Age and Gender Prediction Using Web Camera and Images

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Abstract. The research project Age and Gender Prediction focuses on human-computer interaction. In this project, we take into consideration the automatic age and gender prediction from face photos, which has recently received a lot of interest because to its numerous applications in various facial analysis issues. Unfortunately, the available models still fall short of the requisite accuracy level, which is required for the implementation of these models in real-world applications, because of the significant intraclass variance of face images (such as change in lighting, position, scale, and occlusion). In this study, the researcher offers a deep learning framework, based on the ensemble of attentional and residual convolutional networks, to predict gender and age group of facial images with high accuracy rate. By implementing attention mechanisms.

Keywords: Age prediction, gender prediction

1. Introduction

Face is another prominent biometric that is used, along with iris, fingerprint, and palm print. Age and biometrics recognition have drawn a lot of interest in recent decades. Age and gender are two important facial characteristics that play a significant role in social interactions, making the task of determining age and gender from a single face image, webcam, or video crucial and significant in a number of applications, such as surveillance, facial recognition on smartphones, access control, human-computer interaction, law enforcement, etc. Convolutional neural networks (CNNs) are incredibly effective in facial analysis, which makes them a popular choice for classification systems. In a facial recognition software programmed in articulations of the, a lot of data is present.

- 0 – 2

- 4 – 6

- 8 – 12

- 15 – 20

- 25 – 32

- 38 – 43

- 48 – 53

- 60 – 100.

The features on a person's face can be used to infer information about their identity, ethnicity, gender, age, and emotions. In addition to the purposes previously described, age and gender detection can be very useful in a variety of real-world settings, including security and CCTV monitoring, biometrics, cosmetology, forensic art, human computer interface, and entertainment.

2. Review of Related Literature

French Bremond, Antitza Dantcheva, and Amit das They submitted a system that uses a multi-task CNN technique to reduce bias in the classification of people based on their gender, age, and ethnicity, and it placed first in the BEFA challenge of the European Conference on Computer Vision (ECCV). They made use of the Face Net and Res Net model. They had accuracy of 84% for race, 94% for gender, and 72% for age. [4]

Philip Jones and Cuixian Wang employed deep CNNs and transfer learning to update ImageNet's predefined layer of 1000 classes with a prediction layer of 101 classes for age estimation and gender recognition. In this scenario, transfer learning is detected with the help of VGG-19 and VGG-Face. The MAE achievement of 4.10 years enhanced the age estimation methodology. [2] Accuracy of 96% was made possible with the help of VGG-19.

Age and gender classification for Sepidehsadat Hosseini, Seok He Lee, Hyuk Jin Kwon, Hyung Ii Koo, and Nam Ik Cho They used a wide CNN Gabor filter and a 227x227-shaped picture input for their wide CNN and Gabor filter method. They received an accuracy of 61% for age and 88% for gender.

Ting-Yen Chen, Chu-Song Chen, Jia-Hong Lee, and Yi-Ming Chan Lightweight Multi-task CNN was utilized in the study, Joint Estimate of Age and Gender from Unconstrained Face Pictures for Mobile Applications, which introduced the LMT CNN network. They achieved 85% gender and 44% age accuracy. With the necessary resources, this programmed can be used on any mobile device [1][3].

In their paper Age and Gender Classification using Convolutional Neural Networks [6], Gil Levi and Tal Hassner suggested a brand-new CNN model for determining age and gender. They employed the Deep CNN model, which provided 85% and 86% accuracy for age and gender, respectively. [5]

3. Methodology

Deep learning is an artificial intelligence (AI) technique that aims to simulate a human brain by learning from experience. These representations are learned via a training process. We must first train the software with many object photos that we classify into distinct groups in order to teach it how to detect objects. [10] In comparison to conventional machine learning techniques, deep learning-based algorithms typically need more training data and take longer to train. [9] It takes time and effort to identify distinctive characteristics while attempting to identify any object or character on a picture. Problems can be resolved utilizing deep learning techniques, which automatically extract key characteristics from data, in contrast to classical machine learning, where features are manually collected. Deep learning is a type of neural network that has several hidden layers. [8]

3.1 Convolutional Neural Network (CNN)

Convolutional neural networks, or CNNs, are a type of artificial neural network frequently used for object or picture recognition and categorization. Deep Learning identifies objects in an image by using a CNN. A typical neural network consists of an input layer, hidden layers, and an output layer. CNNs were inspired by the human brain's anatomy. [6]

Similar to the way a neuron in the brain works and sends signals between cells, artificial neurons or nodes in CNNs receive inputs, process them, and offer the outcome as output. Information is gathered from the photos. Figure 1 shows the sample model of the CNN with layers to predict images.
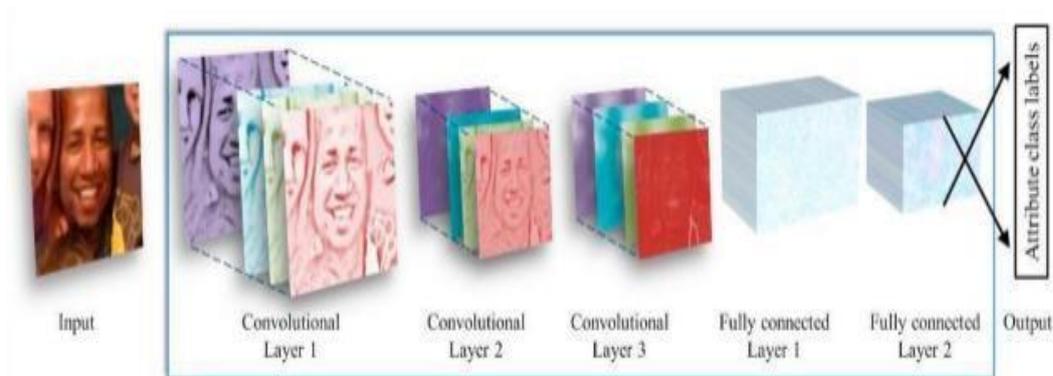
Figure 1: CNN Model

CNN Model

Gender estimation from social image collections, pictures that don't need access to personal information about the subjects like their birth dates that aren't visible in the pictures, and the traditional method which gathers other details about a person and is based on how we identify gender in manually handled, annotated data for gender recognition. [7]

3.2 Algorithm for Gender and Age Prediction

In this study, we employ Python Deep Learning to identify a particular gender and age from the facial data that has been provided. Under the machine learning category, deep learning is included. Artificial intelligence (AI) Deep Learning is a technique that imitates how human cognitive processing works. It can recognise things, persons, speech, and characters in unstructured data collections. The algorithm's four main components are Input, Face Detection, Face Processing (Classification of Gender and Age), and Output.

3.3 Face Processing

The procedure for detecting faces, if any are found. Processing can start with a CNN, or convolutional neural network. It is a specific form of deep neural network used largely for image processing. A training phase is where CNN generates a range of estimates. It is a variety of deep neural networks that are frequently employed in image and natural language processing.

The CNN will conduct the actual training phase, and many forecasts will be made. The two genders that can be anticipated are male and female. Estimating age is a multi-class job where the eras are broken down into groups. It is challenging to obtain precise data since persons of different ages have a wide range of facial traits. To expedite the process, we separated the population into several age groups. Eight

kinds of age estimations are possible: (0-2), (4-6), (8-12), (15-20), (25-32), (38-43), (48-53) and (60–100). Figure 2 shows the flow chart of execution.
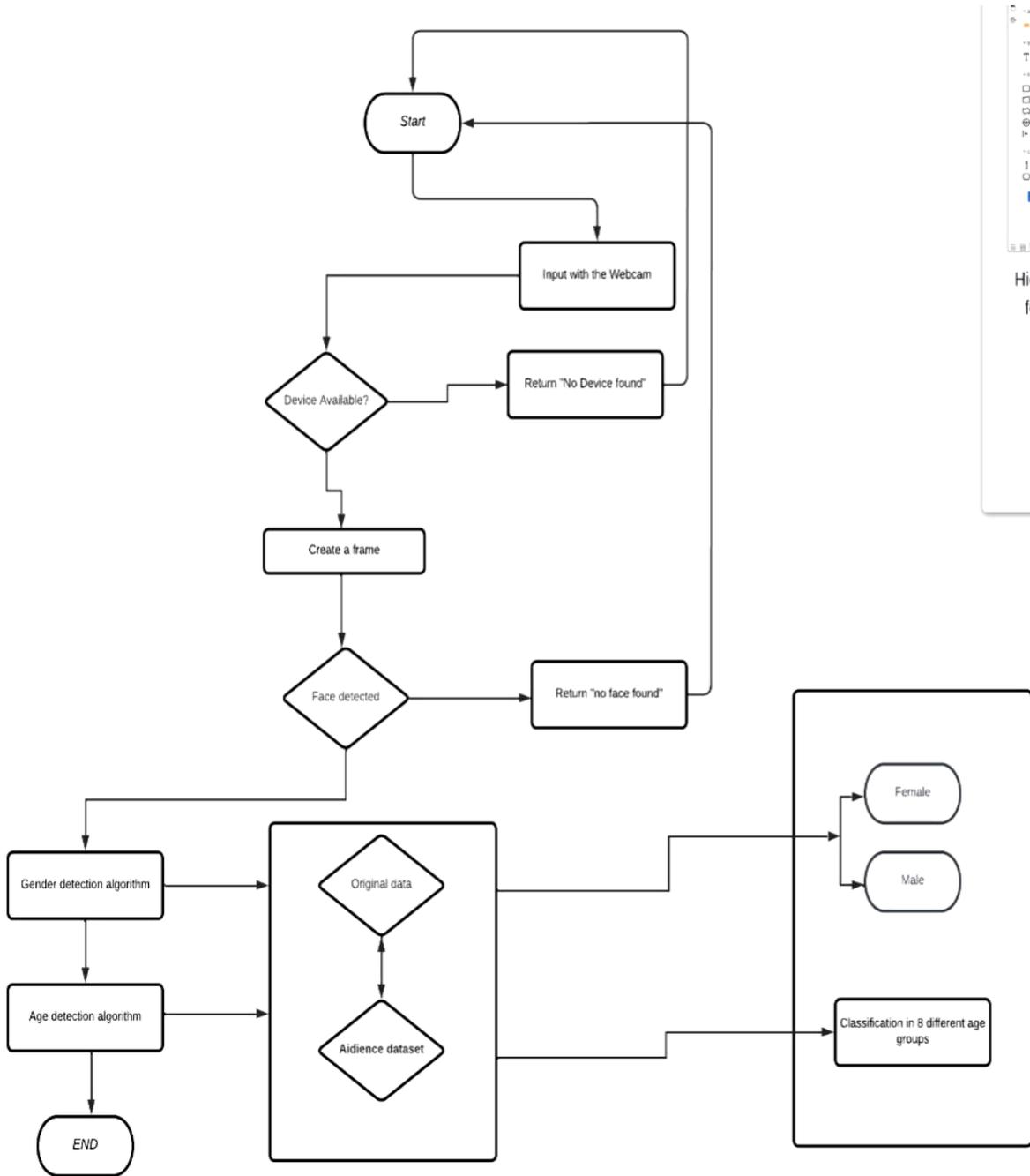

Figure 2: Flow Chart

4. Implementation and Result Analysis

The dataset utilized in this project is taken from Kaggle website. This dataset contains a complete of 26,580 images of 2,284 subjects in eight age ranges as follows:

- 0-3

- 4-7

- 8-14

- 15-24

- 25-37

- 38-43

- 44-59

- 60-100

The dataset has total 8 columns.

Implementation is divided in modules:

Training and testing – Here data is splatted into training and testing dataset. after the spilt data cleaning, data processing and data analysis is performed on training dataset.

Caffe Model – a deep learning framework enables to create image segmentation and classification models. Firstly, the users create and save their models as PROTOTXT files. After that the model is trained and refined using Caffe. Then the program saves the trained model as a Caffe Model. Caffe model files cannot be opened, examined and edited in source code editor, as a PROTOTXT file.

Testing Model

- Input the data.

- Create a frame.

- Detect the face.

- Process the image.

- Classify the Gender.

- Classify the Age Group.

- Attach the result in the image.

- Output the image in specified location.

Limitations

Face identification has a severe challenge with skin colour segmentation. The accuracy of facial segmentation is affected by the object's pose, noise, lighting conditions, and distance from the camera. The following are the numerous types of obstacles that may arise during detection:

- Pose

- Facial expression

- Imaging condition

- Age

- Face size

- Different facial features

- Illumination

Output
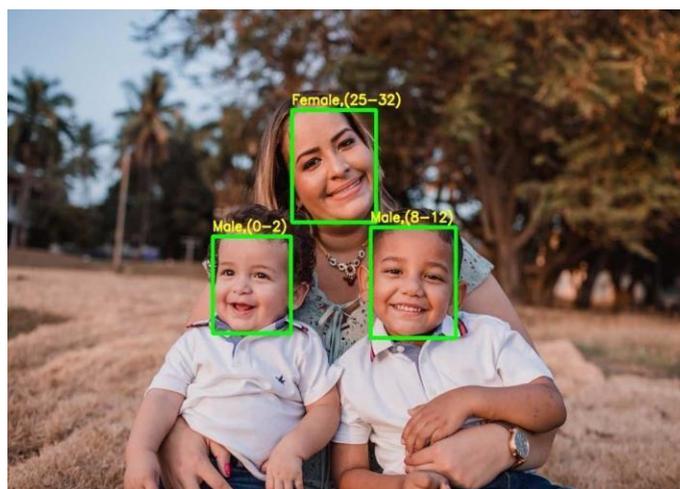
Figure 3: Analyzing Multiple Face.

Figure 3 represents the sample output of the multiple face analysis with the gender and age prediction. In the figure 3 a female with 2 children is passed as input and the face is traced out of the picture which is represented in green colour square and its gender is mentioned based on the parameter range is displayed above the square.

5. Conclusion

Machine learning technology makes it simple to look for relationships and patterns among different dates. This project's work mainly focuses on identifying a person's age and gender and counting the number of human faces that are visible in the frame. With a training dataset that has undergone data pre-processing and data cleaning, a model is created utilizing the deep learning approach.

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