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GENDER – BASED AGE RECOGNITION USING IMAGE PROCESSING WITH RCNN

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Abstract: By observing and analysing patterns based on a person's facial features, biometric advancements known as face recognition can identify or verify a person. Despite the fact that interest in specialised areas of use is growing, face recognition is still primarily used for well-being. Overall, face popularity innovations are well worth taking into account because they have the potential for massive prison jurisdiction and unique business applications. The main goal of this project is to train a machine with different hybrid algorithms to identify gender based on the provided data. In the end, we programme the machine to determine the age based on the images and to define gender and age using hybrid algorithms. [1]. The problem of face recognition is still very challenging and complex. This issue shares a great deal with other private issues. Face recognition uses biometric advancements that can see or validate a person by viewing and looking into designs based on the shape of the person. Despite the growing interest in other applications, face recognition is still primarily used for well-being. Overall, face recognition advancements are important to consider because they may lead to significant legal implications and unique business opportunities. [2].

Keywords: Face recognition, Biometric improvements, Gender Based, Hybrid algorithms.

1.Introduction:

Although interest in using facial recognition (FR) for other purposes is growing, the majority of its applications are for health-related needs. In reality, FR innovation has drawn a lot of attention because it has the potential for a broad range of legal authorization and various commercial applications. It is widely used in various situations such as ATMs, social security systems, train reservation systems, driving/monitoring authentication systems, and identity verification. The product for facial recognition examines the geometry of the face in order to function. Key factors include the space between the ears and the direct routes from the front to the jaw.

In order to separate your face and create your facial mark, the code separates facial highlights. FR has significantly advanced as a result of deep learning techniques. FR with a deep system of significant light or picture faces was the primary subject of exploration during the early stages of the interest.

By removing the expression barrier, we can potentially identify the best characteristics that will result in an accurate measurement of gender and age. We use quite a few machine learning and deep learning algorithms to predict age and gender. One of the most popular methods for determining age and gender is the RCNN (region-based convolution neural network). In this study, we use open CV and RCNN to predict the age and gender of a given person's image.

2. EXISTING CONCEPTS:

The objective of this SRS record is to describe the prerequisites and features of the Intelligent Network Backup Tool. The SRS will outline the traits or utility that the final item must have in the eyes of both our team and the client. A list of optional needs that we plan to include but are not required for the project to run smoothly is also included in this document. This step, which assesses the necessary prerequisites for the Images Processing, includes a few techniques for an organised approach of evaluating the prerequisites. The first step in breaking down the prerequisites of the framework is understanding the notion of the framework for a full examination and identifying all of the cases to better comprehend the dataset inquiry.

3. PROPOSED SYSTEM:

The proposed system is the result of processing facial geometry for facial recognition. The two main factors are the gap between the ear and the proper path from the front to the jaw.

This code identifies the facial feature that is crucial for facial separation and for producing your expression. As a result, this study provides an overview of age detection on the image dataset using various combinations of deep learning and image processing techniques.

We divided our proposed system into three main phases

1. the data preparation stage
2. extraction process
3. prediction and evaluation

In order to enhance the image quality, samples of face image data are collected and pre-processed during the data preparation step. After that, the segmented images are subjected to the feature extraction method. These traits are then used in the training process.

The stage of evaluation and prediction where each constructed model is applied to the input image prediction. Each model's accuracy will be calculated and rated.
Algorithm:

- RCNN(Deep Learning)
- Random Forest Keras(Tensor Flow And Theano)
- Tensor Flow
- Pandas
- Matplotlib
- Seaborn.

The System Design:
The document includes descriptions of the system requirements, operating environment, system and subsystem architecture, file and database design, input and output formats, layouts for human-machine interfaces, complex design, processing logic, and external interfaces. In this section, the system is explained narratively and in simple terms. It should, if necessary, include a high-level system architectural diagram that breaks the system down into its component parts. The high-level system architecture or subsystem diagrams should, if applicable, show interfaces to external systems.

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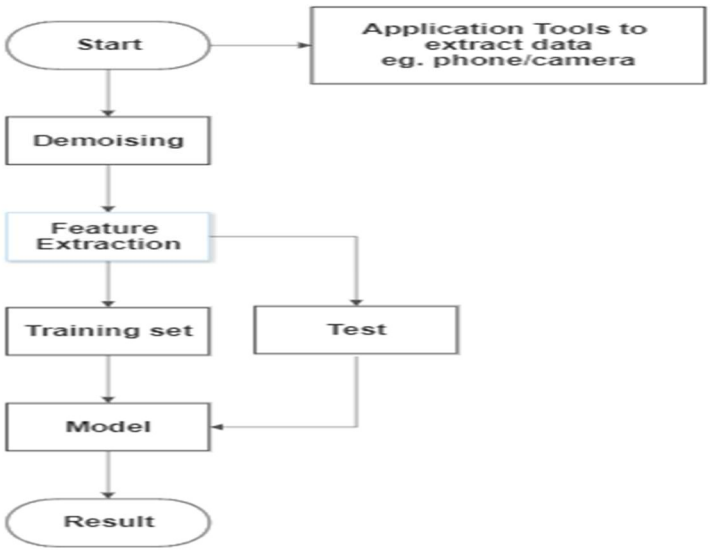


Figure 1. The System Design.

IMPLEMENTATION :

- **Pre-Processing:**

At this point, every image in the dataset is scrutinised to see if there is an image file without the label in the representational format. If such a file is discovered, it is either deleted or given an estimated value. Since we already have the cropped images and the other data set, cropping can be regarded as part of the pre-processing stage.

```
import pandas as pd
import numpy as np
from tqdm import tqdm

import tensorflow.keras as keras
import tensorflow as tf

import seaborn as sns
import matplotlib.pyplot as plts

from sklearn.metrics import classification_report
```

```
from google.colab import drive
drive.mount('/content/drive')

df = pd.read_csv('/content/drive/MyDrive/age_gender.csv')

ethnicity_mapping = {0:"White", 1:"Black", 2:"Asian", 3:"Indian", 4:"Hispanic"}
df['ethnicity'].replace(ethnicity_mapping, inplace=True)

tmp = pd.get_dummies(df['ethnicity'], prefix='eth')
df = pd.concat([df, tmp], axis=1)
df
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

age	ethnicity	gender	img name	pixels	eth Asian	eth Black	eth Hispanic	eth Indian	eth Whit

```
if 11<=age_value<=15:
    age_category = 1
if 16<=age_value<=20:
    age_category = 2
if 21<=age_value<=25:
    age_category = 3
if 26<=age_value<=30:
    age_category = 4
if 31<=age_value<=35:
    age_category = 5
if 36<=age_value<=42:
    age_category = 6
if 43<=age_value<=50:
    age_category = 7
if 51<=age_value<=60:
    age_category = 8
if age_value>60:
    age_category = 9

return age_category

'age_category'] = df['age'].apply(convert_age)
```

	age	ethnicity	gender	img_name	pixels	eth_Asian	eth_Black	eth_Hispanic	eth_Indian	eth_White	age_category
0	1	Asian	0	20161219203650636.jpg.chip.jpg	129 128 128 126 127 130 133 135 139 142 145 14...	1	0	0	0	0	0
1	1	Asian	0	20161219222752047.jpg.chip.jpg	164 74 111 168 169 171 175 182 184 188 193 199...	1	0	0	0	0	0
2	1	Asian	0	20161219222832191.jpg.chip.jpg	67 70 71 70 69 67 70 79 90 103 116 132 145 155...	1	0	0	0	0	0

Figure 2. Pre Processing

Figure 2 shows the dataset, some preliminary code installations and preparations, arrayization of the pixels, and classification of the age into discrete numbers using a class interval of 10 years.

- **Training Data:**

Modeling to identify age and gender from photos, we applied the ResNet50 RCNN neural network model. A single RCNN is used to determine both the age and gender. It is unnecessary to run two different models for various attributes because both assumptions are simultaneously predicted in this single RCNN. With the help of the RCNN's various stages, the input images are first convolved in accordance with the filter, then the necessary features are pooled out,

and finally, by using a fully connected layer, the features and weights are mapped so that we can determine the person's age and gender.

Figure 3. Training Data.

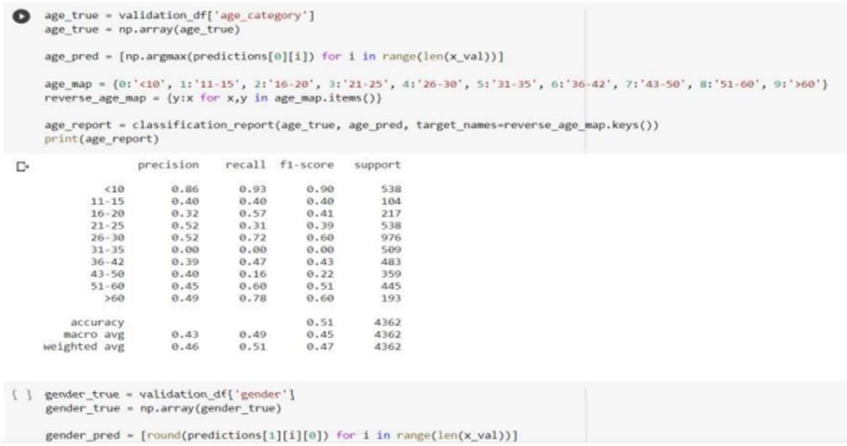
TESTING:

The method of testing helps to find programmatic faults. A key component of confirming programming quality is programming testing, which is the term for a careful analysis of choice, outline, and coding. Through testing, we identified key factors like the cost of a failed product and the increased perceivability of programming as a framework component. Running a programme with the intention of finding a bug is the process of testing.

- **Validation**

Determining whether programming satisfies established business requirements by evaluating it either during the development process or at the conclusion of development. The item's effectiveness in resolving the client's problems is ensured by approval testing. Additionally, it can be said that it proves that the product, when shipped in good condition, satisfies the intended use. The system has been successfully tested and implemented, ensuring that all requirements outlined in the product requirements determination have been met in full.

RESULTS:



```
age_true = validation_df['age_category']
age_true = np.array(age_true)

age_pred = [np.argmax(predictions[0][i]) for i in range(len(x_val))]

age_map = {0:'<10', 1:'11-15', 2:'16-20', 3:'21-25', 4:'26-30', 5:'31-35', 6:'36-42', 7:'43-50', 8:'51-60', 9:'>60'}
reverse_age_map = {y:x for x,y in age_map.items()}

age_report = classification_report(age_true, age_pred, target_names=reverse_age_map.keys())
print(age_report)
```

```
              precision    recall  f1-score   support

         <10       0.86      0.93      0.90       538
       11-15       0.40      0.40      0.40       104
       16-20       0.32      0.57      0.41       217
       21-25       0.52      0.31      0.39       538
       26-30       0.52      0.72      0.60       976
       31-35       0.00      0.00      0.00       509
       36-42       0.39      0.47      0.43       483
       43-50       0.40      0.16      0.22       359
       51-60       0.45      0.60      0.51       445
         >60       0.49      0.78      0.60       193

    accuracy                           0.51      4362
   macro avg       0.43      0.49      0.45      4362
weighted avg       0.46      0.51      0.47      4362
```

```
gender_true = validation_df['gender']
gender_true = np.array(gender_true)

gender_pred = [round(predictions[1][i][0]) for i in range(len(x_val))]
```

Figure 4. Accuracy of age

In, the Figure 4 diagram we are printing the accuracy of the age and also the precision,recall, f1-score ,support of the age .

```
gender_true = validation_df['gender']
gender_true = np.array(gender_true)

gender_pred = [round(predictions[1][i][0]) for i in range(len(x_val))]

gender_report = classification_report(gender_true, gender_pred, target_names={'male':0, 'female':1}.keys())
print(gender_report)
```

```
              precision    recall  f1-score   support

        male       0.91      0.92      0.91      2275
      female       0.91      0.90      0.91      2087

    accuracy                           0.91      4362
   macro avg       0.91      0.91      0.91      4362
weighted avg       0.91      0.91      0.91      4362
```

```
eth_true = validation_df[['eth_Asian','eth_Black','eth_Hispanic','eth_Indian','eth_White']].values
eth_true = [np.argmax(eth_true[i]) for i in range(len(eth_true))]

eth_pred = [np.argmax(predictions[2][i]) for i in range(len(x_val))]


eth_map = {0: 'Asian', 1: 'Black', 2: 'Hispanic', 3: 'Indian', 4: 'White'}
reverse_eth_map = {y:x for x,y in eth_map.items()}

eth_report = classification_report(eth_true, eth_pred, target_names=reverse_eth_map.keys())
print(eth_report)
```

Figure 5. Accuracy of gender.

In, the figure 5 diagram we are printing the accuracy of the gender and also the precision, recall, f1score, support of the gender.

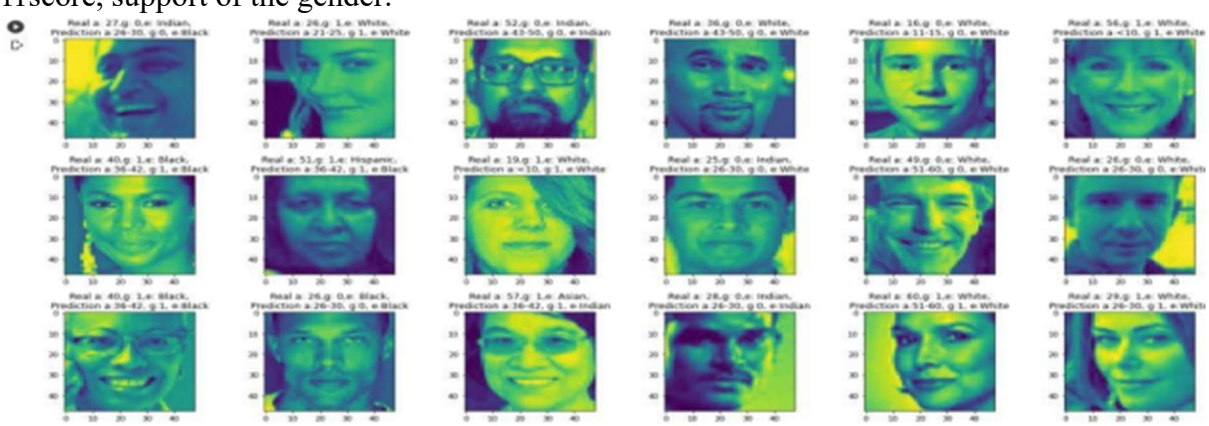


Figure 6. Output of final Results.

As can be seen in Figure 6, where we give the findings for age, gender, and ethnicity of the real and prediction values of the various photographs, we apply deep learning and hybrid RCNN to achieve high accuracy and very accurate results.

4.Conclusion Future Enhancement:

Understanding the factors that result in the outputs of both predicted and real values of age, gender, and ethnicity of the providing input image is made easier by this project, "Gender-based age recognition using Image processing with RCNN." We are training our machine in a very accurate manner and producing high accuracies for all the age, gender, and ethnicity for the input images because we are using the Hybrid RCNN algorithm and Random forest as per decision making with the help of these algorithms.

Using a variety of algorithms, this project displays the high accuracy values and Data gathering takes place in the first stage. During the data preparation stage, samples of facial image data are collected and pre-processed to improve the image quality. Segmented images are then put through a feature extraction process in the second phase. The training process then makes use of these extracted features. The prediction and evaluation stage, which follows the final phase, employs each built model to forecast the input image. Each model's accuracy will be calculated and assessed..

To identify and work on student face recognition system for attendance-based model and mask recognition.

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