American International University-Bangladesh



**Age and Gender Detection using RESNET**

Semester : Spring 2022-23

Course Name: Computer Vision and Pattern Recognition

Section: C

Submitted by:

Rishad, Ismail Hossain [20-43002-1]

Tuli, Taslima Akther [20-43174-1]

Krishnendu Das [19-40762-2]

ALI, SYED MUSHFIQ [19-41701-3]

Table of Contents

Abstract1

Introduction1

Related Works4

Methodology5

Discussion6

Conclusion6

References7

**Abstract**

Age and gender detection from facial images have become an essential task in various domains such as marketing, healthcare, and security. Automated age and gender detection have been generally used in our daily lives that we come across, majorly in a person to computer interaction, visual surveillance, biometric analysis, electronics and other applications of commercial use. This article investigates the utilization of RESNET (Residual Neural Network), a highly effective deep learning architecture, for age and gender prediction. We provide an overview of related research in this field, discuss the methodology employed for age and gender detection using RESNET, and provide insights into the decision-making process. Finally, we conclude with the achievements, challenges, and future prospects of age and gender detection using RESNET.

**Introduction**

Age and gender detection have gained significant attention due to their broad range of applications in various domains, including marketing, security, and healthcare. The ability to predict demographic information accurately from facial images enables tailored services and personalized experiences. A large amount of research has been devoted to age estimation from a face image under its most known form - the real, biological, age estimation [1].

Deep learning techniques, particularly RESNET, have proven to be highly effective in tackling complex computer vision tasks. RESNET is a state-of-the-art convolutional neural network (CNN) architecture that has demonstrated outstanding performance in image recognition tasks, making it an ideal choice for age and gender detection applications. By leveraging large-scale datasets and hierarchical representations learned by RESNET, accurate predictions can be made based on facial images [4]. In particular, RESNET, a popular CNN architecture, has been widely utilized in this field due to its ability to capture complex hierarchical representations of facial features [2]. Several research studies have focused on exploring different architectures, loss functions, and optimization techniques for age and gender detection using RESNET, aiming to improve the performance and robustness of the models. These studies have highlighted the importance of large-scale datasets, proper preprocessing techniques, and fine-tuning strategies to enhance the overall performance of age and gender detection systems [3]. The utilization of RESNET for age and gender detection involves training a neural network to recognize facial features and patterns that correlate with different age groups and genders [4].

In this article, we provide an overview of age and gender detection using RESNET, discussing the related work in this field and highlighting the methodology and decision-making process.

**Related Works**

This section overviews some of the work that is related to the research gender detection using CNN. In 2015, Liu, Z., Luo, P., Wang, X., & Tang, X propose a novel deep learning framework for attribute prediction in the wild. It cascades two CNNs, LNet and ANet, which are fine-tuned jointly with attribute tags, but pre-trained differently [5]. The limitations of the paper is that the dataset used for evaluation is biased towards certain age and gender groups, which can limit the generalizability of the proposed method.

Wang, S., Li, Y., Wang, Y., & Wu, Q. J. [6] they have proposed a method for age and gender classification using a combination of ResNet-based convolutional neural network (CNN) and extreme learning machine (ELM) in 2020. Because of the quality and the diversity of the input data the performance of the proposed method may be affected and the evaluation of the proposed method is limited to a few benchmark datasets.

This paper [7] tries to detect gender and age by using feed forward neural networks at a coarser level. The ultimate decision is made by deploying validation on three sigma control limits. The researcher claims it is faster and works better with frontal face two genders and three age groups and it works 95% of the time. This other study [8] used the haar cascade pretrained model for face detection and then applied Cafenet CNN framework for gender detection. They claim an accuracy of 68.89%. [9] The researchers claim that use of DMTL improves the performance of CNN and gives more accurate results. They use CNN to attain gender classifications. The researchers of this paper [10] claim it was only possible to detect faces due to superior image representation ability of depth convolution neural networks. They also replaced the PCA dimensionality reduction method with FAM. The authors claim this paper is more discriminative and robust then other traditional methods. The authors of this paper [11] used state-of-the-art VGGNet network architectures and D-CNN to get a more accurate result. They claimed no one before them has used VGGN with D-CNN and they prove that these two not only work but work very well. They used a data set of celebrity faces to create their model.

**Methodology**

ResNet, short for "Residual Network," is a deep convolutional neural network (CNN) architecture that has been successfully applied to a wide range of computer vision tasks, including age and gender detection. The basic idea behind ResNet is to add residual connections, or "shortcut connections," that bypass one or more convolutional layers in the network.

For age and gender detection using ResNet, the input image is first preprocessed and fed into the network. The network typically consists of several convolutional layers followed by a set of fully connected layers. The convolutional layers are responsible for learning features that are relevant to age and gender classification, while the fully connected layers are used to make the actual age and gender predictions.

One common variant of ResNet used for age and gender detection is the ResNet-50 architecture, which consists of 50 layers and has been shown to achieve high accuracy on a variety of benchmark datasets. The ResNet-50 architecture typically involves a combination of 2D convolutional layers, batch normalization layers, max pooling layers, and fully connected layers.

During training, the ResNet model is optimized to minimize a loss function that measures the difference between the predicted and actual ages and genders of the input images. This is typically done using a variant of stochastic gradient descent (SGD) with backpropagation.

Overall, ResNet has proven to be a highly effective method for age and gender detection, and has achieved state-of-the-art performance on many benchmark datasets. However, as with any deep learning method, the performance of ResNet can be affected by various factors, including the size and quality of the training dataset, the choice of hyperparameters, and the presence of data biases.

**Discussion**

Compared to more established profound convolutional neural networks, such VGG-16, their model outperformed the latter.

Utilizing the IMDB-WIKI and APPA-REAL datasets.On transparent, discernible images and actual photographs, Mean Apparent Error was substantially lower than it was for the VGG-16 model. When There are numerous method through effective gradient optimization on the loss function, test accuracy was increased.When evaluated, their model outperformed more traditional profound convolutional neural networksincluding the VGG16, in terms of performanceThere are many different methods for extracting features, including those that are geometrically based, appearance-based, template-based, and color-based. The process of gender detection entails identifying a person's gender based on their visual traits. It is possible to train CNNs to identify patterns and distinguishing face features that are specific to male and female individuals. These networks acquire the ability to recognize facial characteristics including jawlines, brows, and hairlines, which enables them to determine gender with accuracy.

**Conclusion**

This study looked at how to predict a person's age and gender automatically from real-time face photos. Here, The cascade pre-trained face detection model was used, and the region of the face that was discovered was fed into the Cafenet CNN framework to estimate age and gender. The output layer in the gender prediction network displays two classes, namely "Male" and "Female," whereas the output layer of the age prediction CNN has 8 values for pre-defined 8x8 age groupings. Based on a CNN method, we used traditional CNN for emotion recognition.

Although numerous initiatives and research articles have been presented in this area in the past, utilizing different datasets from different sources, none that I came across had combined age, gender, and emotions.

**References**

1. Angulu, Raphael & Tapamo, Jules-Raymond & Adewumi, Aderemi. (2018). Age estimation via face images: a survey. EURASIP Journal on Image and Video Processing. 2018.
2. Wu, Y., & Guo, R. (2017). Deep Convolutional Neural Networks for Age and Gender Classification. Journal of Visual Communication and Image Representation.
3. Gil Levi and Tal Hassner.Age and Gender Classification Using Convolutional Neural Networks. IEEE Workshop on Analysis and Modeling of Faces and Gestures (AMFG), at the IEEE Conf. on Computer Vision and Pattern Recognition (CVPR), Boston, 2015.
4. Liu, Z., Luo, P., Wang, X., & Tang, X. (2017). Deep Expectation of Real and Apparent Age from a Single Image Without Facial Landmarks. IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI).
5. Liu, Z., Luo, P., Wang, X., & Tang, X. (2015). "Deep Learning Face Attributes in the Wild." Proceedings of the IEEE International Conference on Computer Vision (ICCV), 2015.
6. Wang, S., Li, Y., Wang, Y., & Wu, Q. J. (2020). "Age and Gender Classification of Face Images Using Convolutional Neural Network and Extreme Learning Machine." Neurocomputing, 385, 87-94.
7. [7] M.R. Dileep, A. Danti, Human Age and Gender Prediction Based on Neural Networks and Three Sigma Control Limits, Appl. Artif. Intell. 32 (3) (2018) 281– 292.
8. Abirami, B., Subashini, T. S., & Mahavaishnavi, V. (2020). Gender and age prediction from real time facial images using CNN. Materials Today: Proceedings.
9. Koichi Ito, Hiroya Kawai, Takehisa Okano&Takafumi Aoki, ‘‘Age and Gender Prediction from Face Images Using Convolutional Neural Network”, APSIPAASC 2018, pp. 978-988-14768-5-2
10. Haibin Liao, Yuchen Yan,Wenhua Dai & Ping Fan, ‘‘Age Estimation of Face Images Based onCNN and Divide-and-Rule Strategy”, Hindawi Mathematical Problems in Engineering, Volume 2018, https://doi.org/10.1155/2018/ 1712686.
11. Amit Dhomne, Ranjit Kumar, Vijay Bhan, Gender Recognition Through Face Using Deep Learning, Procedia Computer Science, Volume 132, 2018, Pages 2-10, ISSN 1877-0509,

Source Code here- <https://github.com/RISHAD-prog/CVPR--C-SPRING-22-23-/blob/main/Age%26Gender_classification.ipynb>