**MACHINE LEARNING PROJECT**

**Skin Lesions Classification using Computer Vision and Convolutional Neural Networks**

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**Introduction:**

Computer vision-based skin cancer detection has the potential to be very useful in the identification of skin cancer. Many lives can be saved if cancer is detected and treated early. To reliably classify skin lesions as skin cancer, it is critical to have efficient and improved image processing tools. Skin cancer is a condition caused by changes in the qualities of normal skin cells that cause them to become malignant, meaning that the cells continue to divide uncontrollably owing to DNA damage. Skin cancer has an uneven structure with cell differentiation at multiple levels of chromatin, nucleus, and cytoplasm, according to histopathology. Despite the fact that the incidence of Malignant Melanoma is lower than that of Basal Cell Carcinoma and Squamous Cell Carcinoma, the death rate is higher, accounting for 75 percent of all skin cancer deaths. Convolutional Neural Networks (CNN) are being used in the research to accurately categories pigmented skin lesions in dermoscopic pictures in order to detect malignant skin lesions as early as feasible. Convolutional neural networks (CNNs) are a type of deep neural network that uses convolution instead of conventional matrix multiplication in at least one layer. They excel at assessing visual images because they are fully-connected (FC) feed-forward networks, which efficiently minimize the number of parameters without sacrificing model quality. The study looks at two convolutional neural networks with different architecture and/or depth, as well as data pre-processing methods, to evaluate how they affect skin lesion classification performance. The CNN architecture ResNet50 and ResNet152V2 models were employed.

**ResNet50**: ResNet-50 is a 50-layer deep convolutional neural network. You can import a pertained version of the network from the ImageNet database, which has been trained on over a million photos. The network can classify photos into 1000 different object categories, including keyboards, mice, pencils, and a variety of animals. As a result, the network has learned a variety of rich feature representations for a variety of images. The network's picture input size is 224 × 224 pixels. The top-5 test accuracy is 92.7%

**ResNet152V2**: The ResNet152V2 model is followed by a reshape layer, a flatten layer, a dense layer with 128 neurons, a dropout layer, and finally a dense layer with Softmax activation function to categories the picture into its appropriate class in the model architecture. The top-5 test accuracy is 94.3%

**Dataset:**

The goal of this project is to create the best accurate machine learning model for the HAM10000 dataset in order to categories skin lesion categories in photographs ("Human against Machine with 10000 training images"). This will assist clinicians in immediately identifying high-priority patients and expediting their workflow. The dataset consists of 10015 dermatoscopic images that were provided as a training set for academic machine learning and are freely accessible via the ISIC archive. (https://www.kaggle.com/kmader/skin-cancer-mnist-ham10000).

**There are seven attributes connected with each image and patient in the dataset:**

1. lesion\_id [lesion\_id]
2. unique image\_id [image\_id]
3. diagnostic skin lesion category [dx] [To be predicted in our tests]
4. technical validation field type, which indicates how the skin lesion diagnosis was made [dx\_type]
5. patient’s age [age]
6. patient’s sex [sex]
7. localization of the skin lesion [localization]

**The following are the seven different diagnostic skin lesion classifications that must be predicted:**

1. **Melanocytic Nevi [nv]** are benign melanocyte neoplasms that exist in a wide range of shapes and sizes. The variants may differ considerably from a dermatoscopic standpoint. [6705 images]
2. **Melanoma [mel]** is a cancerous tumor that develops from melanocytes and can take many different shapes. If detected early enough, it can be treated with a simple surgical excision. [1113 images]
3. **Benign Keratosis-like Lesions [bkl]** is a flat form of seborrheic keratosis and lichen-planus-like keratoses (LPLK), which is a seborrheic keratosis or solar lentigo with inflammation and regression. [1099 images]
4. **Basal Cell Carcinoma [bcc]** is an epithelial skin cancer that rarely spreads but can be fatal if left untreated. [514 photos]
5. **Vascular lesions [vasc]** range from cherry angiomas to angiokeratomas and pyogenic granulomas and can be benign or malignant.[142 photos]
6. **Actinic Keratoses [akiec**] are a non-invasive kind of squamous cell carcinoma that can be treated locally without surgery. [327 photos].
7. **Vascular lesions [vasc]** range from cherry angiomas to angiokeratomas and pyogenic granulomas and can be benign or malignant. [142 photos]