Experiment – 01

Paper 1:- Early Detection of Skin Cancer Using Deep Learning Architectures

Introduction:

The rapid increase in the prevalence of skin cancer, the most commonly observed type of cancer worldwide, has sparked significant interest in understanding its underlying causes and improving diagnostic methods. This paper aims to review the multifaceted landscape of skin cancer, encompassing its epidemiological trends, genetic origins, and the pivotal role of sunlight exposure. Additionally, the paper delves into the medical processes involved in diagnosing skin cancer, emphasizing the critical use of dermoscopy a computer-assisted diagnosis technique that leverages imaging to enhance diagnostic accuracy.

Problem Statement:

Skin cancer is one of the most prevalently seen cancer type in human beings. Skin cancer occurs due to the uncontrollable growing of mutations taking place in DNAs owing to some reasons. Recognizing the cancer in early stages could increase the chance of a successful treatment**.**

Dataset:

The study utilizes a skin cancer dataset obtained from the ISIC-Archive to achieve a classification objective. This dataset comprises a balanced collection of images featuring both benign and malignant skin moles. Each image in this dataset is of dimensions 224x224x3 pixels. The dataset is segregated into two distinct classes: benign skin moles and malignant skin moles. The training subset encompasses a total of 2437 images, with 1330 belonging to the benign class and 1107 to the malignant class. During the testing phase, 660 images are employed, including 360 from the benign class and 300 from the malignant class.

Solution:

The presented section outlines the utilization and assessment of two distinct neural network architectures, ResNet-101 and Inception-v3, for solving a classification task on skin cancer images. It showcases the architectural details, training progression, and prediction insights, shedding light on the models' classification abilities and potential implications for medical image analysis.The evaluation is conducted on a skin cancer dataset, employing both ResNet-101 and Inception-v3 models. The training process spans 60 epochs, with a gradually diminishing learning rate. Graphs depicting accuracy and loss values for both architectures are provided.

Technology:

The technologies used in this document include two different neural network architectures that is ResNet-101 and Inception-v3, for solving a classification task on skin cancer images. ResNet network uses residual connections which the gradients can flow directly through to inhibit the gradients to become zero after the applications of chain rule. ResNet-101 contains 104 convolutional layers in total. Inception-v3 Model is a commonly used image recognition model that has been shown to attain an accuracy rate of greater than 78.1% on the ImageNet dataset. The Inception-v3 is composed of a 42-layer deep neural network. Inception-v3 model consists of symmetric and asymmetric building blocks, including convolutions, max pooling layers, average pooling, dropouts, and fully connected layers

Conclusion:

In this paper, they show that two different deep learning methods can be used to diagnose skin cancer with high accuracy rates. The results obtained by using these two algorithms are above 80%. According to the results, accuracy value obtained in Resnet-101 model is 84.09%, and accuracy value obtained in Inception-v3 model is 87.42%. The results show that the classification performance with Inception-v3 model is better than the classification performance with ResNet-101 model.

Paper 2 - Skin Cancer Classification using Transfer Learning

Introduction:

The paper introduces a compelling approach for improving skin cancer diagnosis through an enhanced image classification model. They have used convolutional neural networks pre-trained on ImageNet as a fixed feature extractor and add custom layers on the top for our specific task which is a type of transfer learning, it is an approach where we used initialized weights of pre-trained networks trained on other data resources.

Problem Statement:

The paper addresses the significance of early skin cancer detection due to its high prevalence and potentially lethal consequences. It points out the challenge of visually differentiating between malignant and benign skin lesions, leading to unnecessary biopsies and resource waste. The authors aim to develop a model that serves as a preliminary diagnostic step before more invasive procedures like biopsies.

Dataset:

These paper present their methodology involving transfer learning using various pretrained models including ResNet50, InceptionV3, MobileNet, and Xception. They conduct their analysis on the HAM10000 dataset, which contains seven distinct classes of skin lesions.

Solution:

The authors propose an enhanced image classification model as a solution. They leverage the effectiveness of convolutional neural networks (CNNs) pretrained on ImageNet. The model combines these pretrained networks as feature extractors, with additional custom layers built on top. This approach constitutes a form of transfer learning, using pre-trained weights to tackle the data scarcity challenge. The proposed model architecture involves removing the top layers of pretrained networks and adding global average pooling, dropout, and dense layers. Multiple architectures are utilized, and the paper discusses the usage of class weights based on individual class frequencies to mitigate class imbalance. The training process, including the use of frozen base layers, dropout thresholds, and training epochs, is detailed.

Technology:

The technologies used in this document include different types of model such as ResNet50, MobileNet, Xception, and InceptionV3 as the base models for the classification of skin lesion images in the HAM10000 dataset.

Conclusion:

In conclusion, the paper presents a well-structured and thoughtful approach to addressing skin cancer diagnosis through an enhanced image classification model. By leveraging transfer learning and pretrained CNNs, the paper offer a potential solution to a significant medical challenge.

Paper 3 - Skin cancer detection: Applying a deep learning based model driven architecture in the cloud for classifying dermal cell images

Introduction:

These paper highlights the seriousness of skin cancer as a widespread disease and the need for early detection to improve survival rates. It discusses the limitations of current diagnostic methods and the potential of computer image analysis algorithms to enhance diagnosis accuracy. The paper's novelty lies in its approach of developing deep learning models without requiring prior programming knowledge. The paper also reviews related research in skin cancer detection and image classification, focusing on advancements in deep learning methods. It points out notable studies using convolutional neural networks (CNNs) and the International Skin Imaging Collaboration (ISIC) challenge as benchmarks.

Problem Statement:

The problem statement of these paper revolves around revolutionizing the detection of skin cancer by introducing a cloud-based model-driven architecture, powered by deep learning, to provide accurate and timely classification of dermal cell images. This approach aims to address the limitations of current diagnostic methods and improve the accessibility and effectiveness of skin cancer detection.

Dataset:

In these paper deep learning models are tested using the HAM10000 dataset, with the data divided into training, validation, and testing sets. The results of each tested model are presented, showing promising performance in terms of Receiver Operating Characteristic (ROC) values.

Solution:

Applying a deep learning based model driven architecture in the cloud for classifying dermal cell images" revolves around the urgent need to improve the accuracy and efficiency of skin cancer diagnosis. Current methods, which heavily rely on skilled dermatologists and time-consuming procedures, are insufficient to handle the growing prevalence of skin cancer cases. Early detection is crucial for improving survival rates, but challenges such as accuracy, timeliness, and limited access to specialized practitioners hinder effective diagnosis.The paper aims to address these challenges by proposing a novel approach that leverages deep learning and cloud-based architecture. The objective is to develop a model-driven system that can accurately classify dermal cell images and detect skin cancer. This approach not only promises enhanced accuracy but also tackles issues related to delays, accuracy variability among dermatologists, and a shortage of skilled professionals in the field.

Technology:

The paper introduces Deep Learning Studio (DLS), a user-friendly tool for building intelligent data discovery models. It explains the process of constructing deep learning models using DLS, starting from data preparation to setting up model parameters. Several model architectures, including CNNs like ResNet, SqueezeNet, DenseNet, and Inception V3, are tested and compared.

Conclusion:

The paper concludes by emphasizing the effectiveness of the proposed approach in simplifying the process of developing deep learning models for skin cancer detection. It highlights the significance of accurate and timely diagnosis and how this approach could address the challenges associated with dermatologist scarcity and diagnostic accuracy, the paper introduces a novel approach to skin cancer detection through deep learning models, enabling practitioners to build accurate models without extensive programming knowledge. The use of DLS and the comparison of pre-trained models provide evidence of the method's efficacy in improving accuracy and overcoming challenges in skin cancer diagnosis.

Comparison:

Criteria	Paper1	Paper 2	Paper 3
Problem Statement	Skin cancer occurs due to the uncontrollable growing of mutations taking place in DNAs owing to some reasons. Recognizing the cancer in early stages could increase the chance of a successful treatment.	Aim to develop a model that serves as a preliminary diagnostic step before more invasive procedures like biopsies.	Detection of skin cancer by introducing a cloud-based model-driven architecture, powered by deep learning, to provide accurate and timely classification of dermal cell images.
Solution	The presented section outlines the utilization and assessment of two distinct neural network architectures, ResNet-101 and Inception-v3, for solving a classification task on skin cancer images.	The authors propose an enhanced image classification model as a solution. They leverage the effectiveness of convolutional neural networks (CNNs) pretrained on ImageNet	Applying a deep learning based model driven architecture in the cloud for classifying dermal cell images" revolves around the urgent need to improve the accuracy and efficiency of skin cancer diagnosis.
Technologies	ResNet-101 and Inception-v3, for solving a classification task on skin cancer images.	ResNet50, MobileNet, Xception, and InceptionV3 as the base models for the classification of skin lesion images	Model architectures, including CNNs like ResNet, SqueezeNet, DenseNet, and Inception V3, are used.
Dataset	ISIC-Archive	HAM10000 dataset	HAM10000 dataset
Accuracy	ResNet-101:- 84.09% Inception-v3 :-87.42%	MobileNet:- 87% Xception:- 84%	Area under the curve :- 99.77% .

Conclusion	Different deep learning methods can be used to diagnose skin cancer with high accuracy rates.	In conclusion, the paper presents a well-structured and thoughtful approach to addressing skin cancer diagnosis by enhanced image classification model.	The paper concludes by emphasizing the effectiveness of the proposed approach in simplifying the process of developing deep learning models for skin cancer detection.