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Machine Learning Based System for the Detection of Skin Cancer

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Abstract: Skin cancer is the increasing common cancer throughout the world nowadays,and occurrence rates are increasing very rapidly. If the cancer is predicted at early stage then the victim life can be saved .If detected at early stage then the patient can be treated successfully.An expert system can be buildup to detect the skin cancer.By such system many lives can be saved. This paper provides the concise review of various medical expert systems and the best methods used by various researchers to detect the skin cancer.

Keywords: otsu method, active contour and k-means clustering.

I. INTRODUCTION

1) Most common type of cancer is skin cancer throughout the world nowadays, and its increasing very rapidly. The skin cancer is broadly divided into melanoma and non – melanoma.
2) The abnormal growth of tissues in the skin is known as skin cancer. Abnormal tissues of skin at present are mainly divided in two types: benign and malignant.
3) The skin tissues are harful and can infect their adjacent cells. In benign wound, melanin is present in the epidermis layer which causes skin cancer in the outermost layer. When this melanin goes into the dermis layer, it becomes harmful.
4) Benign tissues are not harmful but the malignant
5) The skin cancer can be caused by the direct exposure to the sunlight.
6) The spread of cancer cells from the place where they first formed to another parts of the body through blood is known as metastasis. Three epidermis layers are: a) an upper b) middle layer made up of squamous cells c) a bottom layer made up of melanocytes and basal cells.

II. RELATED WORKS

Table 1: Comparison of existing techniques for detecting the skin cancer .

Sr. No.	Author	Title	Year	Source	Method	Dataset	Accuracy
1.	Marriam Nawaz, Zahid Mehmood, Tahira Nazir, Rizwan Ali Naqvi, Amjad Rehman,Munwar Iqbal, Tanzila Saba	Skin cancer detection from dermoscopic images using deep learning and fuzzy k-means clustering	2022	*Microscopy research and technique*	Faster RCNN along with FKM	ISIC-2016, ISIC-2017, PH2	95.4%
2	Garg, Shelly, and Balkrishan Jindal	Skin lesion segmentation using k-mean and optimized fire fly algorithm	2021	*Multimedia Tools and Applications*	K-means algorithm with firefly algorithm(FFA) technique	ISIC,PH2	99.1% using ISIC, 98.9% using PH2
3	Monika, M. Krishna, et al	Skin cancer detection and classification using machine learning	2020	*Materials Today: Proceedings*	Color-based k-means clustering	ISIC-2019 Challenge dataset	96.25%

4	Nadia Smaoui Zghal et. al	Melanoma skin cancer detection based on image processing	2020	*Current Medical Imaging*	Multi-Otsu thresholding algorithm	PH2 dataset	90%
5	E. Akar, O. Marques, W. A. Andrews, and B. Furht	Cloud-Based Skin Lesion Diagnosis System Using Convolutional Neural Networks.	2019	*In intelligent computing-proceedings of the computing conference*	CNN	"ISIC 2018: Skin Lesion Analysis Towards Melanoma Detection"	77.4%
6	Vedanti Chintawar, Jignyasa Sanghavi	Improving Feature Selection Capabilities in Skin Disease Detection System	2019	*International Journal of Innovative Technology and Exploring Engineering (IJITEE)*	OTSU Method		More than 95%
7	Tammineni Sreelatha et. al	Early Detection of Skin Cancer Using Melanoma Segmentation technique	2019	*Journal of medical systems*	Gradient and Feature Adaptive Contour (GFAC)	PH2 dataset	98.64 %
8	N Garg, V Sharma, P Kaur	Melanoma Skin Cancer Detection Using Image Processing.	2018	*In Sensors and Image Processing*	Otsu method	Data set from dermis and medical image gallery	91.6%
9	M Zakareya, MB Alam, MA Ullah	Classification of Cancerous Skin using Artificial Neural Network Classifier	2018	*International Journal of Computer Applications (0975 – 8887)*	Neural Network for Classification.	ISIC Archive and American Cancer Society	97.84%
10	V Yadav, VD Kaushik	Detection of melanoma skin disease by extracting high level features for skin lesions	2018	*Int. J. Advanced Intelligence Paradigms, Vol. 11, Nos. ¾*	Region growing method	DermIs, DermQuest	73.46%
11	Ginni Arora , Ashwani Kumar Dubey , and Zainul Abdin Jaffery	Performance Measure Based Segmentation Techniques for Skin Cancer Detection	2018	*International Conference on Recent Developments in Science, Engineering and Technology. Springer*	Otsu thresholding, Canny edge detection, Watershed, K-Means	----------	----------
12	Nikita Raut, Aayush Shah, Shail Vira, Harmit Sampat	A Study on Different Techniques for Skin Cancer Detection	2018	*International Research Journal of Engineering and Technology (IRJET)*	ABCD rule based detection, Backpropogation Neural Networks based diagnosis, ANN, Hybrid genetic algorithm,CNN, Neuro Fuzzy System, Delaunay Triangulation,SVM, ,k-means.	----------	K-means Result:52.63 %, Back Propagation Neural Network result: 60% to 75%, Support Vector Machine result: 80% to 90%

13	E Craythorne, F Al-Niami	Skin cancer	2017	*Medicine*	Biopsy, Surgical treatment, Radiotherapy, Cryotherapy, Topical treatment, Photodynamic therapy, Vismodigib	----------	----------
14	JC Kavitha, A Suruliandi, D Nagaraja	Melanoma detection in dermoscopic images using global and local feature extraction	2017	*International Journal of Multimedia and Ubiquitous Engineering,12(5),19-28*	Otsu's adaptive thresholding method, GLCM ,SURF, SVM-RBF,KNN	data set from the local repository	SVM:87.3%.
15	Muhammad Aleem Taufiq , Adeel Anjum , Nazia Hameed(&), and Fozia Hameed	m-Skin Doctor: A Mobile Enabled System for Early Melanoma Skin Cancer Detection Using Support Vector Machine	2017	*Machine,In eHealth ,Springer,Chann*	Grab Cut algorithm	Klinik und Poliklinik für Dermatologie und Allergologie, University , Germany	80%
16	Dr.R. Pon Periyasamy, V.Gayathiri	Melanoma Detection through KMeans Segmentation and Feature Extraction	2017	*International Research Journal of Engineering and Technology (IRJET)*	K-Means Clustering Segmentation	Knowledge-base of skin cancer images from University of Wateloo	Highest Classification rate is 83.33 using SVC.
17	Jana, Enakshi, Ravi Subban, and S. Saraswathi	Research on Skin Cancer Cell Detection using Image Processing	2017	*In 2017 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC)*	Techniques for working and detection of cancer	----------	----------
18	Sundar, RS Shiyam, and M. Vadivel	Performance Analysis of Melanoma Early Detection using Skin Lession Classification System	2016	*International Conference on Circuit, Power and Computing Technologies (ICCPCT)*	K-means clustering algorithm, Multiclass Support Vector Machine	----------	----------
19	Nilkamal S. Ramteke et. al	ABCD rule based automatic computer aided skin cancer detection using MATLAB	2013	*International Journal of Computer Technology and Applications*	Watershed Segmentation	Images from digital camera.	90%
20	Dr. J. Abdul Jaleel et. al	Artificial Neural Network Based Detection of Skin Cancer	2012	*International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*	Threshold Segmentation	Dermoscopic images were collected from Internet	Good accuracy
21	Chen Yi-Ling Chen, Tse-Wei,and Shao-Yi Chien	Fast Image Segmentation Based on K-Means Clustering with Histograms in HSV Color Space	2008	*In 2008 IEEE 10th Workshop on multimedia signal processing*	K-Means Clustering with HSV .	----------	----------
22	Ng, H. P., et al.	Medical image segmentation using k-means clustering and improved	2006	*2006 IEEE southwest symposium on image analysis*	K-means clustering, Improved watershed segmentation algorithm	2-D T1 MR images of the head	----------

		watershed algorithm.		*and interpretation*			
23	Likas, Aristidis, Nikos Vlassis, and Jakob J. Verbeek.	The global k- means clustering algorithm	2003	*Pattern recognition*	K-means algorithm	Iris data set , the synthetic data set , artificially created data sets	---------- ------
24	J.M. Pena, J.A. Lozano, P. Larranaga	An empirical comparison of four initialization methods for the K- Means algorithm	1999	*Pattern recognition letters*	RANDOM, Forgy Approach (FA), Macqueen Approach (MA), Kaufman Approach (KA)	Iris database, Ruspini database, Glass database	Kaufman Approach (KA) is more accurate than other methods.
25	Anas, Mohd, Kailash Gupta, and Shafeeq Ahmad	Skin Cancer Classification Using K-Means Clustering	2017	*International Journal of Technical Research and Applications*	K-means clustering algorithm	Images from University of Wateloo	Highest accuracy with SVC classifier:83.3 3

III. CONCLUSION

This review paper gives the comparison the methods used for detection of skin cancer. The comparison in the table is based on the methods , dataset used and performance measures like accuracy. The comparison in the table is done using the literature survey. There are number of techniques for segmentation of skin cancer detection but the methods having highest performance measure are k-means clustering, Otsu method and active contour. In future studies, these three segmentation techniques may be used with different parameters.

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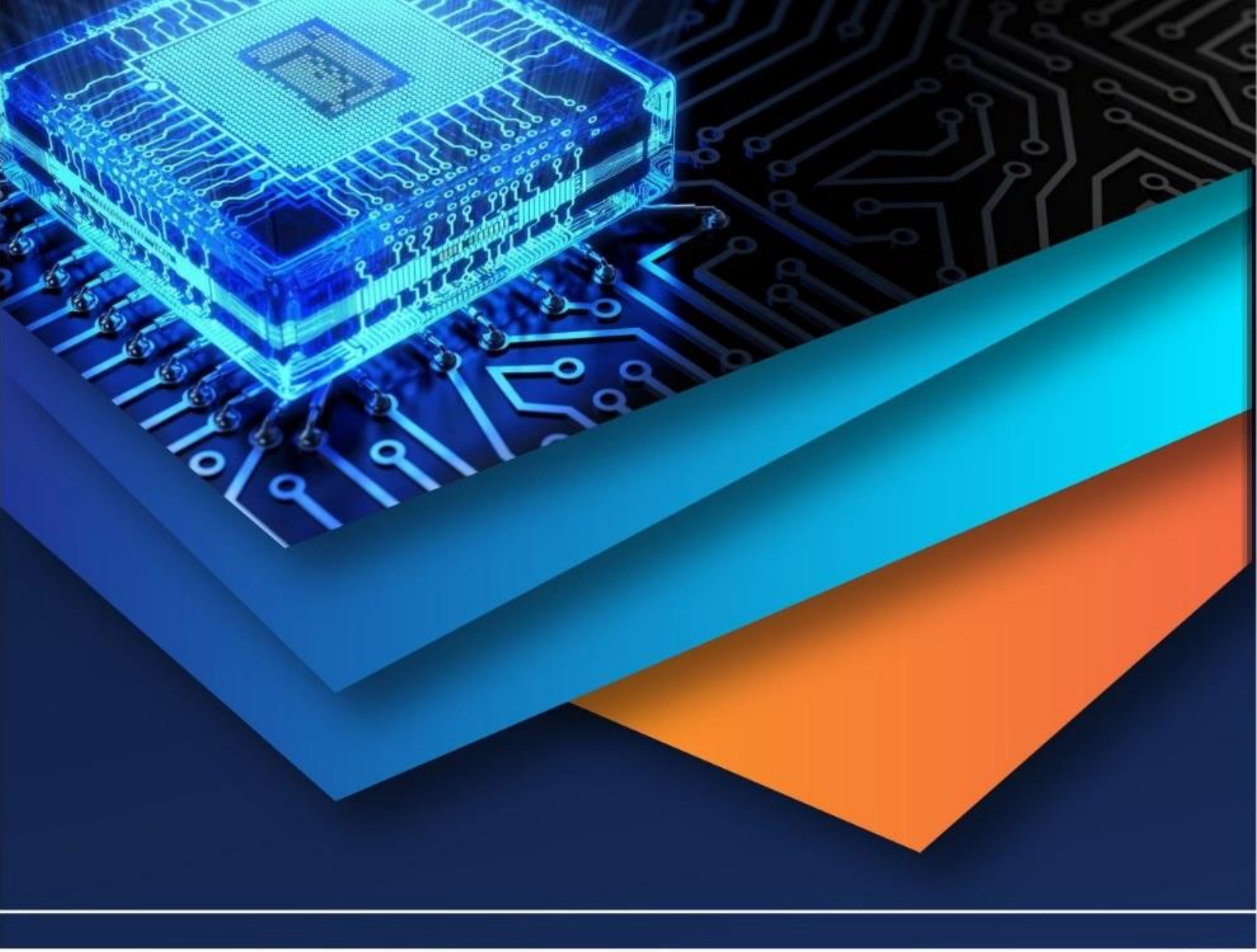

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