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# Age and Gender Prediction and Human count

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**Abstract**—*After the hype of social media and it's platforms like instagram, snapchat, etc age and gender classification is becoming relevant. But the performance of existing models in real world is still falling short, specifically once we compare it to the prodigious gaps within the performance which was recently reported for the task of automatic face recognition. This paper shows that by using deep convolutional neural networks (CNN) and caffe model, significant escalation in performance will be obtained after performing these detections. Also this system is going to count the faces i.e. people present in a frame which is done by using an easy convolutional neural network architecture which will provide the convenience of working even when there's limited dataset available. The model is evaluated on the Adience benchmark for age and gender estimation. The main purpose of this project is to give out a jest idea of how machine learning can be used to detect age and gender of a human and to count the number of humans present in a frame thus reducing the manual work.*

*The paper is divided into following sections:*

*I. Introduction*
*II. Proposed System*
*III. Related work*
*IV. Implementation*
*V. Result*
*VI. Conclusion and future work*
*VII. References*

***Keywords***—**CNN model, caffe model, Machine Learning, accuracy, prediction, count**

## 1. INTRODUCTION

Along with iris, fingerprint and palm print face is also one of the popular biometrics. Within the past few decades age and biometrics recognition have gained plenty of attention. Two of the key facial attributes are age and gender, which contribute in playing a vital role in any social interactions, which makes age and gender detection from a single face image/webcam/video a crucial and an important task in certain applications which includes surveillance, facial recognition in smart phones, access control, interaction of human computer, law enforcement, etc. For classification purpose methods based on Convolutional Neural Networks (CNNs) are being used extensively due to the exceptional performance in facial analysis. In a Facial recognition system: A great deal of data is present in articulations of the faces and assessing age is a multi-class issue where the years are categorized iin eight age ranges as follows:

- 0 – 2
- 4 – 6
- 8 – 12
- 15 – 20
- 25 – 32
- 38 – 43
- 48 – 53
- 60 – 100.

Human's face contains features that can be helpful in determining the identity, ethnicity, gender, age and emotions of people. Apart from the above listed applications, age and gender detection can be extremely helpful in a lot of real world applications like security and CCTV surveillance, biometrics, cosmetology, forensic art, human computer interaction and entertainment.

## 2. PROPOSED SYSTEM

Predictive modelling is a way of building a model that is able to make predictions. This process includes a machine learning algorithm that learns some properties from a training dataset in order to make those predictions. These models make assumptions based on what is happening now. If incoming, new data shows changes in what is happening now, the impact on the future outcome must be recalculated too. Predictive analytics depends mostly on unfettered access to sufficient volumes of accurate, clean and relevant data. It reduces the amount of time, efforts and resources required in forecasting business outcomes.

In this project caffe model is used because it is efficient recognition algorithm and is widely used in pattern recognition and image processing. It provides us with extensive set of features namely simple structure, less training parameters and adaptability. Caffe is a deep learning framework which enables to create image segmentation and classification models. It is developed with expression, speed and modularity. In Caffe models instead of code optimization is defined as plain text with scientific and applied progress for simple code.

Files in caffe model are meant to be integrated into applications that can use the trained image classification and segmentation models. After that, the project is deployed on a website. The website has two options, the first one is to detect the age and gender of the human present in the frame it may be through an image, webcam or a video file. The second one is to count the number of humans that are present in a frame with similar inputs i.e. through image, webcam or a video file.

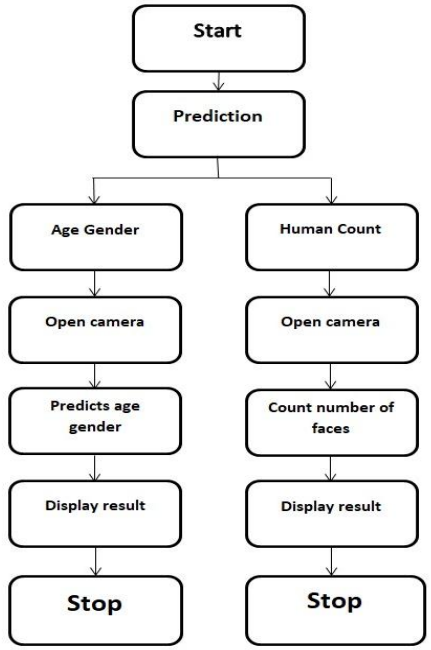


Fig.1 Age and Gender detection and Human counting system Flowchart

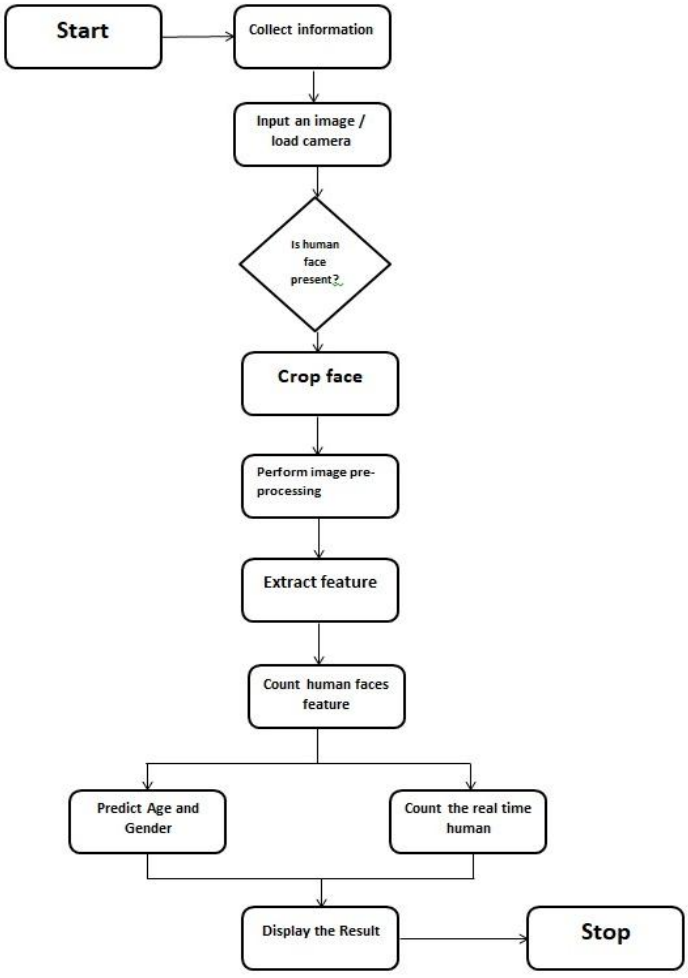


Fig.2 Flowchart for Age and Gender detection

## 3. RELATED WORK

Abhijit Das, Antitza Dantcheva and Francois Bremond Mitigating Bias in Gender, Age and Ethnicity classification [1], they proposed a system using multi-task CNN approach which was ranked first in the BEFA challenge of European Conference on Computer Vision (ECCV). The model used by them was FaceNet and ResNet. The accuracy they got for race was 84%, gender was 94% and age was 72%.

Philip Smith, Cuixian Chen Transfer Learning with Deep CNNs for Gender Recognition and Age Estimation [2], in this they replaced the 1000 class predefined layer by ImageNet with prediction layer of 101 classes for age prediction. In this the transfer learning is detected by the help VGG-19 and VGG-Face. MAE achieved 4.10 years which helped in improving the age estimation model. 96% accuracy was achieved with the help of VGG-19.

Sepidehsadat Hosseini, Seok Hee Lee, Hyuk Jin Kwon, Hyung Ii Koo and Nam Ik Cho Age and Gender Classification Using Wide Convolutional Neural Network and Gabor Filter [3], they used a wide CNN Gabor filter and the image input shaped to 227x227. The accuracy they got for age is 61% and gender is 88%.

Jia-Hong Lee, Yi-Ming Chan, Ting-Yen Chen and Chu-Song Chen Joint Estimation of Age and Gender from Unconstrained Face Images using Lightweight Multi-task CNN for Mobile Applications [4], here they introduced new network LMT CNN and the model used was a light weight multitask CNN. They got an accuracy of 44% for age and 85% for gender. This application can be used on any mobile device with required resources.

Ke Zhang, Liru Guo, Miao Sun, Xingfang Yuan, TonyX Han, Zhenbing Zhao and Baogang Li Age Group and Gender Estimation in the Wild with Deep RoR Architecture [5], in this they have replaced the 1000 class layer with ImageNet. They used Deep RoR architecture. The two system RoR-34 + IMDB WIKI achieved 66% on single model.

Gil Levi and Tal Hassner Age and Gender Classification using Convolutional Neural Networks [6], they proposed a new CNN model for gender and age classification. They used Deep CNN model which gave them 86% accuracy for gender and 85% accuracy for age.

M. Fatih, Aydogdu and M. Fatih Demirci Age Classification Using an Optimized CNN Architecture [7], during this they used a complete of 16 CNN architectures hunt 4 complete stages with each of the 4 complete stages. The model used by them was an optimized CNN architecture and the result received was mean 46.39% and exact success % of STD with 27.35%.

## 4. IMPLEMENTATION

The dataset utilized in this project is taken from kaggle website [8]. This dataset contains a complete of 26,580 images of 2,284 subjects in eight age ranges as follows:

- 0 – 2
- 4 – 6
- 8 – 12
- 15 – 20
- 25 – 32
- 38 – 43
- 48 – 53
- 60 – 100.

The dataset has total 8 columns.

The CNN architecture has 3 convolutional layers.

Implementation is divided in 3 modules:

- Training and testing – Here data is splittedvinto training and testing dataset. apfter the spilt data cleaning, data processing and data analysis is performed on training dataset.

- Caffe Model – It is a deep learning framework that 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 CAFFEMODEL. Caffe model files cannot be opened, examined and edited in source code editor, as a PROTOTXT file.

- Deployment – After the caffe model is trained, it is then deployed to the Age and gender prediction website where the ouput is displayed.

Following are the steps to implement this project:

- Firstly detect the faces
- Classify the image into Male or Female
- Classify the image into one amongst the 8 mentioned age ranges
- Put the results on the image and display the image

The implementation of this project is split into following steps-

### *A. Data Preprocessing*

There are 19370 entries within the dataset. By using the .info() method we are able to find the information about the dataset and also the null values are removed by using dropna().

```
RangeIndex: 19370 entries, 0 to 19369
Data columns (total 12 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   user_id             19370 non-null  object
 1   original_image      19370 non-null  object
 2   face_id             19370 non-null  int64
 3   age                 19370 non-null  object
 4   gender              18591 non-null  object
 5   x                   19370 non-null  int64
 6   y                   19370 non-null  int64
 7   dx                  19370 non-null  int64
 8   dy                  19370 non-null  int64
 9   tilt_ang            19370 non-null  int64
 10  fiducial_yaw_angle  19370 non-null  int64
 11  fiducial_score      19370 non-null  int64
dtypes: int64(8), object(4)
```

Fig.3 Age and gender dataset information

### *B. Building and Training Model*

The training and testing of the dataset begins by firstly dividing the dataset into xtrain, ytrain and xtest, ytest. From sklearn. preprocessing we import OneHotEncoder. Building of the model is done with the help of model .Fit (xtrain,ytrain). After running 28 epochs the accuracy obtained 0.8839.

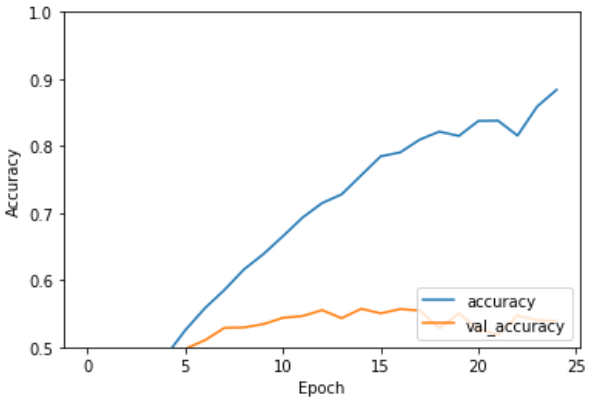


Fig.4 Accuracy obtained for Age and Gender detection

### *C. Prediction*

After the model is totally build using above process, we've done the prediction part using model.predict(xtest).The accuracy is calculated using accuracy_score(xtest, ytest)

### *D. Visualization*

Data visualization is done using matplotlib library from sklearn. Analysis of the Age and gender dataset is completed by plotting various graphs.

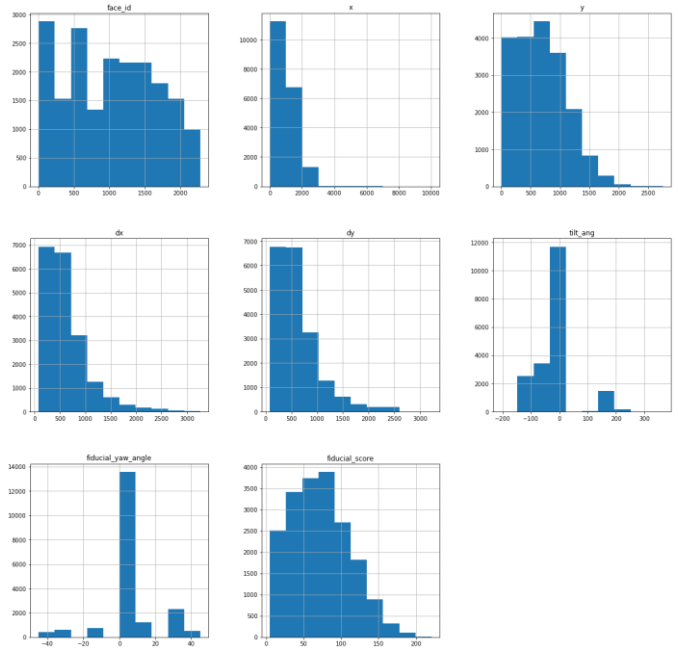


Fig.5 Continuous feature Count Age and Gender detection


Fig.6 Heatmap Age and Gender detection

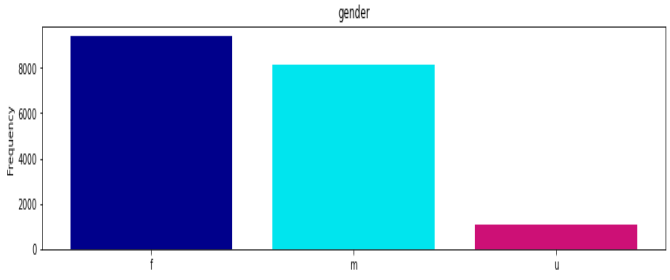


Fig.7 Bar chart for gender

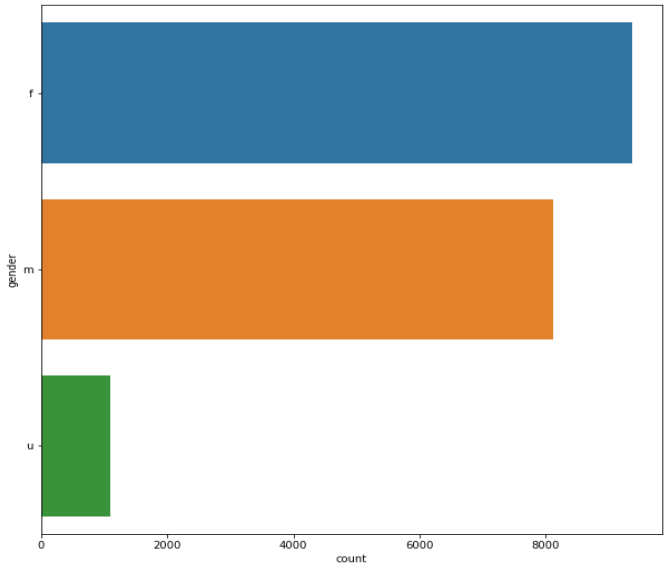


Fig.8 Count plot for gender

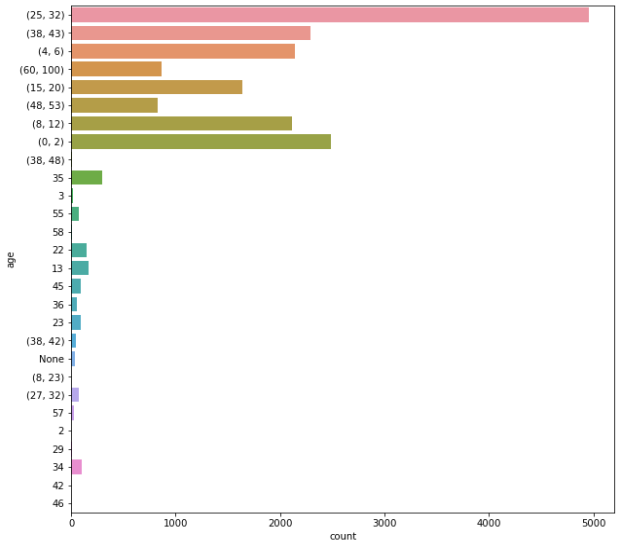


Fig.9 Count plot for age

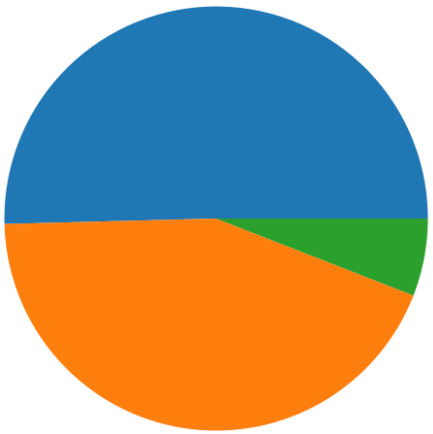

Fig.10 Pie chart for gender

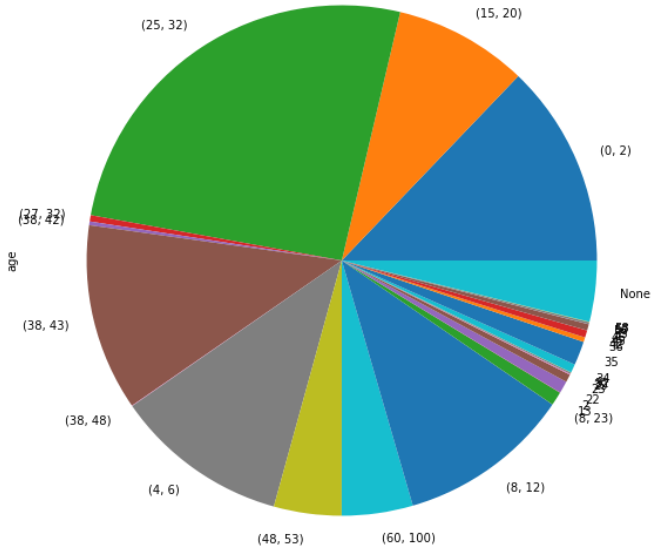


Fig.11 Pie chart for age

## 5. RESULT

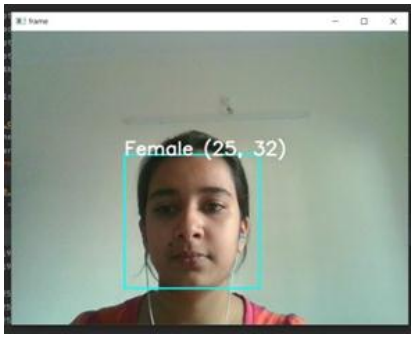


Fig.12 Output obtained for Age and Gender Prediction

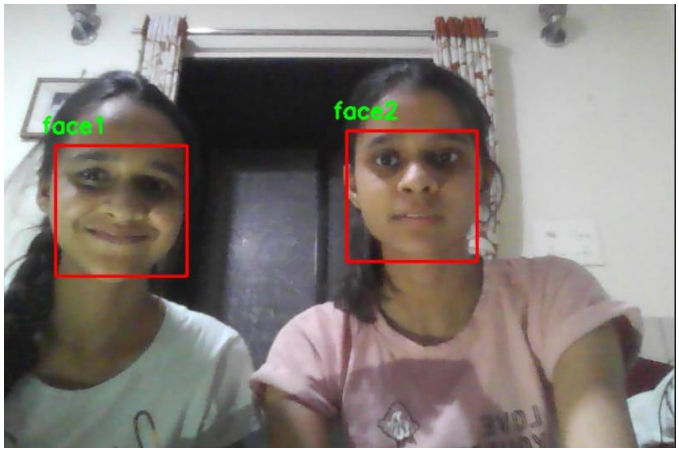


Fig.13 Output obtained for Counting faces

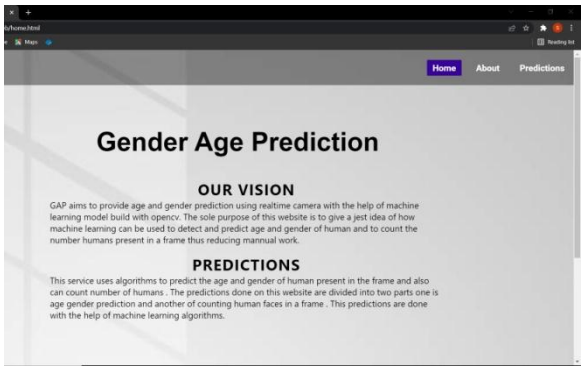


Fig.14 Home page for Age and Gender Prediction

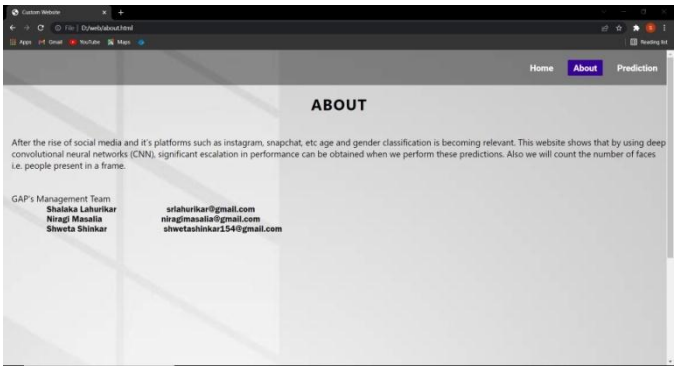


Fig.15 About page for Age and Gender Prediction

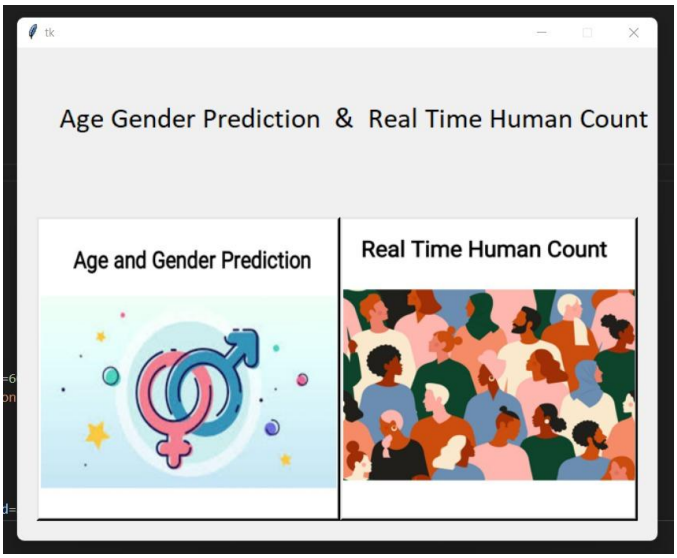


Fig.16 Deployed output for Age and Gender Prediction

## 6. CONCLUSION AND FUTURE SCOPE

With the assistance of machine learning technology, it's become easy to seek out relation and patterns among various datas. The work done in this project mainly concentrates around detecting the age and gender of a human and counting the number of human faces present in the frame. Using the concept of deep learning a model is built using training dataset that has

gone under data pre processing and data cleaning. This model provides high accuracy. Data visualization helps in analysis of the dataset. Graphs, pie chart and heatmaps are also included. Using this analysis we revealed interesting characteristics that helped in understanding the dataset in a better and easy way.

In future, using face age, human expression classification to aid face recognition, facial disease detection, improve experiences with images, pictures of social media, and much more than this. Here we can also consider a deeper CNN architecture and a more robust image processing algorithm for exact age estimation. Also, the apparent age estimation of human's face will be interesting research to investigate in the future.

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