# Gender and age classification using deep learning

**Dr. Vandana S Bhat[1], Shivani A Patilkulkarni[2], Pratiksha Karkannavar[3], Aditi M[4], Madhura Chandunavar[5]**

[1]Dr. Vandana S Bhat, Professor, Department of Information Science and Engineering, SDMCET, Dharwad, Karnataka

[2,3,4,5] Students, Department of Information Science and Engineering, SDMCET, Dharwad, Karnataka

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**Abstract -** *Age and gender, two of the key facial attributes, play a very foundational role in social interactions, making age and gender estimation from a single face image an important task in intelligent applications, such as access control, human-computer interaction, law enforcement, marketing intelligence and visual surveillance, etc. We will be using convolutional neural networks as a deep learning technique to predict age and gender of the facial image. The benchmark dataset that we will be using to train the model is the UTK Face dataset which is obtained from Kaggle. It is not a pre-processed dataset. At the end, an offline mobile application will be built to predict age and gender of the given input image i.e., facial image.*

**Key Words:** Age, Gender, Human-Computer Interaction, Android Application, Android Studio, Deep Learning, Convolutional Neural Network, Facial Image.

## 1. INTRODUCTION

Age and gender are two key facial attributes which play a very important role in social collaborations, making age and gender estimation from a face picture a vital task in smart applications. In this growing industry, age and gender recognition has become one of the important models for computer vision applications for example human global interaction and passive demographic data collection. Recently the interest in the advertising industry for launching specific demographic specific marketing and targeted advertising and public pages, has attracted the attention of more researchers in the field of computer vision to the field of age and gender classification. Human face may be a storehouse of various information about personal characteristics, including identity, colour, expression, gender, age, etc. We will be developing an offline mobile application which classifies age and gender according to the input image given. Entire paper is organized into six sections. Section I has the introduction for Age and Gender classification. Section II includes the literature survey of various Age and Gender detection papers. Section III contains methodology of the proposed project. Section IV explains experimental results of the Age and Gender classification. Section V elaborates the conclusion of the proposed project followed by Section VI which contains acknowledgement.

## 2. LITERATURE SURVEY

The survey of different papers related to Age and Gender classification has been carried out in this section.

[1] Malik, Rathi et al. (IRJET,2020) proposed a model for age estimation and gender recognition using Convolutional Neural Network as a deep learning model. They have used the Kaggle dataset which is the greatest available dataset of human faces for training purposes. They have used Keras high level API of TensorFlow. Keras is used for building and training of their proposed model. They have used the VGG face model for age and gender estimation. They have used VGG-16 architecture that runs on cropped images of faces.

[2] Agarwal, Dixit (Springer, 2020) proposed research to estimate a person's gender and age on the basis of visualization. They explain that to estimate age and gender from a facial image is a difficult task due to variations, lighting and other conditions in the face image. They proposed a methodology which uses Convolutional Neural Network as model and applies Principal Component Analysis technique to reduce the extracted features dimension. This work is done on the IMDB-WIKI dataset as well as their own dataset.

[3] Saxena, Singh et al. (IEEE,2021) proposed research paper that systematically describes the process, the different methods and algorithms that can be used, the most accurate method. They will also highlight its importance and how it can be useful in our daily lives. The main focus of this paper is to create a gender and age identifier that can predict the gender and age of a person's face in an image using in-depth reading of the targeted database. They get the most effective predictions and results by overcoming the problem of accuracy and timing.

[4] Chao Yin et.al (IEEE, 2019) proposed paper that the Conditional Probability Neural Network (CPNN) is a distributed learning algorithm that is used to measure age using facial image. It follows a three-layer neural network system with targets and a vector of conditional features. The training method of this program uses the relationship between image of the face and distribution of its label via the neural network. The method that was previously used assumed that measurements should be used according to the

high entropy model. CPNN shows the best results of all previously created methods. In this way, the results obtained are very simple, require minimal calculation, and the results are very effective.

## 3. METHODOLOGY

The objectives of this project have been explained in Section A followed by Tools and Technologies used in Section B and Proposed methodology in Section C.

### 2.1 Objectives

- To develop a model to detect whether it is a human face or not.

- To develop a model for recognizing faces.

- To develop a model for estimating age and classifying gender.

### 2.2 Tools and Technologies Used

**A. Android Studio** - Android Studio provides a unified environment where one can build Apps for Android phones, tablets, Android Wear, Android TV, and Android Auto.

**B. Deep Learning** - Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.

### 2.3 Proposed Methodology

As we can see in Figure 1., the initial UTK face dataset is taken from the Kaggle. After that, the face detection is carried out using OpenCV. Then it is cleaned and pre-processed using various python functions. Convolutional neural network model as a deep learning model is used for age detection and gender classification. Then the model is converted to a tflite model which is used to build Android applications. At the end, developing a mobile off-line application for the age and gender classification which will display the output.
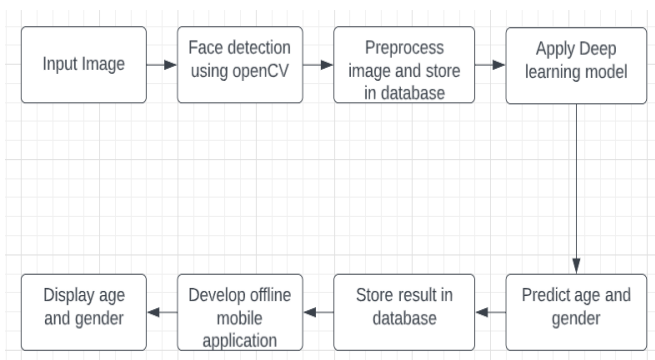


**Fig -1**: Flow chart

The dataset that is being used in this project is the UTK face dataset with a long age span ranging from 0 to 116 years old. The dataset consists of over 20,000 face images with labelling of age, gender and ethnicity. The image format of the UTK face dataset is JPEG.

## 4. EXPERIMENTAL RESULT



**Fig -2**: Application overview



**Fig -3**: Application overview

In Figure 2., we can see that the application has predicted age and gender of the facial image to be 20 and Male respectively.

In Figure 3., the application has calculated the age and gender of the facial image to be 28 and Female respectively.

$$Accuracy = \frac{True_{positive} + True_{negative}}{True_{positive} + True_{negative} + False_{positive} + False_{negative}}$$

The above formula is used to calculate accuracy of the model. Using this formula, the accuracy of our proposed method is calculated as 80%.

## 5. CONCLUSION

To conclude, we have implemented the Convolutional Neural Network model as a deep learning model to detect gender and age of a person from a single picture of a face. As a result, we have calculated the accuracy of the model to be 80%. But still the task of gender and age classification just from an image is not an easy task even for us humans because it is totally based on looks and sometimes it is not easy to guess. People of the same age can look completely different from what we can guess.

## ACKNOWLEDGEMENT

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