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Histopathology Image Colorization for Diagnosis

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Abstract: This paper reviews Histopathology image colorization for diagnosis. Histopathology refers to the examination of invasive or less invasive biopsy sample by a pathologist under microscope for locating, analysing and classifying most of the diseases like cancer. The analysis of histopathological image is done manually by the pathologist to detect disease which leads to subjective diagnosis of sample and varies with level of expertise of examiner. The histopathologist meticulously evaluates tissue architecture, cellular arrangement, and anomalies in cell morphology to discern between benign and malignant conditions within the image. However, this process is labor-intensive and susceptible to both intra and inter-observer variability. To mitigate these challenges, there arises a necessity for computer-assisted image analysis, facilitating a quantitative approach to tissue diagnosis. The process which is useful to analyse the tissue. Pathologist who can observed the tissue under the microscope which has low resolution by colorization of the tissue which gives the clarity in the tissue. The actual process which can be done by the manually which would be taken the long time and accuracy rate would the low. When use this model it would give the highly accuracy rate and also take the less time to analyse the tissue. In this model we have trained the thousands of tissues which contain the non-cancer tissues and the cancer tissues, When trained with the large dataset then it would give the accuracy rate also high

Keywords: Histopathology images, Deep learning, Tissue segmentation, Conventional neural networks, Image Resize, Tissue Identification algorithm Colorization method, Trained dataset

I. INTRODUCTION

Histology involves the microscopic study of cells and tissues, crucial for understanding disease development and prognosis. Pathologists examine biopsy samples by processing them into glass slides and observing them under a microscope at various magnifications. They identify morphological characteristics indicating disease presence, such as cancerous growths. Grading processes assess disease spread within tissues, guiding treatment planning based on severity.

However, manual diagnosis by pathologists is subjective and prone to variations. Quantitative assessment of histological images is crucial for objective diagnosis. With advancements in digital scanners, pathological images are now available in digital format, enabling computer-assisted image analysis. Digital image processing algorithms facilitate this analysis, aiding in computer-assisted disease diagnosis (CAD). Histopathology images when observed under the microscope the images should be appeared as the black and white colour which should not be high resolution to analyse the pathologist.

When we use the image colorization method the tissue get the high resolution of the tissue. In the tissue which contain the cancer cell they Can be identified easily. The colorization we use conventional neural network model(CNN)model which help to resize the Image . Highlight the cancer cells which are in the tissue which makes pathologist easy to analyse the tissue which may or may not contain the cancer cells in the tissue.

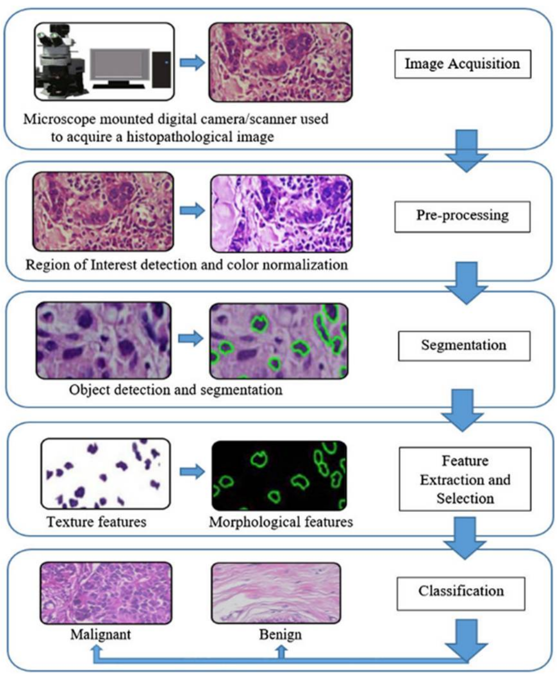
II. LITERATURE SERVEY

1) Progressing in the battle against cancer demands early detection, a feat achievable solely through the implementation of a highly efficient detection system .Techniques have been developed to detect breast cancer, including tissue image processing and digital pathology analysis.
2) Images are acquired by histopathology, which generally includes biopsy of the affected tissue. Tissues affected by the tumors are extracted by the pathologist and stained by H& E, which is the combination of histological stains called hematoxylin and eosin .Following this, the tissue sample undergoes microscopic examination, wherein pathologists scrutinize for cancerous cells by identifying malignant characteristics within cellular structures, such as abnormalities in nuclei morphology.
3) The acquisition of these microscopic images enables the development of computer-aided detection systems. Manual detection, being a laborious and fatiguing process, is prone to human error, particularly as cellular structures often appear irregular, random, and subject to arbitrary visual angles.

4) The primary objective is to distinguish between benign and malignant tumors, as malignant ones are cancerous and necessitate prompt treatment to mitigate and avert further complications. Essentially, this task boils down to a binary classification problem, which can be addressed through a variety of machine learning techniques.
5) Research has demonstrated that machine learning algorithms often outperform human pathologists in certain contexts. Numerous scholars have found that employing machine learning for medical image processing yields more precise results compared to the subjective diagnosis provided by a pathologist..
6) A study in Europe has been conducted by Phillips in which a set of algorithms along with breast images provided more accurate detection.
7) This finding is also evidence that using high-resolution images and better algorithms will improve the performance and accuracy of cancer detection. The remainder of this paper is structured as follows: Section II discusses the published literature along with the Break His dataset.
8) The dataset utilized to obtain experimental results is detailed herein. Section III elaborates on the preprocessing steps and the architecture of the Convolutional Neural Network (CNN) employed in the experiment, followed by neural network classification.
9) Deep learning algorithms necessitate data in the correct format and suitable network parameters tailored to the specific problem. Alternatively, pre-designed networks like AlexNet, MobileNet, Inception, among others, can be employed for streamlined implementation.
10) Indeed, several methods and custom-designed networks have been proposed by scholars for classifying breast cancer, aside from the pre-designed networks mentioned earlier. One such example is Artificial Neural Networks (ANNs), which rely on Maximum Likelihood Estimation (MLE) for classification purposes.

III. PROPOSED METHODOLOGY

This project presents a novel deep learning framework designed for Histopathology image colorization for diagnosis, integrating principles from machine learning and image classification. Various architectures of Deep Neural Networks are explored, particularly those optimized for processing image data like Convolutional Neural Networks (CNNs). The approach involves utilizing input images labeled as benign or malignant directly from raw pixel data. Through this method, the model learns to discern characteristic visual patterns associated with cancerous tissue, akin to digital staining. These patterns are then utilized by a classifier network to distinguish between non-cancerous and cancerous tissue samples. The CNN is trained using a dataset comprising 2480 benign and 5429 malignant samples represented in the RGB color model.



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IV. MODULE DESIGN SPECIFICATIONS

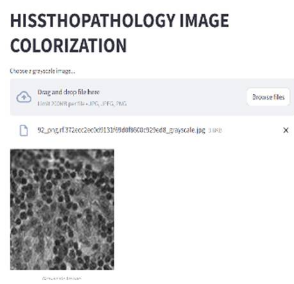
The modules which are used to develop the Histopathology image colorization building with the model

A. User Interface Module

Uploading the images by the user into the interactive page then we need to process tissues by the pre training model. When we uploading the images it takes the parameters as default so we need to adjust the parameters. Then after processing need to display the colorized image.

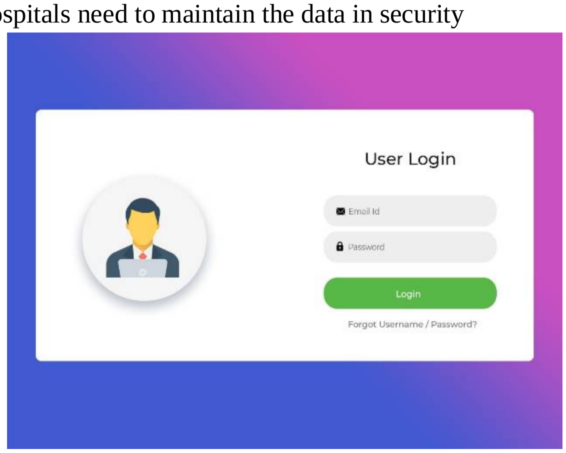
B. Image Processing Model

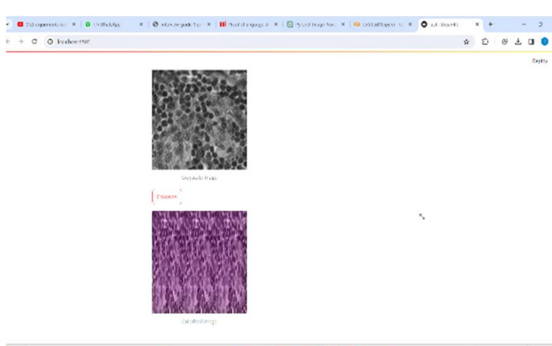
By using the colorization algorithm which is used to process the image and produced the processed image Realtime processing the images which should be done by the tissue in the real time analyse. Customization of the tissues as the adjust of the parameters of the tissues of the images



C. Data Management Module

Here we have taken the large dataset of the tissues which are needed to train the model of the data. Data taken from the patients of the tissues which are obtain from the hospitals need to maintain the data in security





V. DATASET

In dataset we have taken huge number of tissue image to train the data and accuracy could be based upon the size of the dataset.to train the data to capture the cellular structure of the tissues .These images of tissue samples obtain biopsies and surgical procedures

A. *Epoches*

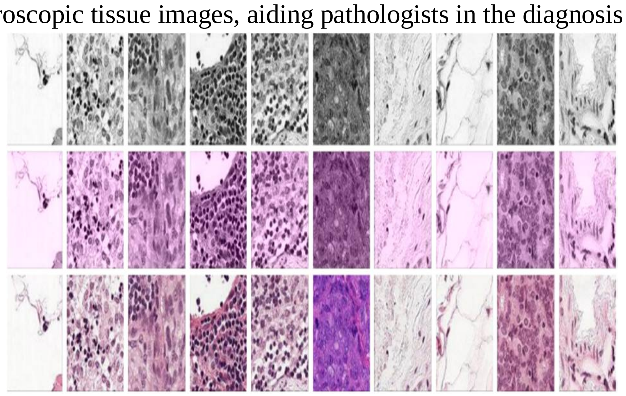
In this Model we are used 30 epoch to train the model .During each epoch the model update the parameters based on the training dataset to improve the performance and the task. By using the 30 epoch on the model to minimize the errors among the predicted and the actual data

B. *Loss Function*

In histopathology image colorization, the choice of loss function is crucial for training. MAE loss, MSE loss, perceptual loss
$MSE=n1\sum i=1n(Yi-Y\hat{}i)2$
$Lperceptual=n1\sum i=1n||\phi(Yi)-\phi(Y\hat{}i)||22$

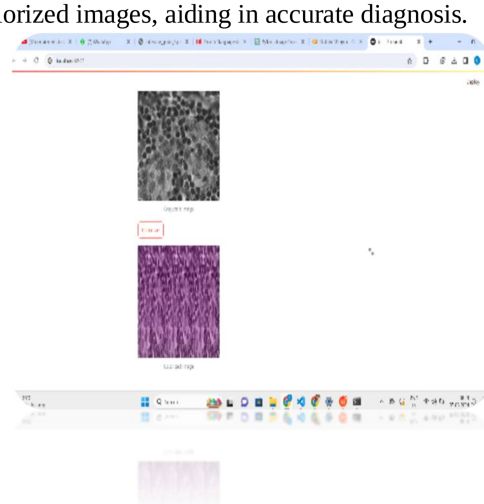
C. *Colorization*

Colorization refers to the process of adding color to grayscale or black-and-white images to make them visually appealing and more informative. To extract the hidden data from the grayscale image .Here by applying the colorization to the grayscale image we enhancing the interpretability of microscopic tissue images, aiding pathologists in the diagnosis of diseases and abnormalities.



D. *Comparing of Grayscale and Colorized*

Colorization of grayscale histopathological images significantly enhances their interpretability and usefulness for medical diagnosis and research. By assigning distinct colors to different tissue components, colorized images provide enhanced tissue differentiation, improved contrast, and better visualization of subtle morphological details. Pathological features such as necrosis, inflammation, and tumor invasion are more evident in colorized images, aiding in accurate diagnosis.



VI. CONCLUSION AND LIMITATIONS

In conclusion, the colorization of grayscale histopathological images stands as a transformative advancement, greatly enhancing the interpretability and utility of these critical medical assets. By assigning distinct colors to different tissue components, colorization offers improved tissue differentiation, enhanced contrast, and clearer visualization of subtle morphological details. This augmentation contributes significantly to accurate diagnosis, aids in quantitative analysis, and facilitates educational communication within the field of histopathology. However, it's important to acknowledge the limitations inherent in colorization techniques, including subjectivity in color choices, potential generation of artifacts, and resource-intensive computational requirements. Additionally, ethical considerations regarding patient privacy and data security remain paramount. Nonetheless, as research progresses and methodologies evolve, the benefits of colorization continue to outweigh its challenges, underscoring its indispensable role in advancing medical diagnostics, research, and education.

VII. ACKNOWLEDGMENT

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[DARAPANENI CHANDRASEKHAR/Team Lead]

REFERENCES

[1] Siegel RL, Miller KD, Jemal A. Cancer statistics, 2017. CA - Cancer J Clin 2017;67 (1):7–30.

[2] Spanhol FA, Oliveira LS, Cavalin PR, Petitjean C, Heutte L. Deep features for breast cancer histopathological image classification. In: 2017 IEEE international conference on systems, man, and cybernetics, SMC 2017, banff, AB, Canada, october 5-8, 2017; 2017. p. 1868–73. https://doi.org/10.1109/ SMC.2017.8122889. https://doi.org/10.1109/SMC.2017.812288

[3] Spanhol FA, Oliveira LS, Petitjean C, Heutte L. Breast cancer histopathological image classification using convolutional neural networks. In: 2016 international

[4] A. Alias, B. Paulchamy, Detection of breast cancer using artifical neural network, International Journal of Innovative Research in Science 3 (3).

[5] Agarap AF. On breast cancer detection: an application of machine learning algorithms on the Wisconsin diagnostic dataset, CoRR abs/1711.07831. 1711.07831. http://arxiv.org/abs/1711.07831.

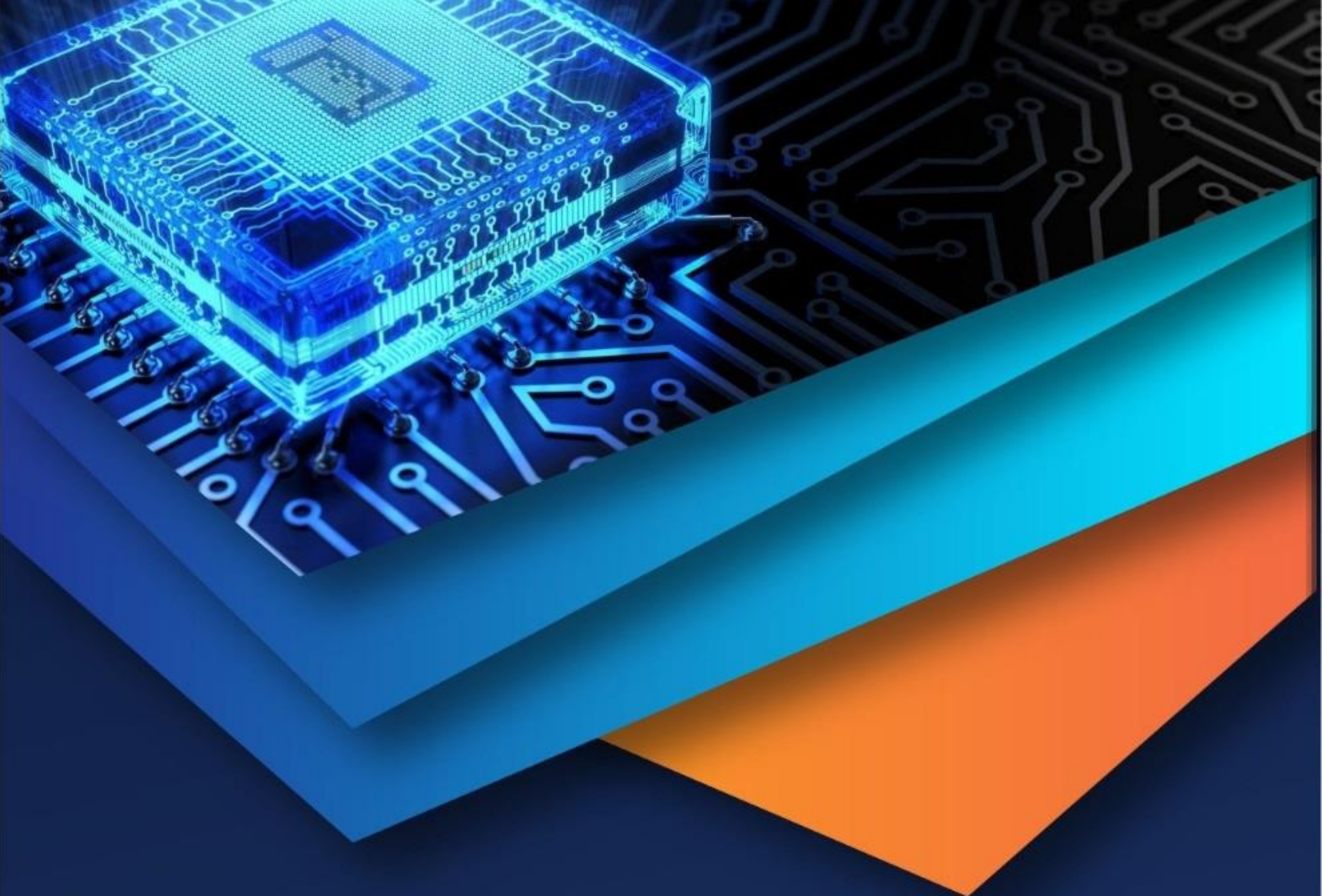
[6] Sahan S, Polat K, Kodaz H, Günes S. A new hybrid method based on fuzzy-artificial immune system and k-nn algorithm for breast cancer diagnosis.

[7] R. A. Johnson, D. W. Wichern, Multivariate analysis, Encyclopedia of Statistical Sciences 8.

[8] Lowe A KMe a, Grunkin M. Visiopharm digital pathology blog philips teams up with visiopharm to boost breast cancer diagnosis objectivity through computational pathology. 2016. http://www.visiopharm.com/blog/category/image-_analysis/.

[9] Spanhol FA, Oliveira LS, Petitjean C, Heutte L. A dataset for breast cancer histopathological image classification. IEEE Trans Biomed Eng 2016;63(7): 1455–62.
https://doi.org/10.1109/TBME.2015.2496264. https://doi.org/10.1109/TBME.2015.2496264.

[10] Han Z, Wei B, Zheng Y, Yin Y, Li K, Li S. Breast cancer multi-classification from histopathological images with structured deep learning model. Sci Rep 2017;7(1):4172.



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