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A Survey on Classification of Malignant Melanoma and Benign Skin Lesion by Using Machine Learning Techniques

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Abstract--*Malignant cancer is one of the many skin most cancers types. Melanoma treatment relies upon the stage of detection. Several techniques which includes clinical and automatic are popular in prognosis of melanoma. Image-based digital diagnosis systems facilitate early cancer detection. The kingdom of the artwork in pc aided analysis device look at recent practices of the above cited systems the use of different processes which includes k-clustering, fuzzy good judgment etc. Research demanding situations related to the different processes concerned in computer aided prognosis of pores and skin cancer are also highlighted. Statistical traits of the dermoscopy picture may be used as efficient discriminating features for detection. Different parameters like texture capabilities, coloration space, form and asymmetry can in addition the expertise of upcoming researchers in the discipline of digital skin prognosis.*

Key words--*Skin cancer detection; dermoscopy; laptop aided diagnosis; category; melanoma detection;*

I. INTRODUCTION

Machine learning strategies are extensively used in photograph tagging programs and spam detection. Detection of skin lesion and its classification is the application needed here. In today's era, pc structures prepared with the excessive resolution cameras, superior multi middle processors, innovative working structures form portable platform to run complicated software like in case of healthcare. Advancement in pc technologies research has the eye of the hundreds focused closer to the computerized healthcare structures. Majority of the world's population lives in backward regions having little to no access to pores and skin professionals but they'll avail get entry to to a laptop based era easily in this technological age.

Skin most cancers usually happens in center age groups. Moreover, its probabilities of prevalence in males are higher than females. Various methodologies for its detection and treatment were implemented previously consisting of surgical treatment and radiation. Usually, the Epidermis, epidermis and hypodermis layers come beneath the affected region. Types of skin most cancers lesions consist of benign and malignant lesions. Melanin deposits of epidermis layer constitute the benign lesions whereas melanin reproduced at an bizarre rate forms malignant lesion.

Machine learning strategies used in collaboration with laptop aided diagnosis machine facilitate the conducted studies and provide us with useful observations. Every such diagnostic device follows the equal sequence

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of tactics. Research challenges encountered throughout the survey include slow convergence rate, numerous schooling datasets, slower operation, excessive computational complexity etc. Which can be in addition illustrated in the methods involved in the work define given below.

II. ASPECTS OF EXISTING CLASSIFICATION SYSTEMS

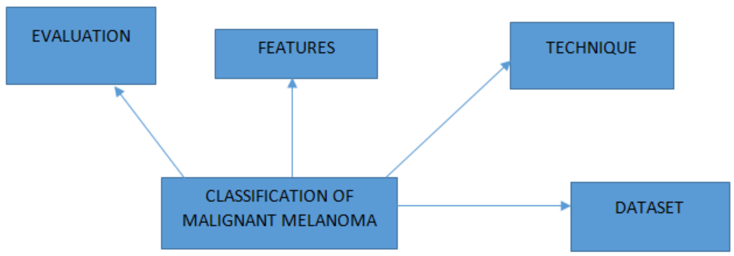

Figure 1: Outline of survey

2.1 Features

Skin lesion classification involves various capabilities. These functions are coined into color functions, ABCD rule capabilities, dermal features, geometric capabilities (2015, [2]), contour capabilities (2014, [23]), and texture functions (2014, [23]). Color is one of the leading and most used feature for figuring out the pores and skin disease. Accurate color assessment and its distribution has its own significance for the best pigmented skin lesion diagnosis. The pigmentation diploma and the color distributions in the skin lesion are major factors in dermoscopy examination. It has been used in pigmented networks (2015, [42]), lesion segmentation (2104, [41]). In dermoscope pictures, dermis is associated with white coloration. Melanin, the most crucial color in determining one of a kind structural/chromatic patterns. Pigmented pores and skin lesion having distinctive distribution depend on the location of specific skin layers of melanin (2016, [13]). It seems black for upper epidermis, mild -dark brown for dermo epidermal layer, slate blue for papillaral epidermis, metallic blue for reticular dermis. We may have some exceptional colors such as various sunglasses of pink and white. Red sun shades are commonly related to multiplied vascular tumor, bleeding lesion and improved variety of capillarious vessels. Continual bleeding and crust development expands the shade range from blue-black to purple-black leading to one of a kind shade spaces being used in skin prognosis. Conspicuous colour areas consist of RGB (2011, [27].), CIE L*a*b*(2011, [27].), CIE L*u*v*, HSV (Hue Saturation Value) (2011, [27].) and HSL (Hue Saturation Luminance). ABCD features prominently encompass major axis length, border irregularity, shade and depth. They had been used for medical image processing (2017, [43]), mobile automated and computerized systems (2017, [44]). Dermal functions involve dermis volume, skin elasticity and collagen densities. Mean value, popular deviation, entropy etc. encapsulate histogram functions.

2.2 Datasets

Details of a number of the publically to be had datasets are as follows.

PH2: It is dermoscopy picture database containing around 200 pictures received Dermatology Service of Hospital Pedro Hispano, Matosinhos, Portugal. Papers coping with lesion segmentation (2014, [41]) cancer

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classification (Mendonca, Ferreira, Marques, Marcal, & Rozeira, 2013) and medical image processing make use of this specific dataset. It is available on http://www.Fc.Up.Pt/addi/ph2database.Html (PH2 Database, 2013).

DermIS and DermQuest: A freely accessible cancer picture dataset for academic purpose.

ISIC project dataset: The International Skin Imaging Collaboration (ISIC) objectives for improvement of cancer diagnosis. It carries 900 pix for schooling and 350 photos are for trying out purposes. This precise dataset has been used for photo processing and skin most cancers detection.

2.3 Classification

Classification section is in rate of making the inferences from the extracted information. Prominent type techniques consist of ABCD rule of Dermatoscopy ([14]-[17]), the 7-point checklist ([18]-[20]), Menzies method (2012, [21].) etc. Researchers have tried and tested one-of-a-kind gadget learning strategies for computerized skin lesion category. Implemented strategies encompass assist vector gadget, artificial neural networks and k-nearest neighbor. Statistically, the schooling and check paradigm are comparable in each case. In accordance with the paradigm, data is separated into wonderful independent schooling and testing sets. One set carries out algorithmic training and the alternative for testing the developed set of rules.

Ganster et al. advanced computerized device for automated melanoma recognition. Applying greyscale morphological remaining operation to diminish noise and hair influence made it less complicated for coloration clustering set of rules, dynamic thresholding and worldwide thresholding to fuse and ensure pores and skin lesion. Features numbering round 122, numerically, containing however not constrained to shape, local and international parameters had been calculated for lesion malignancy description (2001, [12].).

Fuzzy logic picture evaluation strategies proposed by using Lingala et al used blue sunglasses in dermoscopy pics for melanoma prognosis. Construction of the bushy set for distinct blue coloration shades applied an additional set of 22 melanoma pictures and the fuzzy-shade representation turned into decided. The derived 150 unique features the usage of SVM have been classified into classes like contour, color and texture functions (2014, [23].) even as Ten-fold cross-validation changed into used for end result evaluation.

Jain et al. Used photograph processing strategies for melanoma detection. Proposed method includes three important steps that are pre-processing, image segmentation and part detection. Firstly, the image was resized after adjustment of its comparison and brightness. Secondly, Otsu thresholding implemented in each R, G and B aircraft created paired masks which later produced a very last lesion mask. Thirdly, the segmented picture containing many blobs changed into analyzed and the most important blob was picked. Geometric features such as perimeter, greatest diameter and irregularity index were extracted. Predefined thresholds cause the very last classification of the image into ordinary or melanoma type (2015, [2].).

Cudek and Hippe’s computerized approach for melanocytic pores and digital lesion images used color identification to convert the picture into CIE L*a*b* coloration space after which k-means clustering changed into applied colored classification. Difference between colors become determined the usage of city block distance. The clustered color records shaped the shade parameter in ABCD formula (2015, [24].).

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Many sample recognition techniques were proposed by extraordinary researchers. One of them utilized histopathological picture analysis via SVM over 150 pics (2015, [25].) with the intention of malignancy tissues' identity. 45 extracted features due to autoregressive imitation and demographic intensity evaluation the use of gray stage co-occurrence matrix. Dimensionality discount used differential evolution based function selection approach.

2.4 Evaluation

Evaluation of the entire set of features fed to the classifier or some of them, say, 5 features from a total set of 11 features can compared on basis of their accuracy to check the validity and performance of the prognosis. In case of pigment network based system, where the pigment network extracted features are fed to neural network classifier to train it. This results in obtaining classification accuracy with less false detection rates (2015, [42]). Sometimes, we may use more than one classifier either in combination or to compare their confuse matrix results to gauge their respective accuracy values. One such example uses one level and two level classifiers where the latter outperforms the former. In the one level classifier, classification of common, anomalous and tumour images resulted in certainty readings of 90.3%, 92.1% and 90.6% separately whereas two-level classification of the dermoscopy images gave individual values of 90.6%, 91.3% and 97.7% independently (2014, [41]). These examples show that confusion matrix, comparison tables on basis of sensitivity are few methods for evaluation of skin lesion classification systems.

III. CONCLUSION

Early melanoma detection reduces mortality rates. In this paper, examination of new practices in different digital prognosis systems steps have shown us the various methods employed for preprocessing, partition, feature extraction and abrasion analysis. SVM is the most prominent of predictive analysis techniques. Trained, validated data from literature on contrasting datasets makes fitting comparison a taxing task due to varying dataset sizes, implementation of different image procurement techniques in each case. Thus, a set of accepted methods and datasets must be on hand, readily available to contemporary researchers. Appropriate filteration methods, noise-removal and segmentation are hot research topics.

REFERENCES

1. I. Maglogiannis and C.N. Doukas, "Overview of advanced computer vision systems for skin lesions characterization", IEEE Transactions on Information Technology in Biomedicine, 2009
2. S. Jain, V. Jagtap and N. Pise, "Computer aided melanoma skin cancer detection using image processing", Procedia Computer Science, pp. 736–741, 2015.
3. Q. Abbas, M. E. Celebi and I. Fondón, "Hair removal methods: A comparative study for dermoscopy images", Biomedical Signal Processing and Control, vol. 6 issue 6, pp. 395–404, 2011.
4. Q. Abbas, I. F. Garcia, M. Emre Celebi, and W. Ahmad, "A Feature-Preserving Hair Removal Algorithm for Dermoscopy Images", Skin Research and Technology, vol. 19 issue 1,pp 27–36. 2013.
5. M. E. Celebi., Y. A. Aslandogan and P. R. Bergstresser,. "Unsupervised border detection of skin lesion images", International Conference on Information Technology: Coding and Computing (ITCC'05) , vol. II, pp. 1–6, 2005
6. I. Maglogiannis, S. M. and K. Delibasis , "Hair Removal on Dermoscopy Images", 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), pp. 2960–2963 ,2015

DOI: 10.37200/IJPR/V24I8/PR280129
Received: 21 Jan 2020 | Revised: 08 Feb 2020 | Accepted: 14 Mar 2020

7. J. Korjakowska. and R. Tadeusiewicz, “Hair removal from dermoscopic color images”, Bio-Algorithms and Med-Systems, vol. 9 issue 2, pp.53–58. 2013
8. A. Masood and A. Al-jumaily, “Differential Evolution based Advised SVM for Histopathalogical Image Analysis for Skin Cancer Detection”, 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society , pp. 781 –784, 2015
9. M E. Celebi, A. Hassan, Kingravi, Hitoshi Iyatomi, Y. Alp Aslandogan, W. V., Stoecker, Randy H. Moss, Joseph M. Malters, James M. Grichnik and Marghoob, Harold S. Rabinovitz, and S. W. M., “Border detection in dermoscopy images using statistical region merging”, Skin Research and Technology, 48(Suppl 2), 1–6. 2008
10. A. Sultana, I. Dumitrache, M. Vocurek and M. Ciuc, “Removal of artifacts from dermatoscopic images”, IEEE International Conference on Communications, 2014
11. M. E. Celebi, “Detection of blue-white veil areas in dermoscopy images using machine learning techniques”, Proceedings of SPIE, 2006
12. H. Ganster, A. Pinz, R. Rohrer, R., E. Wildling, E., M. Binder, M., and H. Kittler, “Automated melanoma recognition”, IEEE Transactions on Medical Imaging, 2001
13. I. Stanganelli and M. A. P, “Dermoscopy: Overview, Technical Procedures and Equipment, Color” , Available: http://emedicine.medscape.com/article/1130783-overview#a2, Retrieved June 2, 2016
14. F. Nachbar, W. Stolz, T. Merkle, A. B. Cognetta, T. Vogt, ,M. Landthaler. and G. Plewig, “The ABCD rule of dermatoscopy”, Journal of the American Academy of Dermatology, vol.30 issue 4, pp. 551–559, 1994
15. W. Stolz, A. Riemann, A. B. Cognetta, L. Pillet, W. Abmayr, D. Holzel, P. Bilek, F. Nachbar, M. Landthaler,and O. Braun-Falco, “ABCD rule of dermatoscopy: A new practical method for early recognition of malignant melanoma”, European Journal of Dermatology, vol. 4, pp. 521–527, 1994
16. W. Stolz, A. Reimann, and A. Cognetta, “ABCD rule of dermatoscopy: A new practical method for early recognition of malignant melanoma”, 1993
17. H. Tsao, J. M. Olazagasti, K. M. Cordoro, J. D. Brewer, S. C. Taylor, J. S. Bordeaux and W.S. Begolka, “Early detection of melanoma: reviewing the ABCDEs”, Journal of the American Academy of Dermatology, vol. 72 issue 4, pp.717–23, 2015.
18. G. Betta, G. Di Leo, G. Fabbrocini, A. Paolillo and M. Scalvenzi, (2005). Automated application of the “7-point checklist” diagnosis method for skin lesions: Estimation of chromatic and shape parameters”, IEEE Instrumentation and Measurement Technology Conference, pp. 1818–1822, 2005
19. T. Wadhawan, N. Situ, H. Rui, K. Lancaster, X. Yuan and G. Zouridakis, “Implementation of the 7-point checklist for melanoma detection on smart handheld devices”, Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 3180–3183, 2011
20. F. M. Walter, A. T. Prevost, J. Vasconcelos, P. N. Hall, N. P. Burrows, H. C. Morris and J. D. Emery, “Using the 7-point checklist as a diagnostic aid for pigmented skin lesions in general practice: A diagnostic validation study”, British Journal of General Practice, vol. 63, pp. 345–353, 2013
21. A. R. S. Marcal, T. Mendonca, M. A. Pereira, J. Rozeira and C. S. P. Silva, “Evaluation of the Menzies method potential for automatic dermoscopic image analysis”, Proceedings of the International Symposium, CompIMAGE 2012, pp. 103–108, 2012
22. P. Rubegni, G. Cevenini, M. Burroni, R. Perotti, G. Dell’Eva, ,P. Sbano and L. Andreassi, “Automated diagnosis of pigmented skin lesions” , International Journal of Cancer, vol. 101 issue. 6, pp. 576–580, 2002
23. M. Lingala, R. Joe Stanley, R. K. Rader, J. Hagerty, , H. S. Rabinovitz, , M. Oliviero, and Stoecker, “Fuzzy logic color detection: Blue areas in melanoma dermoscopy images”, Computerized Medical Imaging and Graphics, vol. 38 issue 5, pp. 403–410, 2014
24. P. Cudek and Z. Hippe, “Melanocytic Skin Lesions : A New Approach to Color Assessment”, 2015 8th International Conference on Human System Interaction (HSI), pp. 99–101, 2015
25. A. Masood and A. Al-jumaily, “Differential Evolution based Advised SVM for Histopathalogical Image Analysis for Skin Cancer Detection”, 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) ,pp. 781 – 784, 2015
26. T. Wadhawan, N. Situ, H. Rui, X. Yuan, and G. Zouridakis,“SkinScan c : A PORTABLE LIBRARY FOR MELANOMA DETECTION ON HANDHELD DEVICES”. 2011 IEEE International Symposium on Biomedical Imaging: From Nano to Macro, pp. 133–136, 2011
27. T. Wadhawan, N. Situ, H. Rui, K. Lancaster, X. Yuan, and G. Zouridakis, “Implementation of the 7-point checklist for melanoma detection on smart handheld devices”, Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS pp. 3180–3183, 2011

28. T. T. Do, Y. Zhou, H. Zheng, N. M. Cheung and D. Koh, "Early Melanoma Diagnosis with Mobile Imaging", 36th IEEE Annual International Conference of the Engineering in Medicine and Biology Society (EMBC), pp. 6752–6757, 2014
29. PH2 Database. (2013). PH2 Database. [Online] Avaiable http://www.fc.up.pt/addi/ph2 database.html Retrieved Retrieved August 19, 2016
30. DermIS.(2016).DermIS.[Online]Avaiable http://www.dermis.net/dermisroot/en/home/index.htm Retrieved June 29, 2016
31. DermQuest Image Library (2016). DermQuest Image Library [Online] Avaiable https://www.dermquest.com/image-library/ Retrieved June 29, 2016
32. ISBI 2016: Skin Lesion Analysis Towards Melanoma Detection [Online] Available at http://biomedicalimaging.org/2016/?page_id=422, Retrieved 14 November 14, 2016
33. R. B. Oliveira a, M. E.. Filho, Z Ma , J. P. Papa,A. S. Pereira ,J. M. R.S. Tavares, "Computational methods for the image segmentation of pigmented skin lesions: A review", Computer methods and programs in biomedicine vol 131, 127-141, 2016
34. D. Grossman, AG. Goodson, "Strategies for early melanoma detection: approaches to the patient with nevi," Pubmed. J., no. 60, pp. 719-738, 2009.
35. DS. Rigel, J. Russak, R. Friedman, "The evolution of melanoma diagnosis: 25 years beyond the ABCD," CA: To Cancer J., no. 5, pp. 301316
36. MA. Tucker, "Melanoma epidemiology," Hematology/Oncology Clinics of North America, no. 23, pp. 383-395, 2009.
37. C. Barata, J. S. Marques, and J. Rozeira, "A System for the Detection of Pigment Network in Dermoscopy Images Using Directional Filters," Biomedical Engineering, IEEE Transactions on, vol. 59, no. 10, pp. 2744-2754, 2012.
38. T. F. Chan and L. A. Vese, "Active contours without edges," Image processing, IEEE transactions on, vol. 10, pp. 266-277, 2001.
39. N. Otsu, "A threshold selection method from graylevel histograms," Automatica, vol. 11, pp. 23-27, 1975.
40. N. Smaoui, and S. Bessassi, "A developed system for melanoma diagnosis," International Journal of Computer Vision and Signal Processing, vol. 3, no. 1, pp. 10-17, 2013.
41. Omar Abuzaghleh, Buket D. Barkana and Miad Faezipour, "Automated Skin Lesion Analysis Based on Color and Shape Geometry Feature Set for Melanoma Early Detection and Prevention", 978-1-4577-1343-9/12/$26.00 ©2014 IEEE.
42. Naser Alfed, Fouad Khelifi, "Pigment network-based skin cancer detection", 978-1-4244-9270-1/15/$31.00 ©2015 IEEE.
43. Hiam Alquran, Isam Abu Qasmieh, Ali Mohammad Alqudah, "The Melanoma Skin Cancer Detection and Classification using Support Vector Machine", 978-1-5090-5969-0/17/$ 31.00 ©2017 IEEE.
44. Ms. Amulya P M, "A Study on Melanoma Skin Cancer Detection Techniques", 978-1-5386-1959-9/17/$31.00 ©2017 IEEE.
45. Quadri, Kunle Alabi, Christian Eseigbe Imafidon, Rufus Ojo Akomolafe, and . 2019. Kolaviron mitigates proteinuria and potentiates loop diuresis in Wistar rats: Relevance to normal renal function. Journal of Complementary Medicine Research, 10 (1), 58-67. doi:10.5455/jcmr.20190112122816
46. Copland, I.B.Mesenchymal stromal cells for cardiovascular disease(2011) Journal of Cardiovascular Disease Research, 2 (1), pp. 3-13. DOI: 10.4103/0975-3583.78581