iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** V **Month of publication:** May 2022

DOI: https://doi.org/10.22214/ijraset.2022.42145

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

Age Estimation and Gender Recognition Technique Using Deep Learning

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Abstract: ***Using a neural convolution network, this research presents an automatic system for recognising age and gender based on a person's face. In recent years, one of the most effective research subjects has been collecting information from a person's face. The human face has facial features such as eyes, ears, nose, chin, and other aspects that can be examined based on our requirements. The detection of age and gender begins with facial recognition. Detection is the process of identifying many features based on a single input. Our system makes use of OpenCV and includes a few deep convolutional emotional networks that have been trained to detect faces from inserted images and predict their age and gender using either a webcam or an image. Not only are deep neural convolutional networks costly, but they are also difficult to implement.***
Keywords: Age Estimation, Gender Detection, Deep Learning, Webcam, Convolutional neural network, OpenCV.

I. INTRODUCTION

Human Identification is employed in many fields like biometrics, image processing, and lots of more. It's becoming easier to tell apart people, due to computing techniques and techniques like Convolutional Neural Network and Deep Learning. This new technology facilitates the identification, and segregation of humans without the necessity for specific humans or human records and, as they're in no time, this technology can detect several people faster than knowledgeable. Analysis of face detection and identification plays a crucial role in many industries like safety, entertainment and plenty of more [1]. a specific identified face can tell many things about a private like their emotion, their agreement or disagreement on the actual statement, confusion, anger, etc. due to this the face is that the subject of a protracted study of psychology [2]. This data (or for us digital data) is extremely important because it helps to spot, select, or identify the individual as needed. Gender and age detection alone can help to offer information on areas like hiring teams, ID verification cards, like voter id cards that immeasurable people use to vote during elections, etc. Face recognition simplifies the work of finding unsuitable or fake those who lead International Statements. Social interaction is one among the foremost important parts of our daily lives and age and gender play a vital role. It's noteworthy that the languages are reserved for the alternative sex greetings and grammar rules, and it's also noted that the words are used when talking to people of various ages. All of those qualities play a very important role in our daily lives, and it's vital to develop an app to live these qualities accurately and reliably from the face image. However, it's quite confusing when considering recent claims of human skills in a very related identity verification profession.

A. Motivation

The motivation is to take this problem was to build an application for age estimation and gender recognition using a model that is suitable for real-life predictions. Many models are focusing on datasets with constrained faces and are not suitable for in-the-wild estimation. In this, we will focus on deep learning end-to-end methods.

B. Objectives

1) To estimate a person's age and gender through Deep Learning technology.
2) Assessing model performance in terms of estimation accuracy and gender perception.

C. Paper Outline

The paper is divided into 8 sections, in section 1, the introduction, motivation behind taking the problem, and objectiveof the problem statement have been stated. In section 2, the research contribution of other contributors has been reviewed critically to define the problem statement and objectives for the same. In section 3, the entire procedurehas been described in brief. Further, in section 4, the performance of the proposed technique has been discussed and a few test cases have been given to guess the age and detect the gender through an available data set.

In section 5, the key feature is discussed and in section 6, the use case has been described. In section 7, use case of is discussed and in final section 8 of the paper the conclusion, limitation, and future direction of the work have been discussed in length.

II. RELATED-WORK

A. Gender or Age categorization

Gil Levi, Tal Hassner Location for Conference: Boston, MA, USA Date: 7-12 June 2015

In this it's been evidenced that with the use of deep learning and neural networks the system performance has been dramatically improved. A straightforward neutral spec has been designed and is applied to the prediction system keeping in mind the quantity of data is restricted. The gap between old technologies and automated face identification technique has been minimised. The system have been tested on Audience-benchmark. This dataset is nothing but just the images which are uploaded to websites like Flickr from smart phones without any editing. The results of this method are a lot of correct then those showed by the foremost of the opposite systems.

B. Age and gender classification of human faces for analyzing human behavior

Xiaofeng Wang, AzlizaMohd Ali, Plamen Angelov Location for Conference: Exeter, UK 2014 Date: 21-23 June 2017

An individual behavior is unpredictable, it is often laid low with emotions or the encircling environment. It was very difficult to grasp an individual behavior and to perform an automated face detection keeping in mind that an individual behavior changes frequently but a way was introduced to do that work. This technique is used to stop any future crime by investigating any suspicious/abnormal happening. Here Transfer Learning concept has been inroduced which mainly depends on the deep learning which is the subset of machine learning. The features of face are extracted and is passed to support vector machine classifier. As the provision is very low of the data, a dataset was buid and the proposed method was applied on dataset. Very good results were achieved from the proposed method as it was very sturdy. Talking about accuracy for age detection, an accuracy of 80.16% was achieved and for gender detection, an accuracy of about 90.32% was achieved which was considered great on comparison with other technologies.

III. METHODOLOGY

There are some basic requirements this project includes system with Webcam, Visual Studio Code(or any other supporting editor), Python 2.7-3.6 is used to code, Open CV2 a computer vision library. Deep learning is used in this project in which a model is trained to identify age and gender of the human face images accurately provided. Deep learning is a part of machine learning basically a subset, machine learning which is itself a subset of Artificial Intelligence. Deep leaning is about computers learning to think using structures like how human brain learns, it mimics the human mind's working and thus called as an AI program.

Computer Vision is used to make this possible, through this computer can see digital images and identify them as how human brain sees and understands it. It involves processing, analysing and then understanding the images so that data could be extracted from the real world and from this data required information could be generated and used further in many applications without involving human intervention this will be beneficial in many perspectives as a lot of data can be fetched in less time which helps in solving major issues. This majorly includes video tracking. Motion estimation, image restoration and most importantly object recognition which further includes facial recognition. Our project uses Computer Vision to detect a person's age and gender. The model is trained using deep learning by feeding it various human face pictures to learn the features and then through the classification model gender and age can be detected. OpenCV which stands for Open Source Computer Vision it is a machine learning python library which allows processing real time image supporting analytical capabilities. This library supports other Deep learning frameworks. Convolutional Neural Network a deep neural network is used to train the model.

It can detect objects, faces, expressions, and characters from random data sets.

The model's algorithm consists of four main parts:

1) Input image
2) Face Recognition
3) Face Analysis
4) Output

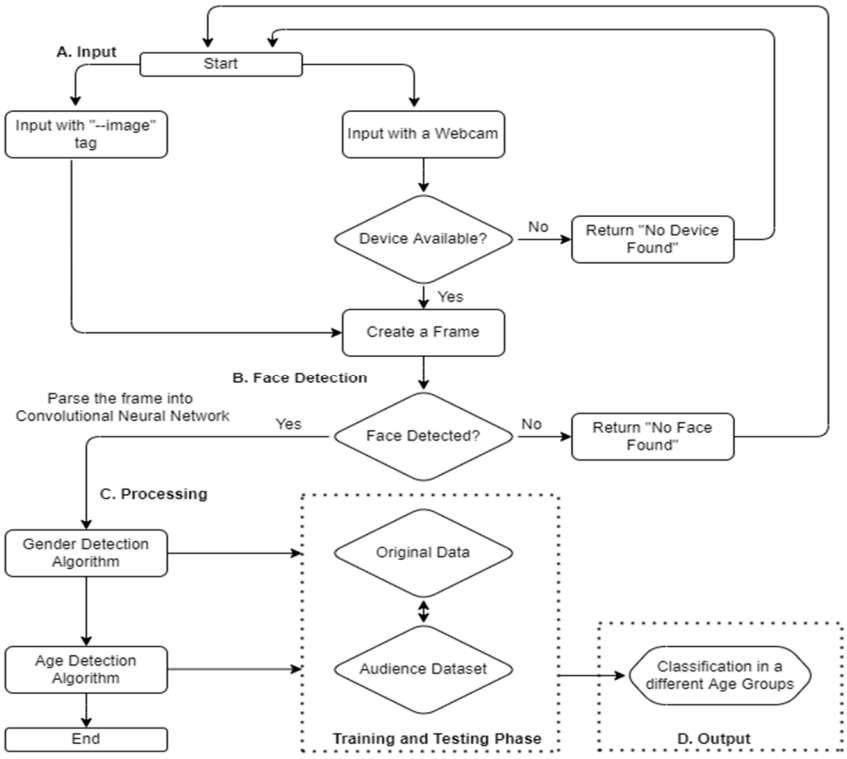


Fig 1: Flow Chart of the proposed algorithm to recognize age and estimate age

A. Input

There are two image feeding options in the algorithm. One is user using the web camera of the system catching the live image the live data this gets us the real time data that means the model will be trained with variety of pictures also this would be faster comparatively. The other way of doing is using the images with .jpg tags when the algorithm is being launched this is going to first read the jpeg file then going to further process it through deep learning and at last giving us the output based on the classification analysis, other advantage of this could vbe that multiple files could be processed by the user at one time.

B. Detecting Face

A survey on face recognition can be seen in [5] Some natural (positioning angles, brightness) facial expressions digital variations (noise, errors) and emotions set while a face is being detected frame formed. There are some difficulties in recognising faces of human those two major factors are majorly: (1) the number of patterns, perhaps infinite; and (2) pattern similarity. Audience databases of all different types of variables are used to fix this problem and hence will help improving efficiency of the algo. The dataset set will be used as a benchmark to detect sex and also segregating age in categories in our sensory network. (All images are collected under a Creative Common (CC) distribution license.)

C. Processing Face

This component comprises of the process in which data can be extracted from the face of the image given in previous step and once this is done we will only measure, assess the age and sex of the provided face.

Not only we can find age and gender but also can find a lot of other information such that learning emotion, value, attitude and other personality characteristics these could be very helpful at different scenarios and social experimentations as face is a very important part of our body for biometrics.

Once the face is found processing can be started via CNN Convolutional Neural Network as mentioned previously it is a deep learning model to make computer learn how human mind does. Through this training can be done on the provided images in which gender can be classified into two male or female as age detection will have multiple categories hence, we have different age categories defined for different face types. In total 8 age categories have been created to speed up.

D. Output

The output is the final component of the algorithm in this the output will be saved in .jpg format if the input is in the form of photo and if the webcam is used then it will consist of video as output to webcam.

In the case when the model cannot find face in the frame then "Found no face" is going to be showed in form of an output and hence no .jpg format output to be saved.

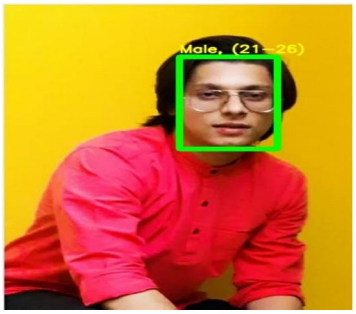


Fig 2: Sample image in JPEG format to estimate age and recognize gender

IV. PROCEDURE

As the process progresses, we can begin to assess its accuracy. The most common procedure to follow is:

1) Enter data.
2) Create an outline.
3) Find a face.
4) Separate gender.
5) Organize Age Group.
6) Paste the result on the picture.
7) Show output.

V. TESTING

To ensure the effectiveness of the method we collected a particular person's face and their age stated at the time photo was taken and saved them into the algorithm. Below is the performance comparison:

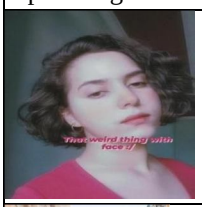
Input Image	Actual Gender	Actual Age Group
	Female	20
	Male	21
	Female	7 Months
	Female	23

Fig 3: Input Data

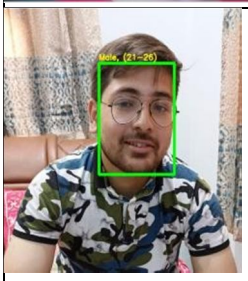
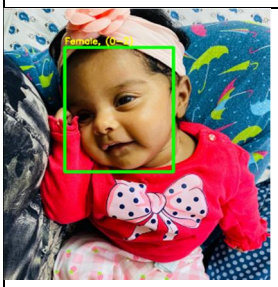
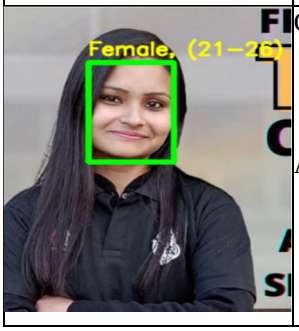
Output Image	Output	Analysis
	Gender: Female Age Group: 19-20	Age and gender are matched
	Gender: Male Age Group: 21-26	Age and gender are matched
	Gender: Female Age Group: 0-2	Age and gender are matched
	Gender: Female Age Group: 21-26	Age and gender are matched

Fig 4: Output Data

VI. KEY FEATURES

The foremost purpose of the program is to supply a quick and cheaper thanks to age and gender segregation. a number of the foremost key features of the project are : -

1) No need for top hardware/software accuracy. Images can be processed and detected directly from a webcam or from an image.
2) This method of operation is straightforward to use and doesn't require advanced knowledge. a bit of general computer information is enough.
3) Can process and maintain many facial effects with an identical effect without slowing down or delaying.

VII. USE CASE

Several scenarios for using this project include the following:

1) Within the hiring process, to confirm the eligibility of applicants.
2) Verification of the particular person applying for state IDs.
3) Identify target audiences in an exceedingly marketing organization
4) Calculate ticket prices supported gender and age in a very few public places.

VIII. CONCLUSION

An individual age-gender identification are two major tools for collecting personal information. An appropriate amout of data can be provided by the face that can be used in several things. Reaching an audience that deserves gender segregation is incredibly important. Here, we've got tried to try to to the identical process but with standard machines. The algorithm efficiency is dependent on several factors but the major motivation behind the project is to keep it as simple, fast and accurate as possible. An appropriate amount of work has been done to enhance the algorithm efficiency. In coming future their will be many enhancements including taking away faces like non-personal items, multiple data sets of individuals of various nationalities, and extra granularity control.

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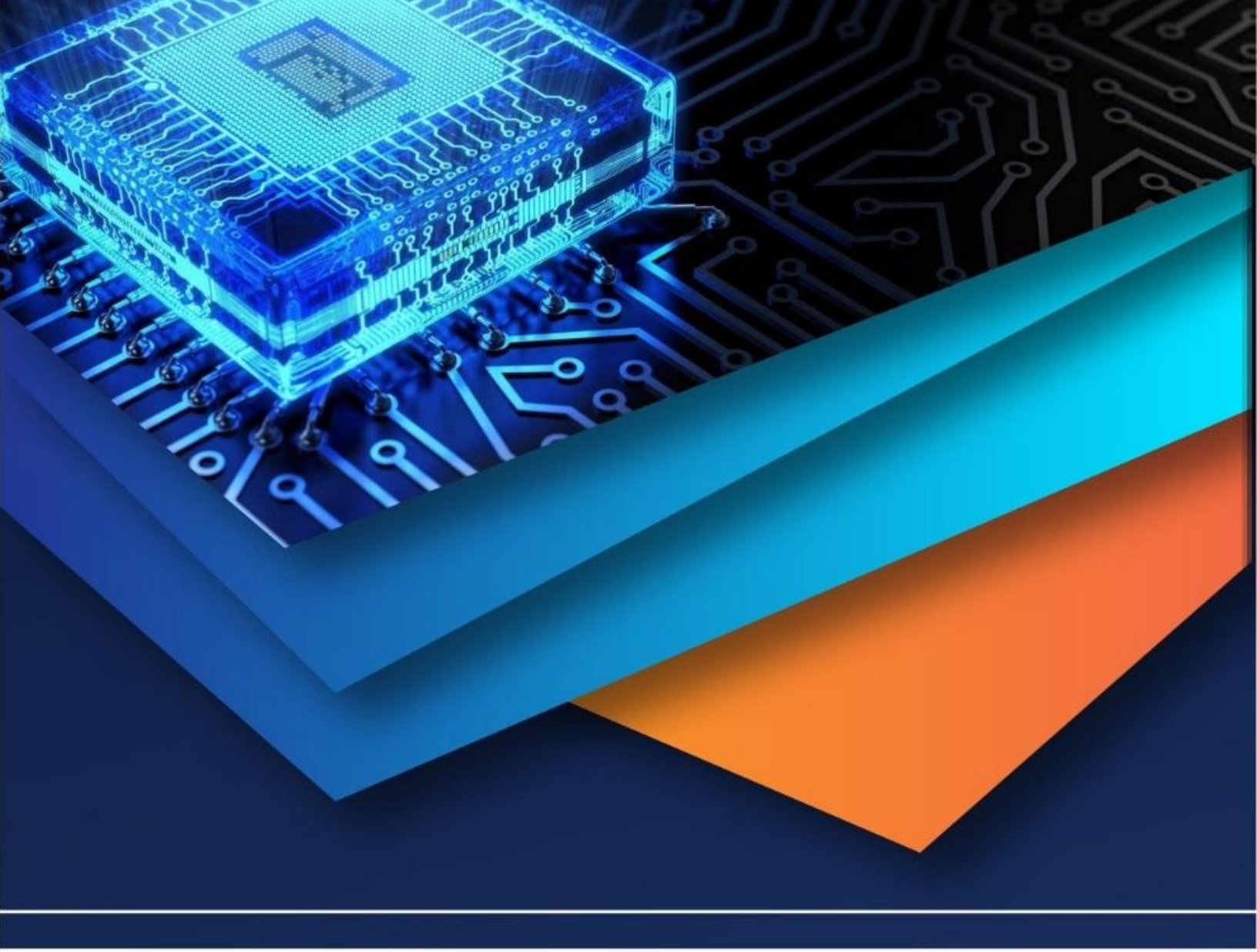

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