PREDICTION OF MELANOMA FROM DERMOSCOPIC IMAGES USING DEEP LEARNING-BASED ARTIFICIAL INTELLIGENCE TECHNIQUE

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College ***:*** *S.J.C. Institute of Technology, Chikkaballapura*
Branch ***:*** *Department of Electronics and Communication Engineering*
Guide(s) ***:*** *Prof. Ravi Kiran R.*
Student(S) ***:*** *Ms. Lakshmi G. N.*
Ms. Lokepalli Anvitha
Mr. Kanchukommala Jayaprakash

Introduction:

The skin cancer is a type of cancer that affects the surface of the skin. More than 5 million people in the United States have been diagnosed with skin cancer. Thus, the improvement in the diagnostic accuracy and the rate of early diagnosis is a crucial task. In this regard, both medical experts and researchers are putting their great efforts in advancing medical diagnosis, treatments, and examinations. Skin lesion is the abnormal appearance or growth of skin compared to the skin area around it. Lesions can differ in type, texture, colour, shape, affected location and distribution. They are classified into 2,032 categories that is organized into a hierarchy. Dermoscopy is one of the most widely used skin imaging techniques to improve the diagnostic performance and reduce skin cancer deaths. It is a non-invasive method in which a magnified and well illuminated picture of skin is taken to clearly see and understand the lesion area. This technique is usually used to diagnose the skin cancer in early stages and enhances the diagnostic ability of the doctors. Usually, dermatologists analyse the dermoscopic images through visual inspection, which requires a high degree of skill and concentration, and is time-consuming and prone to operator bias. The reason is that the skin infected parts and normal moles are so similar that sometimes it is hard to make an accurate diagnosis.

Objectives:

- Identify melanoma skin cancer at an early stage when it is more relatable, potentially saving lives
- It is capable to quickly identify and analyse a large number of dermoscopic images which helps in treating skin cancer without any risks.

Methodology:

Biological systems have motivated convolutionary neural networks. The communication structure between a network's neurons matches the arrangement of the visual cortex of the living being. Different neurons partly cross the receptive fields so that they occupy the whole visual field CNN consists of three tiers of neural layers

to assemble the architectures: Convolutional layer, Pooling layer, and Fully-Connected layer. There are three fundamental elements in the suggested system, such as feature extraction, detection, and classification.

- Firstly, a concurrent layer of convolution, activation, and max-pooling is used. After this, we connect parallel layers at the function level. Afterward, the flattened characteristics or features have Multi-Layer Perceptron's (MLP) into two levels, but the number of neurons at each layer that drops has to be calculated through an alteration to prevent overfitting.
- After this, the classification task was done by the final layer including the SoftMax layer. Their class activation maps are also generated in those layers. Created class activation maps function as a classification translator coupled to the last convolution layer.
- We split the flow of work into two sections. The first section is the extraction and the last section is called the classification & detection, one is for feature extraction and another is for image classification and detection respectively.

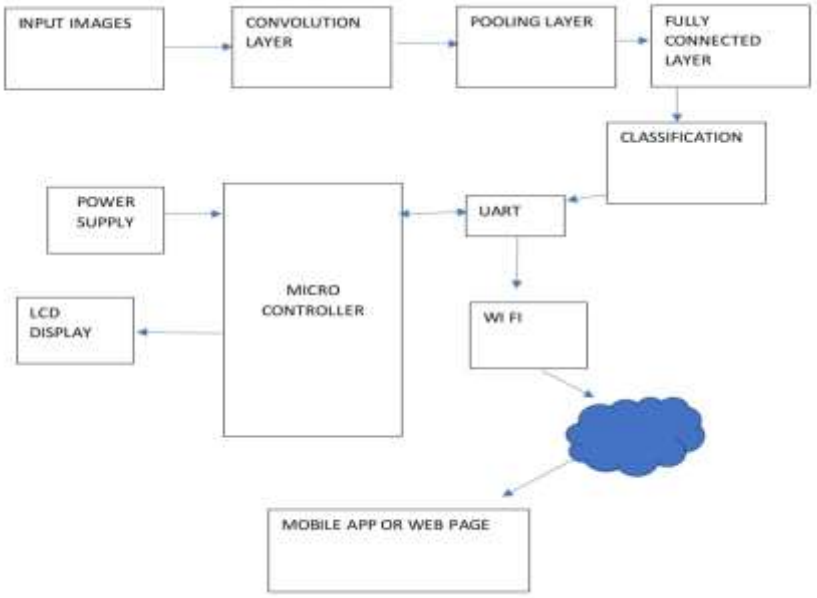

Fig 2: Workflow

Scope for future work:

- Data Collection: Dermoscopic images of skin lesions, including benign and malignant melanomas, are collected and labelled.
- Data Preprocessing: The images are pre-processed to enhance their quality, remove noise, and normalize them for consistent input.

- Model Architecture: Deep learning models, particularly CNNs, are designed to automatically learn relevant features from the images. These models can consist of multiple layers to extract hierarchical features.
- Training: The model is trained on a labelled dataset, using techniques like transfer learning or from scratch, to learn the patterns associated with melanoma.
- Digital Photographs: CNN's have been used to classify digital photographs of skin lesions as malignant.
- Mobile apps: There have been several mobile apps developed that cnns to analyze images of skin lesion and provide a prediction of whether they are malignant and non-malignant.

Reference:

[1] M. A. Kassem, K. M. Hosny, and M. M. Fouad, ''Skin lesions classification into eight classes for ISIC 2019 using deep convolutional neural network and transfer learning,'' IEEE Access, vol. 8, pp. 114822–114832, (2020).
[2] S. H. Kassani and P. H. Kassani, ''A comparative study of deep learning architectures on melanoma detection,'' Tissue Cell, vol. 58, pp. 76–83, (Jun. 2021).
[3] J. A. A. Salido and C. Ruiz, ''Using deep learning for melanoma detection in dermoscopy images,'' Int. J. Mach. Learn. Comput., vol. 8, no. 1, pp. 61–68, Feb. 2019.
[4] H. M. Ünver and E. Ayan, ''Skin lesion segmentation in dermoscopic images with combination of Yolo and GrabCut algorithm,'' Diagnostics, vol. 9, no. 3, p. 72, Jul. (2022).
[5] M. R. Zafar and N. Khan, ''Deterministic local interpretable modelagnostic explanations for stable explainability,'' Mach. Learn. Knowl. Extraction, vol. 3, no. 3, pp. 525–541, Jun. (2021).
[6] S. A. Ajagbe, K. A. Amuda, M. A. Oladipupo, F. A. Oluwaseyi, and K. I. Okesola, ''Multi-classification of Alzheimer disease on magnetic resonance images (MRI) using deep convolutional neural network (DCNN) approaches,'' Int. J. Adv. Comput. Res., vol. 11, no. 53, p. 51, (2021).
[7] H. Zunair and A. B. Hamza, ''Melanoma detection using adversarial training and deep transfer learning,'' Phys. Med. Biol., vol. 65, no. 13,(July 2020).
[8] B. H. M. van der Velden, H. J. Kuijf, K. G. A. Gilhuijs, and M. A. Viergever, ''Explainable artificial intelligence (XAI) in deep learning-based medical image analysis,'' Med. Image Anal., vol. 79, (Jul. 2022), Art. no. 102470.
[9] Y. Xie, J. Zhang, Y. Xia, and C. Shen, ''A mutual bootstrapping model for automated skin lesion segmentation and classification,'' IEEE Trans. Med. Imag., vol. 39, no. 7, pp. 2482– 2493, (Dec. 2020)
[10] B. Ankad, P. Sakhare, and M. Prabhu, ''Dermoscopy of non-melanocytic and pink tumors in Brown skin: A descriptive study,'' Indian J. Dermatopathol. Diagnostic Dermatol., vol. 4, no. 2, p. 41, (2020).