**Presentation File**

**Problem**

*Detection of Acral Lentiginous Melanoma Using Dermoscopic Images*

**Problem Domain**

This problem is taken from Medical Imaging domain. This problem will be treated as Binary Classification Problem because we have to classify the disease in two class i.e., acral melanoma and benign nevi.

**Introduction:**

Cancer is the most lethal disease in the world. According to report of National Center for Health Statistics expected 1.8 million new cases of cancer will be diagnosed in US. Melanoma is also called malignant melanoma. Malignant tumors have the ability to grow and affect the nearby healthy cells. This process is called metastasis. Malignant melanoma has four subtypes.

* Superficial spreading melanoma
* Nodular melanoma
* Lentigo maligna melanoma
* Acral lentiginous melanoma

The Acral lentiginous melanoma which simply known as acral melanoma is most common in Africa, Central America and especially Asia with darker skin.[1] Much of the work done in the vision related tasks are based on deep learning and CNNs because off their automated feature extraction. So deep learning has the potential in vision related tasks such as the detection and classification tasks [2]. The dermoscopy technique is usually used to diagnose the melanoma. It can be used to enhance the diagnostic ability of doctors in melanoma diagnosis. It is noninvasive technique in which a magnified and well illuminated picture of skin is taken to clearly see and understand the lesion area [3]. Although dermoscopy can be helpful in the diagnosis but it requires well trained and experienced dermatologists. Detecting melanoma is still hard and challenging [1]. In this report, we proposed a deep neural network based efficient model that automatically detect the acral melanoma.

**Literature Review:**

The most related and recent work in Acral melanoma diagnosis was done in their work [3]. Where the researchers from Korea applied a CNN on a dataset which was obtained from their university hospitals. They got 750 images from different people out of which nearly half of the images were of Acral Melanoma and rest of the images were of acral benign nevi. They used augmentation and transfer learning approach to train the CNN model. VGG16 was used as pre trained model. Their model got 80.3% accuracy, 92% sensitivity and 75% specificity.

The researchers in [4] developed and implemented a CNN to investigate whether a CNN can be used to detect Acral Melanoma and help physicians in the early detection. They trained a CNN on dermoscopic images of benign nevi and acral melanoma along with some intermediate tumors. The ResNet50 was used as pre trained convolutional neural network for feature extraction and images were preprocessed to increase the accuracy. Their results showed that a CNN can help the physician in the early detection of the acral melanoma so it can be further avoided. A CNN helped the physician to decide accurately and increased the accuracy of the physician up to 8%.

The researchers [5] used transfer learning approach to detect the melanoma on PH2 which is a benchmark dataset for dermoscopic images. They showed that classification rates can be improved by removing different artifacts in the dermoscopic images. They preprocessed images by removing hairs in the images and used Alex Net as pre-trained CNN for feature extraction. They got 86% sensitivity and 94% specificity for melanoma detection.

The highest accuracy reported in the above-mentioned literatures in classifying the acral melanoma vs benign nevi patients using dermoscopy images using deep learning algorithms was 80.3% respectively. Therefore, there is significant room for improving the result either by using different deep learning algorithms or modifying the existing outperforming algorithms or combining several outperforming algorithms as an ensemble model to produce a better classification accuracy particularly in classifying acral melanoma and benign nevi skin cancer.

**Significance of the Research**

According to the data which was collected by the National Center for Health Statistics expected 1.8 million new cases of cancer will be diagnosed in US. A total of 606,520 deaths due to cancer are expected in the US in 2020. So, the figures clarify the need of more work to be done in this area. A very little work is done in this area and there was no preprocessing of the images.

For affective detection and classification of acral melanoma, in this research we will be developing an automated system for acral melanoma detection in dermoscopy images. The proposed system will first preprocess images and remove dermoscopy artifacts and then use different techniques of machine learning and deep learning techniques to detect acral melanoma and to classify the images.

**Differential Diagnosis**

The differential diagnosis for ALM is relatively broad. The differential includes other melanocytic neoplasms such as lentigo, congenital acral nevi, and acquired acral nevi. The differential for subungual ALM includes ethnic pigmentation, lentigo, and nevi. Other non-melanocytic lesions that may mimic ALM on the glabrous skin and subungual nail include fungal and bacterial infections, trauma-related hemorrhage (talon noir), terra firma-forme dermatosis, chronic wounds, verrucae, and other skin cancers which may be secondarily pigmented such as squamous cell carcinoma or porocarcinoma.

**Motivations**

* To reduce death rate due to skin cancer.
* Detection of cancer at early stage.
* Help radiologist and neurologist to detect exact type of cancer in terms of accuracy and speed.

**AIMS AND OBJECTIVES**

Based on literature review of melanoma detection, very little work is done on melanoma subtype detection and classification. Acral melanoma being a subtype of malignant must be diagnosed early. So, to address this issue this research aims to design and develop Neural Network for Acral Lentiginous Melanoma detection in dermoscopic images to improve the performance of physicians with diagnosis in early decision making of Acral melanoma.

The aim of this research is to facilitate medical professionals to detect Acral Melanoma with high expertise of consultants.

1. To investigate the accuracy of model to detect Acral Lentiginous Melanoma using dermoscopic images.

**PROPOSED METHODOLOGY**

**Relevant Dataset:**

The original dataset consists of two main folders (i.e., training and testing folders) and two subfolders containing Acral Melanoma (AM) and Benign Nevi (BN) dermoscopic images, respectively taken form (<https://figshare.com/s/a8c22c09f999f60a81bd>). A total of 724 dermoscopy images were collected from January 2013 to March 2014 at the Sev-erance Hospital in the Yonsei University Health System, Seoul, Korea, and from March 2015to April 2016 at the Dongsan Hospital in the Keimyung University Health System, Daegu, Korea. In which acral melanoma contain 350 and benign nevi contain 374 dermoscopic images. We rearranged the entire data into training and testing set. The total of 80% images are used for training set and 20% for testing set. A total of 579 images were allocated to the training set and 145 images were assigned to the testing set.