Xception Net and DenseNet121 for Deep Learning-Based Melanoma Detection Classification

Mrs. S Spandana[1], K. Sowmya Sri[2], Ch. Rushmitha[3], B. Akanksha[4],

[1] Assistant Professor, Department of CSE-AIML, Malla Reddy Engineering College for Women (Autonomous Institution), Hyderabad,

[2],[3],[4] Student, Department of CSE-AIML, Malla Reddy Engineering College for Women (Autonomous Institution), Hyderabad.

ABSTRACT:

More than 40% of all malignancies are skin cancers, making it among the most frequent tumors globally. In 2018, there were over 300,000 new instances of melanoma, making it the 19th most prevalent cancer in humans. Studies demonstrate that doctors may aid in the healing of cancer by using modern computer technologies, such as photographic processing mechanisms, in procedures pertaining to early diagnosis. Currently, cancer diagnosis is dependent on interventional treatments like surgery, radiation, and chemotherapy. An automated system for skin cancer detection using dermoscopy pictures is presented in this work. An upgraded XceptionNet with fluid activation functions and depth-separable convolutions forms the basis of the suggested model. When compared to earlier versions of Xception, as and other dome designs, this method demonstrates a considerable improvement in the network's categorization accuracy. After running simulations of the suggested approach alongside other state-of-the-art solutions for skin cancer detection, the findings reveal that the recommended method outperforms the others in terms of accuracy.

INTRODUCTION

Cancers of the skin, which cover the biggest organ in the body, account for the vast majority of cancer cases in the US. External factors such as heat, sunshine, wounds, and infections are repelled by the skin. Three layers make up the skin: the epidermis, dermis, and the dermis. The outermost layer of skin, known as the epidermis, is responsible for producing the skin's tone and acting as a protective barrier against water. Rough connective tissues, glands for sweating, and hair follicles make up the

dermis, the second layer of skin. At last, connective tissue and adipose tissue make up the hypodermis, the lowest layer of the skin. Skin cancer is the biggest risk to skin. At least 40% of all types of malignancies are skin cancers, including melanoma, making them one of the most frequent tumors globally. Daily skin cancer diagnoses in the United States are estimated to be about 9,500.

Although conventional cancer treatment relies on invasive procedures like surgery, radiation, and chemotherapy, recent research has shown the efficacy of incorporating modern computer technologies, such as computerized image processing mechanisms, into procedures pertaining to cancer detection and categorization. Melanoma ranks as the nineteenth most frequent malignancy in both sexes of all skin cancers. Roughly 300,000 instances were identified in 2018. The Tumor Cell Organization reports that out of all cancers, melanoma ranks fourth with 15,000 cases worldwide. Additionally, melanoma is the ninth leading cause of cancer-related mortality in 2019, according to this organization. Due to the proliferation of various skin lesions, particularly melanoma and carcinoma, skin cancer detection is notoriously difficult. The use of needless biopsies in melanoma diagnosis has prompted the proposal of many noninvasive alternatives. The three primary components of the majority of these approaches are division, features the extraction process, and classification. In this situation, a number of tasks were completed. Using deep learning to extract features from images, Bansal et al. developed a method for diagnosing melanoma. For feature extraction using transfer learning and several classifiers, such as k closest neighbors (KNN), AdaBoost, which and random forests (RF), the researchers used neural networks based on convolution (CNN). The ISIC dataset was used to test the approach, and the results demonstrated the classifiers' accuracy. Although the system was technically sound, the lengthy setup procedure made it impractical for most applications.

RELATED WORK

Analysis of skin lesions and diagnosis of melanoma using deep learning methods

Adegun A., Viriri S

The 5-year survival rate for melanoma, the deadliest form of skin cancer, may reach 99.2% if detected early enough. Despite efforts to employ technology during the last decade, manual inspection by dermatologists

remains the fundamental and most trusted approach. Due to the scarcity of dermatology specialists, it is not feasible to proactively monitor those at the greatest risk in order to detect them early. In order to enhance diagnostic performance for the general public with limited access to professionals, Convolutional neural networks with deep con (DCNNs) have shown a remarkable improvement in autonomous skin lesion categorization. Future skin lesion analysis might make use of web-application based dermoscopy with incorporated artificial intelligence (AI). As a result, the dermatological community may benefit from the artificial intelligence plugin. Our research on the use of deep convolutional neural networks (DCNNs) for the automatic segmentation of melanoma regions in dermoscopy pictures is detailed in this article. The the HAM10000 public dataset is used for both training and assessment purposes. Our goal is to build a web-based application that can inform lab techs and general practitioners (GPs) about the likelihood of diagnosing a certain skin lesion. Automating the process of identifying and isolating individuals at high risk would greatly improve the efficiency of subsequent diagnostic and treatment procedures.

a few of the the majority rapidly propagating cancers between various additional kinds of cancers referred to to people is skin tumors. Melanoma is the the worst and the the majority hazardous type of the skin cancer which appears typically on the the skin surface as well as then extends more deeply into the sections of skin. Yet, if identified at an early the stage, and the surviving rate of Melanoma individuals is 96% in simple and economical therapies. The conventional technique of identifying Melanoma includes expert dermatology specialists, machinery, and Biopsies. achieve avoid the costly diagnosis, and to help dermatology specialists, the the field of machine acquiring has proven to offer state of the art remedies for skin tumors detection at an earlier stage with high accuracy. In this paper, a method for skin lesion classification and segmentation as benign or malignant is proposed using image processing and machine learning. A novel method of contrast stretching of dermoscopic images based on the methods of mean values and standard deviation of pixels is proposed. Then the OTSU thresholding algorithm is

applied for image segmentation. After the segmentation, features including Gray level Co-occurrence Matrix (GLCM) features for texture identification, the histogram of oriented gradients (HOG) object, and color identification features are extracted from the segmented images. Principal component analysis (PCA) reduction of HOG features is performed for dimensionality reduction. Synthetic minority oversampling technique (SMOTE) sampling is performed to deal with the class imbalance problem. The feature vector is then standardized and scaled. A novel approach of feature selection based on the wrapper method is proposed before classification. Classifiers including Quadratic Discriminant, SVM (Medium Gaussian), and Random Forest are used for classification. The proposed approach is verified on the publicly accessible dataset of ISIC-ISBI 2016. Maximum accuracy is achieved using the Random Forest classifier.

Skin cancer detection using histopathology images and a deep learning architecture that can be visually understood

Jiang S., Li H., Jin Z.

The elevated prevalence rate and devastating effects of skin cancer make accurate detection of dangerous skin tumors an important objective; early detection is often associated with more successful therapy. Making excellent and interpretable computer-aided diagnosis (CAD) systems is challenging due to restricted published histopathology image sets and the absence of an intuitive relationship between the characteristics of lesion sites and a given kind of skin cancer. Based on a genuine histopathology image collection that we have gathered over the last decade, we present DRANet, a lightweight attention mechanism-based deep learning framework, to distinguish eleven distinct skin disorders. This will help us address this issue. In addition to providing the name of a specific illness, the CAD system may also provide a visual diagnostic report that highlights potential locations associated with the condition. The experimental findings show that the DRANet outperforms baseline models with similar parameter sizes and competitive accuracy using less parameters, such as InceptionV3, ResNet50, VGG16, and VGG19. In order to aid in the diagnosis of skin illnesses, the visual findings generated by the DRANet's hidden layers serve to emphasize portions of the

diagnostic points that are distinctive to each class.

Computer-assisted Detection of Breast Cancer: A Review. Modern Radiological Diagnostics

Reinaldo F. P., Vishnevski M.

At this time, cancer is among the most pressing global health concerns. When it comes to malignancies, skin cancer is by far the most prevalent, making about 75% of all cases globally. True, cancer of the skin manifests as aberrant alterations to the skin's outer layer. Skin cancer is a big worry for many individuals because of how common it is, even though the majority of patients make a full recovery. Melanoma, the most uncommon form of skin cancer, has the potential to spread via the lymphatic or circulatory systems to distant parts of the body, however the vast majority of skin malignancies only develop locally and invade neighboring tissues. The use of image processing for cancer detection has been the subject of several reviews. Automatic skin cancer diagnosis based on implantation capabilities and the many procedures involved in this process are explained in this research.

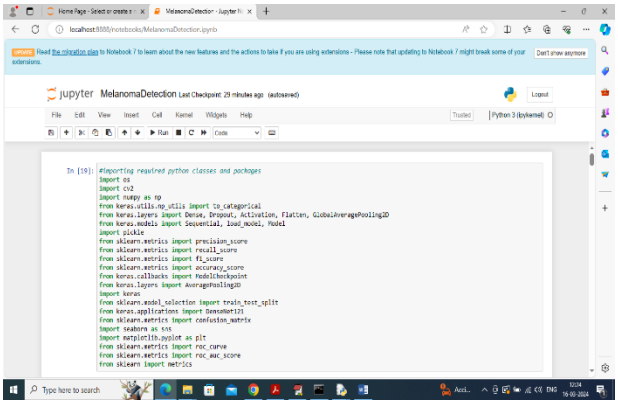
METHODOLOGY

1. Uploading Dataset: This section allows us to transfer datasets to the program, which will thereafter read all of the photographs.
2. Pre-process Dataset will transform all photos into numerical vectors.
3. Dataset Split: This section will shuffle and normalize all reviews before splitting them into two sets: one set will be used for the application's training, while the other will be used for testing.
4. Use White Skin to Train the DenseNet121 Algorithm: For this, we will use 80% of the white skin data to train the model, and then we will apply it to 20% of the test data to determine the accuracy of our predictions.
5. Dark Skin Algorithm Training: DenseNet121 will be fed 80% of the dark skin data for model training, and then applied to 20% of the test data for prediction accuracy.
6. Comparison graph: DenseNet121's effectiveness for both dark and white skin is shown in this module. The x-axis stands for skin type, while the y-axis shows accuracy and other

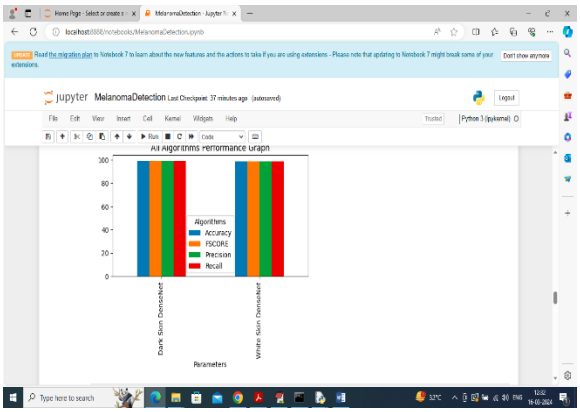
parameters in various color bars. The method achieved about same accuracy on all skin types, with just a little variation.

7. Upload Test photographs: Upload test photographs here, and the function will forecast melanoma or non-melanoma skin cancer based on the image path. The results will be shown in red language.

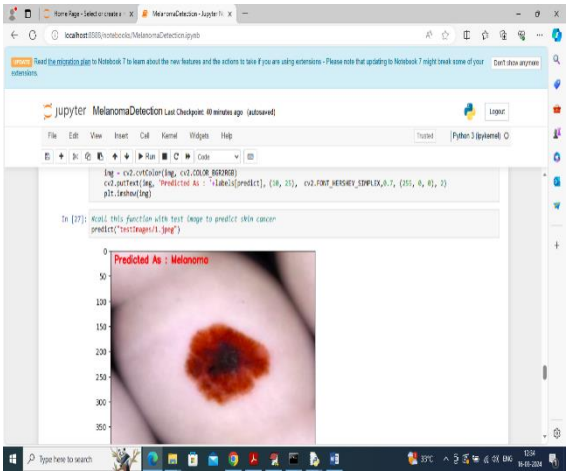
RESULT AND DISCUSSION



In above result importing require python classes and packages



In above screen can see DenseNet121 performance on both dark and white skin where graph x-axis represents skin type and y-axis represents accuracy and other metrics in different colour bars and algorithm got equal accuracy on both skin type with minor difference



In above screen calling predict function with image path and then in red colour text can see skin cancer detected as Melanoma

CONCLUSION

Most people would agree that skin cancer is among the most common forms of the disease. Of all the skin cancers, melanoma is among the worst. One hundred percent of cases of this malignancy are curable if caught early. Unfortunately, treatment will be rendered useless in the event that it escalates to an aggressive stage and metastasizes to other parts of the body.

Melanoma is a skin cancer that may spread from person to person and can be more easily treated if caught early. An effective diagnostic method for melanoma detection was suggested in this research using an architecture of convolutional neural networks based on the Xception deep network. Using the Move activated function with depth-wise separable convolutions to enhance the CNN's classification accuracy are two key enhancements to this model. After that, the MNIST dermatology dataset was used to test the suggested Xception approach, and its performance was compared to that of other state-of-the-art methods. Out of all the methods tested, the suggested one performed the best with a perfect score of 95.53%, a sensitivity of 94.05%, a precision of 97.07%, and an accuracy of 100%.

REFERENCES

1. Adegun A., Viriri S. Deep learning techniques for skin lesion analysis and melanoma cancer detection: a survey of state-of-the-art. Artificial Intelligence Review . 2021;54(2):811–841.
doi: 10.1007/s10462-020-09865-y.

2. Javaid A., Sadiq M., Akram F. Skin cancer classification using image processing and machine learning. Proceedings of the 2021 International Bhurban Conference on Applied Sciences and Technologies (IBCAST); 12-16 Jan 2021; Islamabad, Pakistan. IEEE; pp. 439–444.

3. Jiang S., Li H., Jin Z. A visually interpretable deep learning framework for histopathological Image-based skin cancer diagnosis. *IEEE Journal of Biomedical and Health Informatics* . 2021;25(5):1483–1494. doi: 10.1109/jbhi.2021.3052044.

4. Reinaldo F. P., Vishnevski M. Computer-Aided Diagnosis of Skin Cancer: A Review. *Current Medical Imaging* . 2020;16:781–793.
doi: 10.2174/1573405616666200129095242
.

5. Clinton S. K., Giovannucci E. L., Hursting S. D. The World Cancer Research Fund/American Institute for Cancer Research third expert report on diet, nutrition, physical activity, and cancer: impact and future directions. Journal of Nutrition . 2020;150(4):663–671.
doi: 10.1093/jn/nxz268.

6. Xu Z., Sheykhahmad F. R., Ghadimi N., Razmjooy N. Computer-aided diagnosis of

skin cancer based on soft computing techniques. *Open* Medicine . 2020;15(1):860–871. doi: 10.1515/med-2020-0131.

7. Khan M. Q., Hussain A., Rehman S. U., et al. Classification of melanoma and nevus in digital images for diagnosis of skin cancer. *IEEE Access* . 2019;7:90132–90144. doi: 10.1109/access.2019.2926837.

8. Bharathi S., Premchand J., Nivedeethaa A., Kousiya M., Ajay Kumar V. *Journal of Physics: Conference Series* . 1. Vol. 1917. IOP Publishing; 2021. Identification of melanoma from nevus images.012027

9. Rokhana R., Herulambang W., Indraswari R. Deep convolutional neural network for melanoma image classification. Proceedings of the 2020 International Electronics Symposium (IES); 29-30 Sept 2020; Surabaya, Indonesia. IEEE; pp. 481–486.

10. Costa A., Kieffer Y., Scholer-Dahirel A., et al. *Cancer Cell* . 3. Vol. 33. e10: 2018. Fibroblast heterogeneity and immunosuppressive environment in human breast cancer; pp. 463–479.

11. Babar M., Butt R. T., Batool H., Asghar M. A., Majeed A. R., Khan M. J. A refined approach for classification and detection of melanoma skin cancer using deep neural network. Proceedings of the 2021 International Conference on Digital Futures and Transformative Technologies (ICoDT2); 20-21 May 2021; Islamabad, Pakistan. IEEE; pp. 1–6.

12. Brinker T. J., Schmitt M., Krieghoff-Henning E. I., et al. Diagnostic performance of artificial intelligence for histologic melanoma recognition compared to 18 international expert pathologists. Journal of the American Academy ofDermatology . 2021;86:640–642. doi: 10.1016/j.jaad.2021.02.009.

13. Wang Q., Sun L., Wang Y., et al. Identification of melanoma from hyperspectral pathology image using 3D convolutional networks. IEEE Transactions on MedicalImaging . 2020;40(1):218–227. doi: 10.1109/tmi.2020.3024923.

14. Modi H., Chhabra B., Mahalakshmi P. Melanoma Classification: A Survey. Annals of the Romanian Society for Cell Biology . 2021;25:801–805.

15. Azad M. M., Ganapathy A., Vadlamudi S., Paruchuri H. Medical diagnosis using deep learning techniques: a research survey. Annals of the Romanian Society for Cell Biology . 2021;25(6):5591–5600.

16. Pérez E., Reyes O., Ventura S. Convolutional neural networks for the

automatic diagnosis of melanoma: an extensive experimental study. *Medical Image Analysis* . 2021;67 doi: 10.1016/j.media.2020 .101858.101858

17. Bansal P., Kumar S., Srivastava R., Agarwal S. Using transfer learning and hierarchical classifier to diagnose melanoma from dermoscopic images. *International Journal of Healthcare Information Systems and Informatics* . 2021;16(2):73–86. doi: 10.4018/ijhisi.20210401.oa4.

18. Razmjooy N., Sheykhahmad F. R., Ghadimi N. A hybrid neural network – world Cup optimization algorithm for melanoma detection. *Open Medicine* . 2018;13:9–16. doi: 10.1515/med-2018-0002.

19. Vocaturo E., Zumpano E. Dangerousness of dysplastic nevi: a multiple instance learning solution for early diagnosis. Proceedings of the 2019 IEEE International Conference on Bioinformatics and Biomedicine (BIBM); 18-21 Nov 2019; San Diego, CA, USA. IEEE; pp. 2318–2323.

20. Dey N., Rajinikanth V., Lin H., Shi F. Applications of Bat Algorithm and its Variants . Singapore: Springer; 2021. A study on the bat algorithm technique to evaluate the skin melanoma images; pp. 45–60.

21. Chollet F. Xception: deep learning with depthwise separable convolutions. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition; 21-26 July 2017; Honolulu, HI, USA. pp. 1251–1258.

22. Manasa K., Murthy D. G. V. Skin cancer detection using VGG-16. European Journal ofMolecular & Clinical Medicine . 2021;8(1):1419–1426.

23. Ridell P., Spett H. Training Set Size for Skin Cancer Classification Using Google's Inception *V3* . Stockholm, Sweden: Kth Royal Institute of Technology; 2017.