DHAKA UNIVERSITY OF ENGINEERING & TECHNOLOGY, GAZIPUR

OFFICE OF THE DIRECTOR (RESEARCH & EXTENSION)

Form for **Board of Examination**

M Sc. Engg./M Engg./M Sc. /M Phil./Ph. D

Date: 10-19-2022

1.	**Name of the student (Block Letters):**	**N. I. MD. ASHAFUDDULA**	**Status:**	**Part-Time**
2.	**Student No.:**	18204016	**Enrolled Session:**	2018-19
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4.	**Name of the Department:**	Computer Science and Engineering	**Program:**	M Sc. Engg.
5.	**Name of the Supervisor:**	Dr. Rafiqul Islam	**Designation:**	Professor
6.	**Name of the Co-Supervisor (if any)**	Not Applicable (N/A)	**Designation:**	N/A
7.	**Date of First Enrolment:**	06 January, 2020		
8.	**Title (Block Letters):**	**SKIN CANCER DETECTION UTILIZING INTENSITY VALUE ESTIMATION MODEL WITH A DEEP NEURAL NETWORK**		

9. Abstract:

Melanoma skin cancer is one of the most dangerous and life-threatening cancer. Exposure to ultraviolet rays may damage the skin cell's DNA, which causes melanoma skin cancer. However, it is difficult to detect and classify melanoma and nevus mole at the immature stages. In this work, an automatic deep learning system is developed based on the intensity value estimation with a convolutional neural network model (CNN) to detect and classify melanoma and nevus mole more accurately. Since intensity levels are the most distinctive features for object or region of interest identification, the high-intensity pixel values are selected from the extracted lesion images. Incorporating those high-intensity features into the CNN improves the overall performance of the proposed model than the state-of-the-art methods for detecting melanoma skin cancer. To evaluate the system, we used 5-fold cross-validation. Experimental results show that a superior percentage of accuracy (92.58%), sensitivity (93.76%), specificity (91.56%), and precision (90.68%) are achieved.

10. Objectives:

We will develop an algorithm for the detection and classification of Melanoma skin cancer and Nevus mole. Our main objectives are written below:

1. To develop an Intensity Value Estimation (IVE) model
2. To embedded the IVE model with deep neural network architecture
3. To apply the proposed algorithm for early-stage skin-cancer detection

11. Summary of Result:

The proposed intensity value estimation with a convolutional neural network (IVEwCNN) led the system to achieve performance to detect and classify melanoma skin cancer and nevus mole. Our proposed system takes 39 (average) seconds to detect and predict melanoma skin cancer and nevus

mole. Table 1 shows the 5-fold cross-validation experimental results of our proposed (IVEwCNN) model. It is demonstrated that pixel intensity levels serve as one of the distinguishing features for identifying an object or region of interest, particularly when considering skin cancer. Textural features are regularly used in image classification because they enhance the classification of nevus and melanoma by computing the irregularity of their structure [1]. Since choosing the high-intense pixels gives more information, the model can easily differentiate Melanoma cells from Nevus cells more preciously. Therefore the proposed model shows a better result when compared with others.

Table 1: 5-Fold cross-validation experimental result using proposed IVEwCNN model

Metrics	Fold-1	Fold-2	Fold-3	Fold-4	Fold-5	Average
Sensitivity	1	1	1	0.875	0.813	0.9376
Specificity	0.894	1	1	0.789	0.895	0.9156
PPV	0.889	1	1	0.778	0.867	0.9068
NPV	1	1	1	0.894	0.85	0.9488
Accuracy	0.943	1	1	0.829	0.857	0.9258

Table 2: Result evaluation of the proposed methodology with the State-of-the-art Methods

Methods	Sensitivity (Recall)	Specificity	PPV (Precision)	NPV	Accuracy
Texture descriptor[2]	0.62	0.85	0.74	0.77	0.76
Optimized NN using PSO[3]	0.86	0.86	-	-	0.86
S. R. S. Jianu et al.[4]	0.72	0.89	0.87	0.76	0.81
S. Mukherjee et al. (PCA feature only)[5]	0.87	0.87	-	-	0.87
Proposed Methodology (IVEwCNN)	0.94	0.92	0.91	0.95	0.93

12. References:

[1] Khan, M. Q., Hussain, A., Rehman, S. U., Khan, U., Maqsood, M., Mehmood, K., & Khan, M. A. (2019). Classification of melanoma and nevus in digital images for diagnosis of skin cancer. *IEEE Access*, *7*, 90132-90144.

[2] Giotis, I., Molders, N., Land, S., Biehl, M., Jonkman, M. F., & Petkov, N. (2015). MED-NODE: A computer-assisted melanoma diagnosis system using non-dermoscopic images. *Expert systems with applications*, *42*(19), 6578-6585.

[3] Mukherjee, S., Adhikari, A., & Roy, M. (2019). Malignant melanoma detection using multi layer perceptron with optimized network parameter selection by pso. In *Contemporary advances in innovative and applicable information technology* (pp. 101-109). Springer, Singapore.

[4] Jianu, S. R. S., Ichim, L., & Popescu, D. (2019, March). Automatic diagnosis of skin cancer using neural networks. In *2019 11th International Symposium on Advanced Topics in Electrical Engineering (ATEE)* (pp. 1-4). IEEE.

[5] Mukherjee, S., Adhikari, A., & Roy, M. (2020). Malignant melanoma detection using multi layer preceptron with visually imperceptible features and PCA components from MED-NODE dataset. *International Journal of Medical Engineering and Informatics*, *12*(2), 151-168.

13. Examination board:

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