IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11469

Human Age and Gender Estimation from Images in Real Time Applications

Tejaswini G[1], Shreya U Naidu[2], Sneha D[3], Supreetha E M[4], Usha Rani J[5]

UG Student Department of Computer Science and Engineering, GSSS Institute of Engineering and Technology for women, Mysuru, VTU, Belagavi, India[1-4]

Assistant Professor, Department of Computer Science and Engineering, GSSS Institute of Engineering and Technology for women, Mysuru, VTU, Belagavi, India[5]

Abstract: "Human Age and Gender Estimation from Images in Real Time Applications" is a technique for age and gender classification using python algorithms. Human identification and classification are being utilized in various field for very long time. Fields like Government ID cards, Verification procedures etc. Now a days a huge number of messages are being shared via internet, this requires to detect the age and gender automatically who write those messages. Our model helps in classifying the age range and gender.

Keywords: Face detection, Age-range, Gender and Emotions.

I. INTRODUCTION

This approach holds immense potential for variety of applications. It can enhance customer service by enabling targeted marketing in retail environments. In security settings it can provide real-time demographics for better monitoring. The system first identifies faces within the image or video stream. Then, it analyses the facial characteristics, such as wrinkles, skin texture and eye shape. These features act as a visual cues that can reveal information about a person's age and gender. By leveraging deep learning algorithm trained on massive data sets of labelled faces, the system can learn to associate these features with specific age groups, genders and emotions.

II. PROBLEM STATEMENT

In order to solve the problem of reliably estimating a person's age and gender from photographs in real time, this project will create a novel system that can make these predictions. The main goal is to develop algorithms that can effectively handle picture data in order to provide quick and accurate gender and age identification. It is critical to get high accuracy across a range of demographic and environmental variables, which calls for the application of strong deep learning models that have been trained on large-scale datasets. Furthermore, the system needs to give priority to computational efficiency in order to facilitate deployment across a range of platforms, including those with limited resources.

III. TECHNIQUES USED

Viola-Jones Algorithm

The technique operates by applying basic rectangular patterns to various regions of an image, known as Haar-like features. These characteristics are employed to ascertain whether or not a face is present in a specific area of the image. In order to efficiently filter out non-face regions and concentrate computational effort on regions that may contain faces, the approach uses a cascade of classifiers.

Viola-Jones algorithm works by:

1. **Haar- like Features**: Haar-like features are basic rectangular patterns that help in detecting edges and shapes within an image. They're simple templates used to analyse local contrast and brightness variations. These features are instrumental in algorithms like Viola-Jones for tasks such as face detection, where they're applied across different parts of an image to highlight specific characteristics that distinguish faces from backgrounds. **Value=∑(pixel in black area) -∑(pixel in white area)**.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11469

2. **Integral Image**: Rectangular area sums within an image can be computed more quickly with the integral image technique. This is accomplished by calculating the sum of the pixel values in advance for each and every potential rectangular area in the image. Regardless of the size of the region, this pre-computation allows for the quick calculation of the total of the pixel values within any rectangular area using just four values from the integral image. For applications like face identification, this method greatly expedites activities like feature calculation in algorithms like Viola-Jones.

3. **Adaboost Training**: Adaboost is a machine learning algorithm that is used to improve the efficiency of other learning algorithm in Viola-Jones' case, usually decision trees. It trains a series of weak classifiers iteratively, each one concentrating on cases that earlier classifiers had trouble with. Adaboost gives misclassified instances a larger weight during training, which compels weaker classifiers to concentrate more on these difficult cases. Adaboost is a potent tool for face detection and other classification tasks because it efficiently learns to classify samples with improved accuracy by combining these weak classifiers into a strong classifier.

$$\mathbf{H(x) = sign\ [\sum_{j=1}^{M} \alpha_j\ h_j(x)]}$$

4. **Cascade of Classifiers:** When filtering away negative examples in tasks such as face detection, a cascade of classifiers—a sequence of more complicated classifiers—is employed to achieve this goal effectively. varying classifiers in the cascade function at varying levels of complexity; earlier stages of the cascade employ simpler classifiers to swiftly eliminate obvious non-face regions. A region is regarded as a candidate for the object of interest if it passes each classifier at a given stage. The Viola-Jones face identification algorithm demonstrates how this hierarchical method enables quick rejection of irrelevant regions, concentrates computing power on potential areas, and expedites processing overall.
The false positive rate for an entire cascade is given by,

$$\mathbf{F=\prod_{i=1}^{k} fi.}$$

Detection rate is given by,

$$\mathbf{D=\prod_{i=1}^{k} di}$$

5. Thresholding: The algorithm employs a threshold to decide whether or not to classify a given region as a face. This threshold is calibrated to balance false positives and false negatives and is learned during the Adaboost training phase.

Spatio-temporal Algorithm:
Both geographical and temporal information from video data are integrated by the spatio-temporal algorithm used to detect gender and age in humans. While temporal information examines motions and expressions across a series of frames, spatial information concentrates on the textures, forms, and characteristics of the face. The system improves accuracy by taking into account both dynamic changes in look and behaviour over time, as well as static face traits, by combining these cues. When compared to approaches that solely rely on location information, our all-encompassing approach yields more accurate age and gender estimation.

Spatial Analysis:
When it comes to determining a person's age and gender, spatial analysis entails looking at the static visual traits of face photos. Typically, this analysis involves taking elements out of the photos, such as patterns, contours, and textures on faces. When doing a spatial analysis, the face's look is the only thing taken into account; motion or changes over time are not taken into account. The objective is to extract pertinent features from facial photos that enable precise age and gender classification.

P(age group|Features spatial), where P represents probability of belonging to each age group based on spatial features.

Temporal Analysis:
Examining variations or trends in gestures, motions, or facial expressions over time is known as temporal analysis and is used in the identification of human age and gender. Temporal analysis takes into account how visual properties change over the course of successive frames in a video sequence, in contrast to spatial analysis, which concentrates on static visual characteristics. This study records dynamic data such head motions, face expressions, and aging-related changes in appearance. In addition to the spatial information gathered from individual frames, the system can extract useful indicators for age and gender prediction by examining temporal dynamics.
Motion(x,y,t), representing motion vectors at coordinates(x,y) and time t.
Integration(Features spatial, Motion), combining spatial features with motion information

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11469

IV. OUTPUT

It is the last part of the workflow. Here the Output is saved in .jpeg format if the input had image sourced in it. If the webcam is used the output will be overlaid in the video output from the webcam. If the face is not detected in input frame the "No Face is detected" will be shown as an output. And no .jpeg output will be stored.

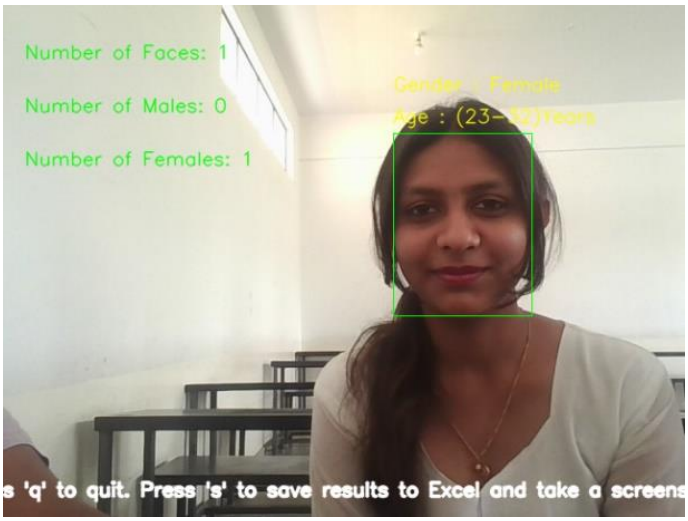

Fig. 1 A sample output of detected face

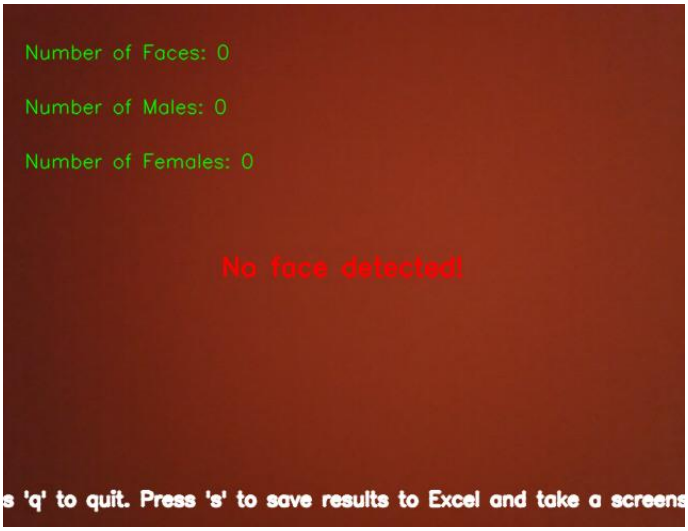

Fig. 2 A sample output of non-detected face

V. PROCEDURE

Since the technique is implemented, we can start testing it for accuracy. The general procedure to be followed is:

1. Input the data
2. Create a frame
3. Detect the face
4. Classify the gender
5. Classify the age group
6. Attach the result in the frame
7. Output of the image

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.066 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 11, Issue 4, April 2024

DOI: 10.17148/IARJSET.2024.11469

VI. CONCLUSION

"Human Age and gender classification" are two of the many important information gathering resource from and individual. Human faces provide enough data which may be used for many purposes. In order to reach the correct audience human age and gender classification is very essential. Here we tried to do the same process but with general equipment. The efficiency of the algorithm depends on several actor but the main motif of this project is being easy and faster while also being as accurate as possible. Work is being done to the improve the efficiency of the algorithm. Some future improvements include discarding the face like non-human objects, more datasets for people belonging to different ethnic groups and more granular control over the workflow of the algorithm. Future work can be done by storing the collected data in the backend and note the availabity of the required data.

REFERENCES

[1]. Pooja Yadav and Gaurav Aggarwal, "Speech Emotion Classification using Machine Learning" International Journal of Computer Applications (0975 – 8887) Volume 118 – No. 13, May 2015.

[2]. M. H. U. Yap, "Facial image processing for facial analysis," Proceedings - International Carnahan Conference on Security Technology., vol. 1, 2010.

[3]. Michael B. Holte, Human Pose Estimation and Activity Recognition from Multi-View Videos: Comparative Explorations of Recent Developments, IEEE Journal of Selected Topics In Signal Processing, Vol. 6, No. 5, September 2012.

[4]. Age and Gender Detection using Python,Mohd Rafey and Gurubasava,International Journal of Interdisciplinary Innovative Research &Development (IJIIRD)ISSN: 2456-236X Vol. 05 Issue 01 | 2020.

[5]. AGE AND GENDER DETECTION, DR.C.K.Gomathy, Mr.A.Lokesh, Mr.CH.HARSHAVARDHAN REDDY, Mr.A.SAI KIRAN, International Journal of Scientific Research in Engineering and Management (IJSREM),ISSN: 2582-3930 Volume: 05 Issue: 10 | Oct - 2021.

[6]. G. Guo, G. Mu, Y. Fu, C. Dyer, and T. Huang. "A study on automatic age estimation using a large database", In Proc. Int.Conf. Comput. Vision, pages 1986–1991. IEEE, 2009

[7]. GA. Graves, A.-R. Mohamed, and G. Hinton. "Speech recognition with deep recurrent neural networks", In Acoustics,Speech and Signal Processing (ICASSP), 2013 IEEE Inter-national Conference on, pages 6645–6649. IEEE, 2013

[8]. F. Gao and H. Ai. "Face age classification on consumer images with gabor feature and fuzzy LDA method", In Advancesin biometrics, pages 132–141. Springer, 2009.

[9]. X. Geng, Z.-H. Zhou, and K. Smith-Miles. "Automatic age estimation based on facial aging patterns", Trans. PatternAnal. Mach. Intell., 29(12):2234–2240, 2007

[10]. A. C. Gallagher and T. Chen. "Understanding images of groups of people", In Proc. Conf. Comput. Vision PatternRecognition, pages 256–263. IEEE, 2009.