IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 10, Issue 4, April 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

A Lightweight Deep Convolutional Neural Network Model for Real-Time Age &Gender Prediction

Priya Patil[1], Amruta Aware[2], Kalpana Thorat[3], Rashmi Gaikwad[4], Rama Barwal[5]

Student, Department of Computer Engineering, Genba Sopanrao Moze Engineering Pune, Maharashtra, India[1]

Student, Department of Computer Engineering, Genba Sopanrao Moze Engineering Pune, Maharashtra, India[2]

Student, Department of Computer Engineering, Genba Sopanrao Moze Engineering Pune, Maharashtra, India[3]

Student, Department of Computer Engineering, Genba Sopanrao Moze Engineering Pune, Maharashtra, India[4]

Professor, Department of Computer Engineering, Genba Sopanrao Moze Engineering Pune, Maharashtra, India[5]

ABSTRACT: Acknowledgment of age and gender has become an indicator an integral part of the biometric system, protection, and treatment. It is used a platform for communication in the distribution of horizontal advertising as well promotion to increase its breadth. Face detection application has grown so much that we have to improve it using a variety of methods ways to get the most accurate results. In this paper, we have built a lightweight Convolution neural network model for real age and gender speculation. Doing training Various Database, Wiki, UTK Face, and Audience data sets including one containing 18728 photos. Using this a large mixed data set, we achieved 48.59% accuracy again 80.76% of age and gender respectively. The model tested in real time. Different test investigations in the modified data set shows that in recent ways, ours the model provides the accuracy of competitive predictions.

KEYWORDS: Convolutional Neural Network, Deep Learning, Facial Images, Age and Gender Prediction, Real-time recognition system.

I. INTRODUCTION

Age and gender of a person are considered bio- values.Metric trait for personal identification. Age and Generation means the process of seeing a person's face image and identification that a person is male or female too predicting years. These two qualities play a vital role in our lives public health. Real-time facial recognition is a wonderful thing promising research topic. Recent research suggests that age features studied in depth in big data have an impact significant improvements in image age-based screening efficiency. With a growing number of apps, default the discovery of age and gender has become important, in particular after the rise of social media and social media platforms. Actually in the world, there are many related technologies available age and gender estimates, including product sales, biometrics, cosmetology, forensics, entertainment, etc. [1]. Predicting the age plays an important role in crime investigations and as it helps to find a real criminal based on manage. However, the effectiveness of accessible processes is real immature world images are not yet fully developed in a practical way of facial recognition. However, there is still a serious lack of established functionality real-world image techniques, especially when compared in large-scale interactive jumping operations recognition function. While age-based research is expanding decades, research to assess age or age as translated into facial image by other people a recent attempt. It should be noted that the acquisition of age from one picture is not an easy task to accomplish because the estimated age depends on several factors and the same age people look very different in different parts of the world. A successful prediction of age and gender from facial imagery taken under real-world conditions will lead to development diagnostic results. Use of age and gender segregation programs have grown rapidly in recent years thanks to its advanced technology such as cascade classifiers, in-depth study of multiple functions and OpenCV etc. [2] - [4]. Recently deep neural networks are already popular with many applications to improve accuracy. In-depth study years as well as gender-based approach is proposed in this paper consider key barriers to mobile application.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

In this work, we have used Convolutional in-depth learning Neural Network (CNN) Solution for guessing age and gender from a single face image that combines three data sets with age and sex labels. This paper shows that by exercising of CNN's deepest experience as outlined here, it is possible to achieve amazing performance. The main objectives of our work are:

• Build a lightweight CNN model.

• Train the CNN model using a large integrated database.

• Estimate age and predict gender from real face image time.

Our multi-activity learning program allows for positive aspects to be shared and studied to improve the effectiveness of recognition in both works. CNN properties used by our model specially designed for age and gender ratio increase time efficiency and reduce model size over time maintaining the consistency of the output. The whole paper is summarized as follows. Related books and lessons are presented in Phase II. Proposed the procedure is described in Section III. In Section IV, the results and performance analysis presented. Finally, paper held in Section V

II. LITERATURE REVIEW

There is a lot of remarkable research done in the area for years as well sex prediction using facial expressions. The first ways to say that 978-1-7281-9183-6 / 20 / $ 31.00 © 2020 IEEE

Third International Conference on Technology, Computers and Communications Authorized licensed use is limited to: IEEE Explore. Downloaded July 09, 2021 at 06:47:20 UTC from IEEE Explore. Restrictions apply the sector focused on output and calculation facial features. In [5], a deep neural computer network was used. Extremely cheap and offers good accuracy for many competitive data sets. CNN's deep network has been promoted [6] consisting of hidden layers connected to the surface. I Database CAS-PEAL and FEI were used for training. Zhuang Liao et al. [7] proposed 9 overlapping patches per photo instead of a hundred patches to cover the entire region. Exactness was achieved by the nine dot method was 95.72% on the Labeled Face in the Wild (LFW) dataset and 78.63% on the Audience dataset for gender forecast. For age classification, perfection was 40.25%. [8]. Approached a deep learning method for age prediction from a single face picture without using facial landmark. Their main contribution are the IMDB WIKI dataset, regression formula by deep classification, and achieving accuracy 64.0%. In [9], a hybrid architecture was introduced that consists of a CNN. Using datasets MORPH-all and Audience benchmark, achieved accuracy for age and gender prediction respectively is around 52% and 88% on average. For age and gender prediction, analytically efficient CNN model was designed for mobile platform in [10]. In [4], authors developed an android app for age and gender using LBP (Local Binary Patterns) classify and LBPH (Local Binary Pattern Histogram). A lightweight CNN was implemented for mobile application in [11] using the Audience dataset and gained correctness using LMTCNN 2-1 for age top 1 is 44.26% and gender top-1 is 85.16%. Also a smartphonebased implementation was done using visual images for gender prediction in [12]. Gabor filter as input in CNN and Audience dataset were used in [13] and achieved accuracy for age and gender is respectively 61.3% and 88.9%. A video based performance was done by using Dumpster Shafer theory to generate classifiers using different datasets such as IMFDB, Kinect, Emote 2018 and IJB-An in [14]. A research was carried out using feed forward propagation neural networks at a finer level with 3 sigma control limits in [15]. By using the JAFFE dataset, they increased accuracy of 95% for age and gender detection. Using the dataset and Audience dataset, another local deep neural network was introduced in [16]. Accuracy of 96.02% and 80.64% for gender prediction was obtained from these two datasets and accuracy of 44.36% for age prediction was achieved from the proposed model. [3]. increased accuracy for CNN+STL and CNN+DMTL is 80.11% and 91.34% for gender prediction. For age prediction, increased mean correct error (MAE) is 4.01. And 4.00 respectively. InshaRafique et al. [2] proposed a deep CNN for eight age groups and two gender groups. They gained 79% accuracy using deep CNN model and Haar Cascade Classifier. Recently in [17], a research was done using CNN with 'Google' and 'IMFDB' datasets and gained approximately 80% accuracy. Another research was done with the IMDB-WIKI dataset and achieved accuracy for gender prediction is approximately 96.50% and age prediction is 85% for their own dataset [1]. In modern years, other researchers developed a Deep CNN architecture for gender detection with standard accuracy and low computational cost. They compared their architecture with other popular CNN with common datasets namely IMDBWIKI, LFW, and Audience dataset [18]. In [19] they implemented a lightweight model for age and gender estimation. They have used multi-task learning for an embedded system using multiple datasets such as MORPH-II, FGNET, and MegaAge Asian datasets. In [20], they have used the same dataset MORPH-II and FG-NET and

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

developed an age estimation process based on a lightweight CNN and Data Augmentation. They proposed a mixed attention method by combining regression and classification formulas. [21] In, a system was developed to detect gender, age and emotion by using CNN. They have used a cascade classifier and 10000 images to train their model. A deep learning classifier was developed to predict age and gender in from unfiltered images. Their CNN architecture consists of two parts that extracts features and classify. They trained their network on IMDB-WIKI, MORPH-II and OIC- Audience datasets and improved accuracy for age and gender prediction. Studying and summarized the above researches, there are some disadvantage of their implementations such as CNN architecture, big sized CNN model, high computing cost, dataset processing, and so on.

• Changes in architecture.

• Dataset preparation.

III. METHODOLOGY

The main focus of this work is to develop a CNN model and training it using a large combined dataset. Total methodology divided into two main part

• Training Phase

• Real-time Testing Phase

A. Training Phase

The steps of training are shown in Fig. 1. The first two steps are, building a CNN and processing the dataset. After that, using the processed dataset, the CNN model is trained. This is because training a deep learning model takes a lot of time and resources. So it is not feasible to train each time before predicting. After successful training, the model with the weights can be saved in memory. Whenever a prediction is required, the model is loaded from memory and used for prediction. This method also enables low end devices, such as IOT devices, smartphones to perform complex tasks a

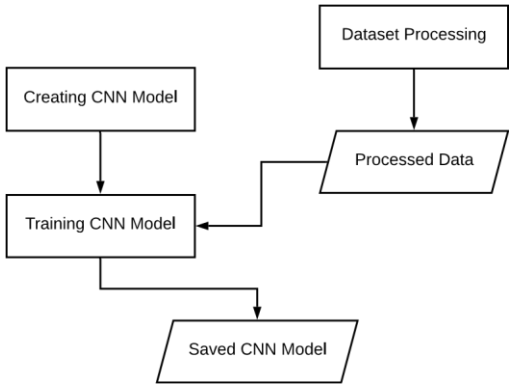

Fig. 1. Training Phase

Prediction or classification, as training is not possible in these low-end devices.

We have learnt two main ideas given below from the deep learning research which are applied in our work:

• The more stability and diverse the datasets are and the more resilient it becomes to over fitting.

• The deeper the neural networks are, the greater the ability to model very nonlinear shifts.

Dataset preparation and model design and train are described here:

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

1) Preparing Dataset: We have selected three publicly available facial datasets which are, Wiki [8], UTKFace [23] and Audience Dataset [24]. Preprocessing steps are different for each of them. For the wiki dataset, the photos which have only one face are picked. Then the age is calculated as mentioned in age = date of photo taken − date of birth

For the UTKFace and Audience dataset, much processing is not needed as these datasets are well organized. We have merged these three datasets into one.

Fig. 2. Dataset Example

The total age range is divided into 8 age groups. These groups are: 0-2, 4-6, 8-13, 15-20, 25-32, 38-43, 48-53 and 60-100 as it has been done in Audience dataset. The total dataset is then down examined according to age so that each age group has equal number of images which results in a total of 18728 images. Fig. 2 shows some sample images from the dataset. The dataset distribution based on age and gender is shown in Fig. 3. Finally, the dataset is divided into three parts,

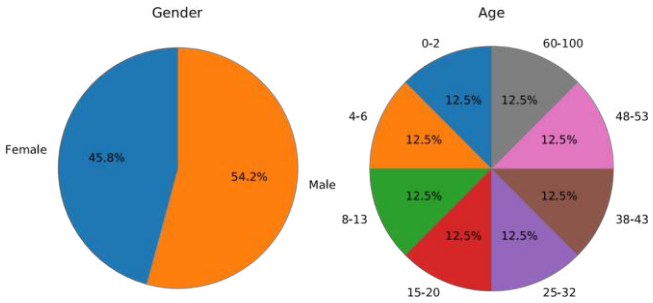

Fig. 3. Dataset Distribution

With an 8:1:1 ratio of training, validation and testing.

2) Creating and Training CNN Model: The CNN is a deep neural network planning used in computer vision, such as image recognition. Computer creativity and image recognizing are not new concepts rather old ones. The construction of CNN as shown in Fig. 4, has two parts which are feature extraction and then classification. The feature part contains several involution layers and pooling layers.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

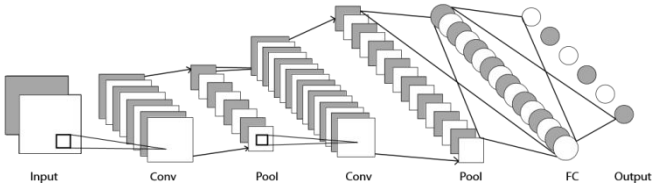

Fig. 4. A Simple CNN Architecture

Combining layer is also called sub sampling or down sampling. This layer decrease the feature map by retaining only the most important information such as taking the average or maximum value. The classification unit generates output according to input data. It indicates that all the neurons of the last layer are connected with all the neurons in the next layer. Typically it uses “Soft ax” operation.

The model that is used contains of a basic building block as shown in Fig. 5. 32 filters are used in each layer. Different sizes of kernels: 3X3, 5X5, 3X1, 1X3, 1X5, 5X1, 1X1 are applied in different layers. Max joining is used for downsampling without reducing dimension. By connecting three of these blocks. The last layers are fully connected layers. The output layer for gender guess has two output units or classes, 1 for male and 0 for female. The output layer for age forecast has 8 output units or classes.

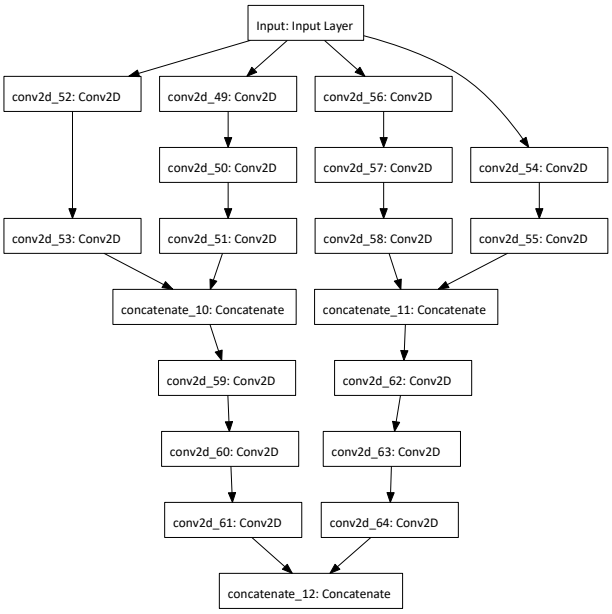

Fig. 5. Basic Building Block of Proposed CNN Architecture

B. Real-time Testing Phase

In the real-time testing phase, after the completion of training, the model is used for forecast captured images via a camera and displaying the result continuously on the screen. This involves several steps

This involves several steps as shown in Fig. 6.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

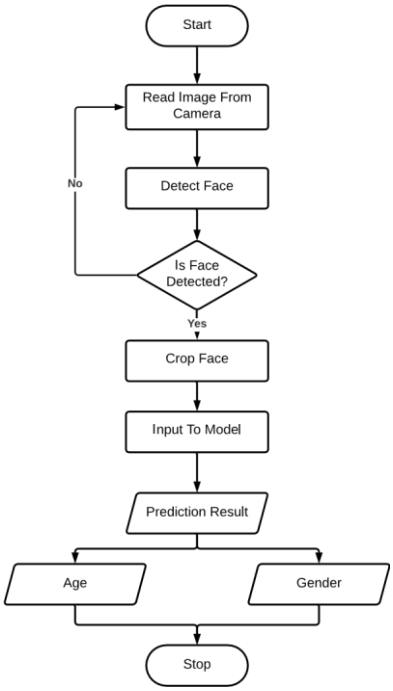

Fig. 6. Real-time Testing Phase

First images are read from the camera. The face is detected from the images using Open CV and haar fall classifiers. OpenCV is a library of programming functions specially targeted at computer vision in real-time. And cascade classifiers can be explained as a trained machine learning model that can detect a face. The face is cut from the main image and sent to the model for prediction.

IV. EXPERIMENTAL RESULTS & ANALYSIS

Experiments were conducted on grayscale images for 100 epoch with a batch size of 32. Images have been resized to 64x64 to reduce training time.

A. Performance Analysis

One of the primary goals of this paper is to create a lightweight model. By the word lightweight model we mean a model that has a small number of parameters, and a small model size that is suitable for mobile integration. The total number of parameters of the proposed model is 210,050. And the final model size is 2.60MB which is very light weight to execute in any mobile platform. Where some well-known models like VGG, Reset has size more than 200MB [25].After 100 era, 81.35% and 51.59% training accuracy have been achieved for gender and age respectively. Test correctness for gender is 80.76% and for age is 48.59% on our combined dataset. Fig. 7. Accuracy vs Epoch and Loss vs Epoch in Table I, results are compared with several research works. The model is tested on the complete Audience dataset to compare with other research work. Accuracy of 46.71% for age and 81.38% for gender are obtained. This is done after link the dataset into train, validation, and test (8:1:1). The training exactness of 86.68% for gender and 64.22% for age are carry off and testing accuracy is 60.03% for age and 85.77% for gender. Which has been trained using the Audience dataset, on both Wiki and UTK Face dataset. It shows moderate accuracy of 79% and 72% on gender respectively. But it performs very imperfectly for age, showing less than 32% accuracy.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.165 |

|| Volume 10, Issue 4, April 2022 ||

| DOI: 10.15680/IJIRCCE.2022.1004042 |

B. Real-time Testing

The model that trained on a mixed dataset was tested

In real-time data. We got promising output in the real time test. In real-time prediction run-time of the model was average 0.0654 ± 0.0056 seconds per prediction for 100 predictions on the Windows platform.

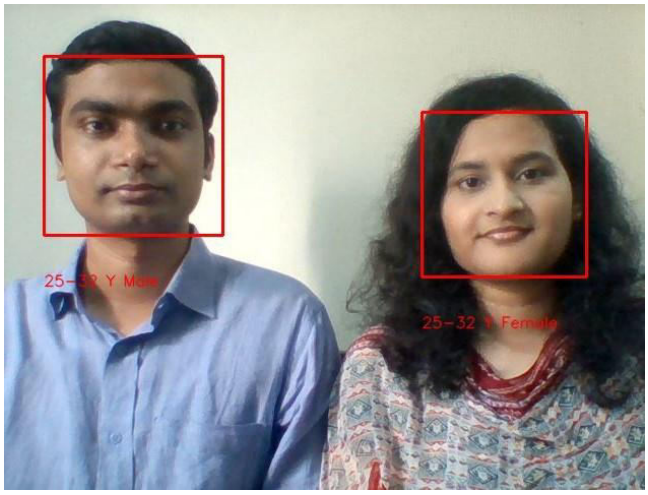

Fig. 8. Real-time Prediction

V. CONCLUSION & FUTURE WORKS

In this work, we developed a lightweight CNN model which is ideal to integrate in mobile devices. And we have achieve this without compromising too much accuracy. We plan add more datasets from different sources and increase accuracy for age We also want to develop a smartphone application that can predict gender and age in real-time using the proposed model. And our other idea is to upgrade the model for special cases such as faces with a mask.

REFERENCES

[1] I. Re figure, A. Hamid, S. Nasser, M. Assad, M. Awaits, and T. Yak sir, "Age and gender prediction using deep convolutional neural networks," in 2019 International Conference on Innovative Computing (IIC). IEEE, 2019, pp. 1–6.

[2] D. S. Al-Sahrawi, "Human age and gender prediction using deep multitask convolutional neural network," Journal of Southwest Xiaoping University, vol. 54, no. 4, 2019.

[3] A. Deafen, E. G. Ortiz, G. Shun, and S. Z. Mascot, "Danger: Deep age, gender and emotion recognition using convolutional neural network," arrive preprint arrive: 1702.04280, 2017.

[4] Z. Liar, S. Petrifies, and M. Panic, "Local deep neural network for age and gender classification," arrive preprint arrive: 1703.08497, 2017.

[5] M. Dual, K. Li, C. Yang, and K. Li, "A hybrid deep learning CNN – elm for age and gender classification," Retro computing , vol. 275, pp. 448–461, 2018.

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details