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Classification of Age Groups Using Convolutional Neural Networks (CNN)

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ABSTRACT

The process of categorising facial photos or videos into specified age groups is known as age group classification. Due of its many applications, including in recruitment, security, health, and social robots with intelligence, it is a crucial task. Recently, Convolutional Neural Network (CNN) has demonstrated exceptional performance in interpreting photos and videos of human faces. This study suggested an All-Age Face (AAF) dataset-trained and evaluated age group classification task using CNN. In this study, a 128-d embedding that quantifies the face of the age group was computed using the FaceNet deep learning model, which makes use of CNN. Adolescence and Mature Adulthood were the two age ranges represented in the experiment. For the training photos, the proposed age group classification model had an accuracy of 84.90%, and for the test images, it had an accuracy of 85.12%. The experimental findings demonstrated that CNN can, even with an imbalanced data distribution, achieve competitive classification accuracy across two age groups in the AAF dataset.

KEYWORDS:

Convolutional Neural Network (CNN), imbalanced Data, All-Age-Face Dataset, Deembedding.

1. INTRODUCTION

Our face and identity are inextricably linked. It is essential in all activities that involve interacting with people. There are several potential applications for the face's automatic detection and its features. As a result of the digitalization connection between computer and human, it might eventually become a hands-free alternative or a humorous feature in imaginative games [1].

Automatic face identification, tracking, and classification have recently been added to security control, surveillance monitoring, and targeted marketing systems [2]. The usage of a tracking platform for a wider variety of mobile services applications can be enabled by the integration of an automatic face identification and classifier [3]. In recent years, a number of strategies and algorithms have been used in the fields of image processing and computer vision, utilising.

Most of the previous age estimation methods were designed to provide an accurate estimate of the real age. However, due to the specialization of aging effects on the face, determining an exact age is difficult. Rather than estimating exact ages, this study focuses on the issue of age group classification. Although several age classification methods have been presented, most of them have focused on constrained images [9], such as Morph [10] and FG-NET [11]. Unlike the approaches described above, this study focuses on unconstrained images and investigates the problem of excessive class imbalance across various age groups: many face images belong to the 51-80 years old age group, while only a few belong to the Adolescence age group. This paper proposes a CNN model using standard techniques with FaceNet embeddings as the feature vectors [12].

The contributions of this study are outlined two folds.

(1) The experimental results demonstrated that the suggested strategy may assist with the issue of class imbalance in CNN-based classification. Despite the extremely difficult nature of the images in the AAF datasets, our approach method is acceptable for face recognition and it is being utilized in this study to recognize age groups.

(2) The proposed work attempted the tedious and complex task of classification of age into eight groups based on the books: The Human Odyssey [13] by splitting AAF dataset.

2. EXISTING SYSTEM AND ITS LIMITATIONS

In the existing system there was no pre-defined method or software to classify the age group classification accurately from a sample images. All the existing systems try to classify the age group based on manual assumption and hence sometimes there are limitations by using manual approach. So the following are the limitations that take place in the existing system. They are as follows:

LIMITATION OF PRIMITIVE SYSTEM

1. Till now there was no method in the literature which can classify the human age group accurately.
2. There was no pre-defined model or algorithm which is providing automatic age classification.

3. PROPOSED SYSTEM AND ITS ADVANTAGES

In the proposed system we try to classify the age group of any human being from sample images very accurately and efficiently. This is possible by using VGG-19 model which can automatically classify the image into parts and then identify the age group of that corresponding user.

ADVANTAGES OF THE PROPOSED SYSTEM

1. It is very advantages to identify the age group classification automatically.
2. By using VGG-19 classification model we can able to identify the age group easily of corresponding user and there is no need to worry about the accuracy.
3. All the current models can accurately and efficiently identify the age group of certain user.

4. IMPLEMENTATION PHASE

Implementation is the stage where the theoretical design is converted into programmatically manner. In this stage we will divide the application into a number of modules and then coded for deployment. The front end of the application takes Google Collaboratory and as a Back-End Data base we took ClaMP_Integrated-5184.csv as dataset. Here we are using Python as Programming Language to implement the current application. The application is divided mainly into following 6 modules. They are as follows:

1. Load Dataset
2. Data Pre-Processing
3. Data Visualizations
4. Apply VGG-19 Model to detect age group of user
5. Find the Matched Class

1) LOAD DATASET MODULE

In this module initially we need to load the input dataset i.e. friendship goals which contain a set of pre-defined images which are of group of persons who gathered in single photo. The dataset is loaded from KAGGLE website for testing the proposed application performance.

2) DATA PRE-PROCESSING MODULE

In this module we try to pre-process the data by applying Natural Language Tool Kit module from python library. Here we try to divide the whole dataset into two parts: One is testing and other is training and then try to build the whole dataset for test and train.

3) DATA VISUALIZATIONS

Here the data which is uploaded into the system is visualized in order to check total number of attributes that are present in the dataset. Here the input is jpg images and hence we can see the image type,size,pixel ratio and so on.

4) APPLY VGG-19 MODEL

Here we try to apply VGG-19 model to classify the age group of corresponding user and also we try to find out the age group of any user who is given as input to the system

5) FIND THE CLASS TYPE

In this current application we tested the dataset on VGG-19 and we divided the application into 3 classes such as: Toddler, Adult and Teenager. And we finally came to conclusion that based on user input image the appropriate age group is found by the end user.

5. EXPERIMENTAL RESULTS

In this section we try to design our current model using Python as programming language and we used Google Collab as working environment for executing the application. Now we can check the performance of our proposed application as follows:

IMPORT LIBRARIES

Import dataset

```
[ ] from google.colab import files
    files.upload()

    Choose Files No file chosen      Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
    Saving kaggle.json to kaggle.json
    {'kaggle.json': b'{"username":"b131832","key":"890b7881a4d2914f4931d59d550836b4"}'}

[ ] ! pip install -q kaggle

[ ] !mkdir ~/.kaggle
    !cp kaggle.json ~/.kaggle
    !chmod 600 ~/.kaggle/kaggle.json

    ! kaggle datasets download -d bing101/friendshipgoals

    Downloading friendshipgoals.zip to /content
     91% 81.0M/88.9M [00:00<00:00, 150MB/s]
    100% 88.9M/88.9M [00:00<00:00, 131MB/s]
```

The above window clearly represents the list of several modules used in our application.

PRE-PROCESS THE DATA

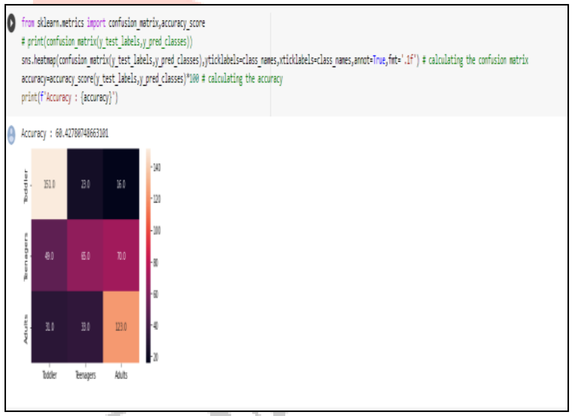
```
[ ] import pandas as pd
    import numpy as np
    import matplotlib.pyplot as plt
    import seaborn as sns
    import os
    import cv2

[ ] imgs_path='data/train'
    img_size=224

[ ] class_names=os.listdir(imgs_path)
    class_names

    ['Toddler', 'Teenagers', 'Adults']

[ ] def img_to_data(path):
        data=[]
        labels=[]
```

From the above window we can see DATA is pre-processed and any incomplete data is removed.

CHECK THE INPUT DATA

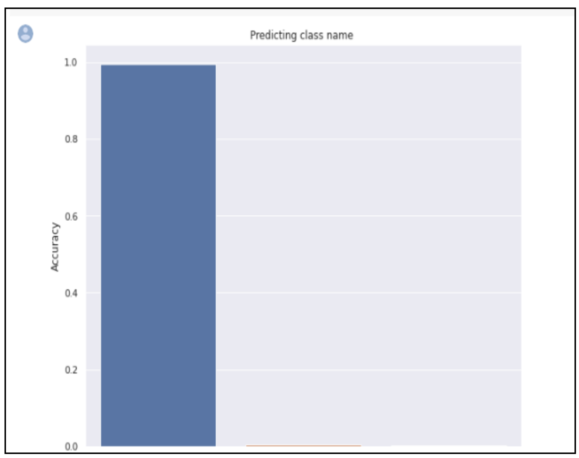
From the above window we can clearly check the input data.

CONFUSION MATRIX



From the above window we can clearly see the confusion matrix is formed based on the input.

PREDICT THE CLASSNAME



From the above window we can clearly see the class name is predicted based on the input image which is taken.

6. CONCLUSION

In this paper, CNN model is proposed to classify two age groups from AAF dataset with unbalanced data distribution: Adolescence and Mature Adulthood. The CNN model that is used in this study is entirely data-driven, learning its representation straight from the pixels of the face. Rather of employing. constructed features, this study used a large AAF dataset including the face images of persons in different ages from 2 years to 80 years. It seems obvious that age group classification models exhibit biased performance when compared to different age groups. Although the distribution of the dataset is unbalanced for two age groups in AAF dataset, the experimental results show that the CNN model is still capable of achieving competitive classification accuracy.

7. REFERENCES

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