International Journal of Scientific Research and Engineering Development-– Volume 6 Issue 3, May-June 2023

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Skin Microstructure Segmentation and Aging Classification Using CNN-Based Models

Ms. Dr.R.Sangeetha Rajendran[1], S.Anusuya[2]

[1](Assistant Professor, Department of Computer Science,
Mangayarkarasi College of Arts and Science for Women, Paravai, Madurai,
Email:marysangeetha137@gmail.com)

[2](PG Student, Department of computer science,
Mangayarkarasi College of Arts and Science for Women, Paravai, Madurai
Email:anuanusuya2211@gmail.com)

ABSTRACT

Aging is a natural process that affects the human body. The primary focus of this process is to study the appearance of hand wrinkles, which is considered as one of the most noticeable changes that happen as people become older. In any medical cosmetology, skin analysis becomes an important procedure for the wrinkle detection or any other medical problems. Maximum of the conventional wrinkles examination schemes is semi-automatic. Also, these methods require a lot of human interference.Since different applications are available for estimating the age based on the facial images and other skin-related factors. The main aim of this process is to use deep CNN for detecting the wrinkles in the human skin. The proposed work describes a method for predicting age and wrinkles by using image processing and other advanced technologies. Hence the process consist of the following steps like, pre-processing, feature extraction and classification. The Results of the classification shows the person is Young, Middle or Old.Finally, the performance of the processing by means of the performance parameters like, Accuracy, Sensitivity and Specificity.

Keywords:**Skin aging, skin micro-structure segmentation, aging classification, CNN models, skin condition evaluation.**
.

1.INTRODUCTION

Face recognition is the process of identifying one or more people in images or videos by analyzing and comparing patterns. Algorithms for face recognition typically extract facial features and compare them to a database to find the best match [1]. Face recognition is animportant part of many biometric, security, and surveillance systems, as well as image andvideocomputer vision to extract discriminative information from facial images, and pattern recognition or machine learning techniques to model the appearance of faces and to classify them. We can use indexing systems. Face recognition leverages computer vision techniques to perform feature extraction to encode the discriminative information required for face recognition as a compact feature vector using techniques and algorithms [2].

Dense local feature extraction with SURF, BRISK or FREAK descriptors. Histogram of oriented gradients. Distance between detected facial landmarks such as eyes, noses, and lips. Machine learning techniques can applied to the extracted features to perform face recognition or classification using Supervised learning techniques such as support vector machines (SVM) and decision trees, Ensemble learning methods, Deep neural networks.

Face recognition is a natural and straightforward biometric method used by us to identify one

another. Face recognition is a recognition process that analyzes facial characteristics of a person. The recent interest in face recognition can be attributed to the use of latest techniques in security and surveillances and many other commercial interests [3]. People look for more secure methods to protect their valuable information. Password authentication, card key authentication, and biometric authentication are the most commonly used authentication types.

Face detection is an essential tool for face recognition system. Face detection locates and segments face regions from cluttered images obtained from still images [4]. It has numerous applications such assurveillance, security control systems, content based image retrieval, video conferencing, and intelligent human computer interfaces. Most of the current face recognition systems presume that faces are readily available for processing. However, one cannot get typical images with just faces. The corollary is that a system that will segment faces into cluttered images is needed. With such a portable system, one can ask the user to pose for the face identification task. In addition to creating a more cooperative target, one can also interact with the system in order to improve and monitor face detection. With a portable system, detection seems easier [5].

The task of face detection is seemingly trivial for the human brain, but it still remains a challenging and difficult problem to enable a computer or mobile phone or PDA to do the same. This is because the human face changes with respect to the internal factors such as facial expression, occlusion etc. And, it is also affected by the external factors such as scale, lightning conditions, contrast between faces, and background and orientation of faces [6]. A facial recognition system is computer applications which automatically identify or verify a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features of the image and a facial database. It is typically used in security systems and other biometrics such as fingerprint or eye iris recognition systems [7].

There are number of potential uses for facial recognition that are currently being developed. For example, the technology could be used as a security measure at ATM's, instead of using a bank card or personal identification number, the ATM would capture an image of your face, and compare it to your photo in the bank database to confirm your identity. The same concept could also be applied to computers, by using a webcam to capture a digital image of yourself and your face could replace your password as a means to log-in in the system [8].

A face recognition system has a lot of commercial, military, security and research applications. Some of them are checking for criminal records. Enhancement of security by using surveillance cameras in conjunction with face recognition system. Knowing in advance, if some VIP is entering the hotel. Detection of a criminal at public place. Can be used in different areas of science for comparing an entity with a group of entities, Pattern Recognition [9].

For the purpose of face representation, here we propose a compression encoding scheme based on maximum correlation criteria. This scheme effectively converts high-dimensional dense features into a much more compact representation.Furthermore, we propose a new face matching method, called the 'Adaptive Matching Framework', and conduct experiments in four different face recognition scenarios: face recognition in the wild, aging face recognition, and matching near-infrared face images and optical face images, and the FERET test. An effective compression encoding scheme based on maximum correlation criteria is proposed. When combined with dense face descriptors, this scheme is able to produce highly discriminant, yet very compact, descriptors [10]. This is supported by thorough experimentation. Based on this feature descriptor, a novel feature matching method, termed the Adaptive Matching Framework, is proposed and which further improves performance; Experiments are conducted to demonstrate that the proposed approach obtains a state-of-the-art result in challenging settings. The system also

demonstrated that the proposed approach is generalizable to other large-scale face databases [11].

2.LITERATURE REVIEW

Jehyeok Rew ORCID,et all Young-Hwan Choi, Hyungjoon KimandEenjun Hwang. Skin aging estimation scheme based on lifestyle and dermoscopy image analysis [12]. In the first demonstrate how to trace people's skin condition accurately using scale-invariant feature transform and the color histogram intersection method. Then, we show how to estimate skin texture aging depending on the lifestyle by considering various features from face, neck, and hand images. we describe how to predict future skin conditions in terms of skin texture features. Based on the Pearson correlation, we describe the correlation between skin aging, and estimate skin aging according to lifestyle using the polynomial regression and support vector regression models.

Baochang Zhanga, Yongsheng Gaob et all Hong Zheng. Local Kernel Feature Analysis (LKFA) for object recognition [13]. This for anew Local Kernel Feature Analysis (LKFA) method.

Chi-Ho CHAN, Josef Kittler et all Muhammad Atif Tahir.Kernel Fusion of Multiple Histogram Descriptors for Robust Face recognition [14]. In this paper the multi-kernel fusion is based on the computationally efficient spectral regression KDA.

Jiwen Lu, Gang Wang, Weihong Deng, and Pierre Moulin. Simultaneous Feature and Dictionary Learning for I mage Set Based Face Recognition [15]. In this paper a simultaneous feature and dictionary learning (SFDL) method for image set based face recognition.

Yangqing Jia Chang Huang et all Beyond Spatial Pyramids: Receptive Field Learning for Pooled Image Features [16]. In this paper an efficient algorithm based on grafting.

3. METHODOLOGY

Various steps involved in the proposed method for skin aging is implemented as follows,

(i) Dataset
(ii) Preprocessing
(iii) Feature Extraction
(iv) Classification
(v) Performance Estimation

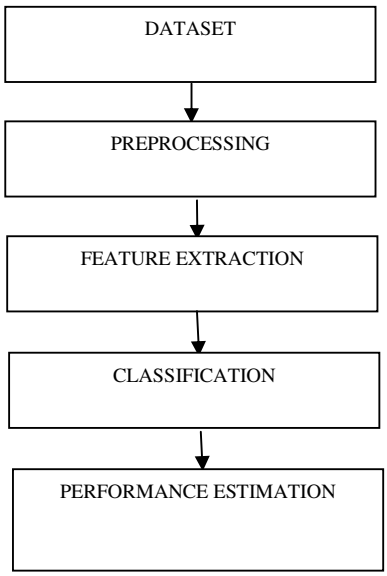

Figure:1 Module description

3.1 Data Sets

The first stage of any vision system is the image acquisition stage. Image acquisition is the digitization and storage of an image. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. First Capture the Input Image from source file by using uigetfile and imread function. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement.

3.2 Preprocessing

3.2.1 Image Resize

In computer graphics and digital imaging, scaling refers to the resizing of a digital image. In video technology, the magnification of digital material

is known as up-scaling or resolution enhancement. When scaling a vector graphic image, the graphic primitives which make up the image can be scaled using geometric transformations, without any loss of image quality. When scaling a raster graphics image, a new image with a higher or lower number of pixels must be generated. In the case of decreasing the pixel number (scaling down) this usually results in a visible quality loss. From the standpoint of digital signal processing, the scaling of raster graphics is a two-dimensional example of sample rate conversion, the conversion of a discrete signal from a sampling rate (in this case the local sampling rate) to another.

3.3 Feature Extraction

In machine learning, pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

3.4 Classification

In machine learning and statistics, classification is the problem of identifying to which of a set of categories (sub-populations) a new observation belongs, on the basis of a training set of data containing observations (or instances) whose category membership is known. Examples are assigning a given email to the "spam" or "non-spam" class, and assigning a diagnosis to a given patient based on observed characteristics of the patient (sex, blood pressure, presence or absence of certain symptoms, etc.). Classification is an example of pattern recognition.

3.4 Performance analysis

In the performance analysis process achieves the estimation and accuracy of aging classification.

3.4.1 Estimations

True positive (TP) = the number of cases correctly identified as patient.

False positive (FP) = the number of cases incorrectly identified as patient.

True negative (TN) = the number of cases correctly identified as healthy.

False negative (FN) = the number of cases incorrectly identified as healthy.

Accuracy:The accuracy of a test is its ability to differentiate the patient and healthy cases correctly. To estimate the accuracy of a test, we should calculate the proportion of true positive and true negative in all evaluated cases. Mathematically, this can be stated as:

Accuracy = (TP+TN) / (TP+TN+FP+FN);

Sensitivity:The sensitivity of a test is its ability to determine the patient cases correctly. To estimate it, we should calculate the proportion of true positive in-patient cases. Mathematically, this can be stated as:

***Sensitivity* = (TP) / (TP + FN)**

Specificity: The specificity of a test is its ability to determine the healthy cases correctly. To estimate it, we should calculate the proportion of true negative in healthy cases. Mathematically, this can be stated as:

***Specificity* = (TN) / (TN + FP)**

4. RESULT & DISCUSSION

In this experiment of aging skin, the dermis and epidermis separate, blood vessels become prominent, and severe curvature occurs. The skin in the process of aging (middle group) has ambiguous wrinkles during deepening or disappearance. The young skin (young group) has

very complex and dense wrinkles. In addition, the mobile skin image includes various noises such as hair, scars, blurring, and shadows on the skin surface. It is difficult to observe the define wrinkles of skin only with the naked eye, without using special equipment such as a dermo scope.

The exiting process of skin microstructure segmentation and aging classification gave the highest accuracy is 86.47%, sensitivity is 85.56% and specificity is 89.54%. They predicted their results using the SVM algorithms.

In the proposed process of this experiment using CNN algorithms are gave the better results comparing to the existing process. The following table shows the highest level of accuracy, sensitivity and specificity with CNN based algorithms.

methods	performance in (%)
accuracy	97.5881
sensitivity	97.1117
specificity	99.2040

Figure :2 Result table

Therefore,the process the segmentation of the skin microstructure to increase the accuracy of skin aging evaluation based on mobile skin images.

5. CONCLUSION

Skin is an organ that reflects internal and external factors. Therefore, observing and analysing skin features such as wrinkles are important for evaluating current skin conditions and aging.In previous skin-related studies, special equipment such as a dermoscopy has been used to obtain skin images under limited conditions. It is possible to evaluate the morphological changes of the skin microstructure with aging by using these standardized skin images

6. REFERENCES

[1]A. Abu Mallouh, Z. Qawaqneh, and B. D. Barkana, ‘‘Utilizing CNNs and transfer learning of pre-trained models for age range classification from unconstrained face images,’’ Image Vis. Comput., vol. 88, pp. 41–51, Aug. 2019.

[2]A. A. Adegun and S. Viriri, ‘‘Deep learning-based system for automatic melanoma detection,’’ IEEE Access, vol. 8, pp. 7160–7172, 2020.

[3] M. A. Anjum, J. Amin, M. Sharif, H. U. Khan, M. S. A. Malik, and S. Kadry, ‘‘Deep semantic segmentation and multi-class skin lesion classification based on convolutional neural network,’’ Access, vol. 8, pp. 129668–129678, 2020.

[4] Q. Gao, J. Yu, F. Wang, T. Ge, L. Hu, and Y. Liu, ‘‘Automatic measurementof skin textures of the dorsal hand in evaluating skin aging,’’ Skin Res. May 2013.

[5] M. A. Hamer, L. C. Jacobs, J. S. Lall, A. Wollstein, L. M. Hollestein, A. R. Rae, K. W. Gossage, A. Hofman, F. Liu, M. Kayser, T. Nijsten and D. A. Gunn, ‘‘Validation of image analysis techniques to measure skinaging features from facial photographs,’’ Skin Res. Technol., vol. 21, no. 4,pp. 392–402, Nov. 2015.

[6]G. Hong and O. Lee, ‘‘Three-dimensional reconstruction of skin diseaseusing multi-view mobile images,’’ Skin Res. Technol., vol. 25, no. 4, pp. 434–439, 2019.

[7]T. L. B. Khanh, D.-P. Dao, N.-H. Ho, H.-J. Yang, E.-T. Baek, G. Lee, S.-H. Kim, and S. B. Yoo, ‘‘Enhancing U-Net with spatial-channel attention gate for abnormal tissue segmentation in medical imaging,’’ Appl. Sci., vol. 10, no. 17, p. 5729, Aug. 2020.

[8] J. M. Lagarde, C. Rouvrais, and D. Black, ‘‘Topography and anisotropy of the skin surface with ageing,’’ Skin Res. Technol., vol. 11, no. 2,pp. 110–119, May 2005.

[9] C. I. Moon and O. Lee, ‘‘Age-dependent skin texture analysis and evaluation using mobile camera image,’’ Skin Res. Technol., vol. 24, no. 3,pp. 490–498, 2018.

[10] C.-I. Moon and O. Lee, ‘‘Adaptive fine distortion correction method for stereo images of skin acquired with a mobile phone,’’ Sensors, vol. 20 ,no. 16, p. 4492, Aug. 2020.

[11] J. Oh, H. Hong, Y. Cho, H. Yun, K. H. Seo, H. Kim, M. Kim, and O. Lee, ‘‘A reliable quasi-dense corresponding points for structure from motion,’’ KSII Trans. Internet Inf. Syst., vol. 14, no. 9, pp. 3782–3796,2020.

[12] J. Rew, Y.-H. Choi, H. Kim, and E. Hwang, ‘‘Skin aging estimation scheme based on lifestyle and dermoscopy image analysis,’’ Appl. Sci., vol. 9, no. 6, p. 1228, Mar. 2019.

[13] O. Ronneberger, P. Fischer, and T. Brox, ‘‘U-Net: Convolutional networks for biomedical image segmentation,’’ in Proc. Int. Conf. Med. Image Comput. Comput.-Assist. Intervent. Cham, Switzerland: Springer, 2015, pp. 234–241.

[14] M. Saha and C. Chakraborty, ‘‘Her2Net: A deep framework for semantic segmentation and classification of cell membranes and nuclei In breast cancer evaluation,’’ Trans. Image Process., vol. 27, no. 5,pp. 2189–2200, May 2018.

[15] C. Trojahn, G. Dobos, M. Schario, L. Ludriksone, U. Blume-Peytavi, andJ. Kottner, ‘‘Relation between skin micro-topography, roughness, and skinage,’’ Skin Res. Technol., vol. 21, no. 1, pp. 69–75, 2015.

[16] A. Wagh, S. Jain, A. Mukherjee, E. Agu, P. C. Pedersen, D. Strong, B. Tulu, C. Lindsay, and Z. Liu, ‘‘Semantic segmentation of smartphone wound images: Comparative analysis of AHRF and CNN-based approaches,’’
Access, vol. 8, pp. 181590–181604, 2020.

[17]Z. Wu, S. Zhao, Y. Peng, X. He, X. Zhao, K. Huang, X. Wu, W. Fan, F. Li, and M. Chen, ‘‘Studies on different CNN algorithmsfor face skin diseaseclassification based on clinical images,’’ Access, vol. 7, pp. 66505–66511, 2019.

[18] J. Xie, L. Zhang, J. You, D. Zhang, and X. Qu, ‘‘A study of hand back skin texture patterns for personal identification and gender classification,’’Sensors, vol. 12, no. 7, pp. 8691–8709, Jun. 2012.

[19] X. Yang, Z. Zeng, S. Yong Yeo, C. Tan, H. Liang Tey, and Y. Su,‘‘A novel multi-task deep learning model for skin lesion segmentation and classification,’’ 2017, arXiv:1703.01025.

[20] Y. Zou, E. Song, and R. Jin, ‘‘Age-dependent changes in skin surface assessed by a novel two-dimensional image analysis,’’ Skin Res. Technol.,vol. 15, no. 4, pp. 399–406, 2009.

