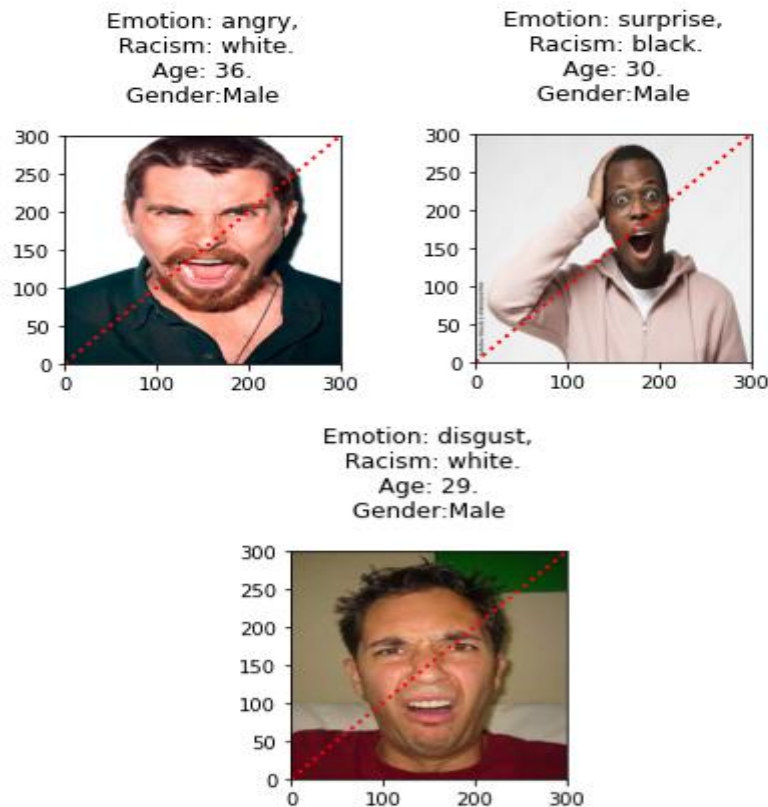


Fig 7. Result 2

VI. CONCLUSION

Human attribute prediction plays an important role in interpersonal relationships. Automatic attribute recognition was an early and active research topic. As a result, I decided to research this topic which can detect the attributes of the human face. The system receives input from the training dataset and processes the image received as input and through comparative studies, users' age, gender, emotions, and racism are identified. For this, here used Deepface method and VGG16 model and attained 97.23 percentage accuracy in overall. Proposed method use around 30000 facial images from FER dataset to train the model. And for testing the model here we used the dataset IMDB and Wikipedia. IMDB WIKI data set is the largest publicly available facial data with gender, age, and name. IMDB contains 460,723 images and Wikipedia contains 62,328 images. The existing system can't detect peoples age below 20, future developments can be done in this area. Emotion and gender recognition is not possible whenever a mask or more makeup is worn on the face. This system can also be applied in the fields like business, medical, education, advertisement, and much more.

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