Journal of Science Engineering Technology and Management Science
Volume 02, Issue 06, June 2025 *ISSN: 3049-0952*
www.jsetms.com *DOI:10.63590/jsetms.2025.v02.i06.pp21-24*

Application of Binary Features and Gabor Filters for Gender Recognition

Armeen
Department of Electronics Engineering, Iran University of Science and Technology, Iran
[1]Corresponding Author: armeeneceiran@gmail.com

To Cite this Article
Armeen, "Application of Binary Features and Gabor Filters for Gender Recognition", Journal of Science Engineering Technology and Management Science, Vol. 02, Issue 06, June 2025, pp:21-24, DOI: http://doi.org/10.63590/jsetms.2025.v02.i06.pp21-24

Submitted: 22-02-2025 *Accepted: 10-05-2025* *Published: 15-05-2025*

Abstract*: One significant biometric is the human face. contains a wealth of helpful data, including identity, gender, age, and race. Classifying people by gender is extremely easy for humans, but it can be difficult for computers. Gender classification from facial photos has garnered a lot of attention lately. When it comes to human-computer interface, gender detection can be helpful for things like individual designation. Our suggested approach is based on Gabor filters and Local Binary Patterns (LBP), which extract face features that are robust against interference. A number of algorithms have been developed for this aim, and the proportion of each of these problems has been resolved. We employed self-organizing neural networks to obtain a suitable categorization; these networks extract weights for each gender with minimal error. The outcomes are contrasted with pre-existing data sets in order to demonstrate the superiority of the suggested approach.*

Keywords*: Geometric features, self-organizing networks, gender classification, Gabor filters picture*

I. Introduction

Determining the gender of the face image is one of the key outcomes of image-based face recognition systems. There are numerous algorithms used in face-based identification techniques. Recommended face recognition techniques that mostly rely on practice with several photos and training to recognize distinct individuals. The neural network and SVM techniques are excellent illustrations of this technique [1–5]. It is challenging to employ a training-based detection system that requires a collection of photos for a single person [11]. However, it is unable to generate many photos of an individual from real-world applications like video surveillance. Because of this, face recognition methods based on single images have gained popularity and are now a useful area of study [6, 7]. The primary function of identification systems is gender classification. It can be observed in applications like corporate profiles, monitoring, and surveillance themes [8]. This research proposes a novel approach to gender estimation by leveraging the rotating patterns of self-organizing neural network weights to extract characteristics based on a binary image. The suggested approach compares the public faces of the sexes, which are derived by averaging the input photos of men and women. The suggested method uses the Gabor and LBP features and face classification based on the triangle method, which can help to extract the greatest relevant radius of a face image, in order to improve the gender classification accuracy. Actually, each case's unique qualities are the significant radius of the face image. We cluster them based on the differences between the public figures of each gender after extracting the Gabor and binary features.

Self-organizing neural networks are used for the clustering process, and the suggested method's last step determines the gender of the images based on their placement within the clusters. We examine the most recent research in the subject of gender classification in the second portion of this study. The general structure of the face is reviewed in the third section, and our approach is suggested in the fourth. The fifth section of the article presents practical outcomes, while the final section serves as the paper's conclusion [11-12].

II. Related Works

Various methods have been presented up to this point for classifying photos based on their gender. These methods involve extracting features from the images and then separating them. These techniques can be broadly categorized into the following approaches: Appearance-based techniques are the first group of methods for extracting features from face images [12]. This uses facial traits to obtain the general information about each person's face. This approach first assembles the image-related data into rows or columns. After that, statistical methods for dimension reduction and data resolution including PCA, LDA, and ICA are employed [3]. This method separates a face image into various facial parts, including the mouth, nose, eyes, and so forth. Additionally, each face component's geometrical features—such as the length of the nose, the separation between the eyes, and other facial features—are retrieved. In actuality, this method identifies the position and form of face features such the nose, eyes, mouth, and eyebrows.

All of the face's feature vectors are extracted [5]. The Base model in model-based techniques makes use of the data from the many facial components. Building a model of the human face based on the face's evolving traits is actually the aim of this methodology. This model can identify changes in the face. Elastic Bunch Graphs (EBG) and Active Appearance Models (AAM) are two examples of this technique.

Fig 1: A sample of the general images of men and women

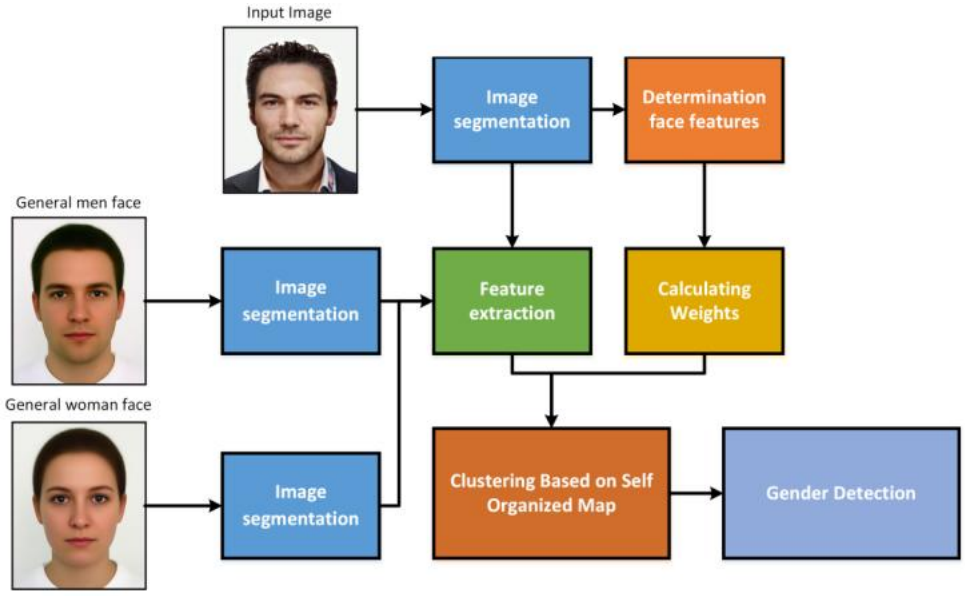

Fig 2: Block diagram of the proposed gender classification system using face images

III. Proposed Method

Applying a single figure for each is the foundation of the suggested approach. A Gabor filter and local binary pattern are used for feature extraction, and a self-organizing neural network is used for classification. The self-organising network contains 50 hidden layers, and the input picture dimensions are 64 by 64 pixels. Figure (2) displays the block diagram for the gender classification system. Segmenting images according to each gender is how the stages

of gender detection are carried out in this block diagram. The triangle segmentation approach was used for the segmentation [6]. Following segmentation, features from every area of the image are retrieved, and these features are then grouped together. The remaining Clustering stage can identify the input image's gender with a respectable level of accuracy.

IV. Initial State

Each neuron's weight in this stage is determined by the weights that were previously retrieved from the nonlinear features. Weights in this paper are adjusted according to the low level of separation. Additionally, features are extracted from the network is fed a pattern of input from prominent people, along with binary and gabor characteristics [12].

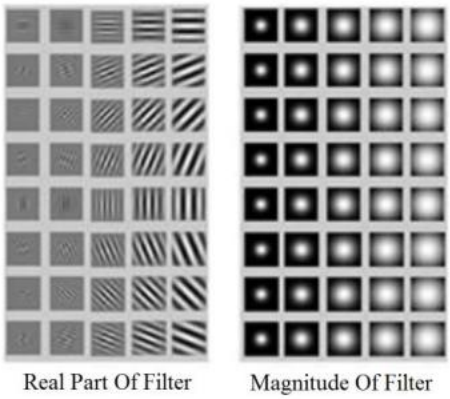

Fig 3: Gabor filters with 5 spatial frequency and 8 different angles

Once the winning neurone has been identified, a group of neurons in the vicinity of the winning neuron should have their values altered [11]. Generally speaking, there are two methods to alter the value of nearby neurons: In the first scenario, a specific neighborhood radius surrounding the winner cells is chosen. In this manner, every neuron in the network is at a specific distance from the winning neurone, which will travel in the direction of the input at a constant factor. All of the network's neurones migrate in the direction of the input using an uneven factor in the second technique. The winner neurone has the highest value of this unequal component, and its value decreases as it gets farther away from the winner neurone [1].

V. Conclusion

One of the areas of interest in image processing, identification systems, video surveillance systems, and other areas is face recognition. One of the subfields of face detection is gender detection. The majority of gender detection techniques now in use rely on an image database with training and testing procedures. The suggested approach uses a single image per person, extracts features based on Gabor filters and local binary patterns from portions of the image created using the triangular segmentation technique, and uses the SOM neural network to cluster these features in order to recognize the gender of each individual. The gender of the input image can be ascertained after clustering.

References

[1] Makinen, Erno, and Roope Raisamo. “Evaluation of gender classification methods with automatically detected and aligned faces”. IEEE Transactions on Pattern Analysis and Machine Intelligence. 2008; 30(3): 541-547.

[2] Lian, Hui-Cheng, and Bao-Liang Lu. “Multi-view gender classification using local binary patterns and support vector machines”. Advances in Neural Networks-ISNN 2006, Springer Berlin Heidelberg. 2006: 202-209.

[3] Yang, Zhiguang, Ming Li, and Haizhou Ai. “An experimental study on automatic face gender classification”, Pattern Recognition, 2006. ICPR 2006. 18th International Conference on. Vol. 3. IEEE, 2006.

[4] Sharma, Rajeev, Mohammed Yeasin, and Leena A. Walavalkar. “Multi-modal gender classification using support vector machines (SVMs)”. U.S. Patent Application. 10/271, 911.

[5] Shan, Caifeng. “Learning local binary patterns for gender classification on real-world face images”. Pattern Recognition Letters. 2012; 33(4): 431-437.

[6] Shan, Caifeng, Shaogang Gong, and Peter W. McOwan. “Learning gender from human gaits and faces”. Advanced Video and Signal Based Surveillance, 2007. AVSS 2007. IEEE Conference on. IEEE, 2007.

[7] Thomas, Vince, et.al. “Learning to predict gender from iris images”. Biometrics: Theory, Applications, and Systems. 2007. BTAS 2007. First IEEE International Conference on. IEEE, 2007.

[8] Tivive, Fok Hing Chi, and Abdesselam Bouzerdoum. “A shunting inhibitory convolutional neural network for gender classification”. Pattern Recognition, 2006. ICPR 2006. 18th International Conference on. Vol. 4. IEEE, 2006.

[9] Zhao, Wenyi, et.al. “Face recognition: A literature survey”. Acm Computing Surveys (CSUR). 2003; 35(4): 399- 458.

[10] Jafri, Rabia, and Hamid R Arabnia. “A Survey of Face Recognition Techniques”. JIPS. 2009; 5(2): 41-68.

[11] K, Ramesh, and Vijay P. “HVDC Links for Automatic Generation Control in a Multi-Area Power System.” Journal of Science Engineering Technology and Management Sciences, vol. 2, no. 4, Apr. 2025, pp. 27–33. Crossref, https://doi.org/10.63590/jsetms.2025.v02.i04.pp27-33.

[12] Mohammad Rafi Khan, “Finding Anti-patterns in the Development of Service-Oriented Systems”, Journal of Engineering Technology and Sciences, Vol. 02, Issue 05, May 2025, pp: 19-21, Crossref, http://doi.org/10.63590/jets.2025.v02.i05.pp19-21