Experiment No. 1
Review of Deep Learning techniques
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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, "Precision Breast Cancer Detection with Deep Learning"

Introduction:

- The increasing incidence of breast cancer, one of the most common cancers worldwide, has led to a growing interest in understanding its etiology and enhancing diagnostic approaches.This research paper seeks to provide a comprehensive overview of breast cancer, covering its epidemiological patterns, genetic factors, and the potential role of early detection methods.The study will delve into the medical procedures associated with breast cancer diagnosis, emphasizing the significance of using deep learning models for improved diagnostic accuracy.

Problem Statement:

- Breast cancer is a leading cause of cancer-related mortality among women. It often arises from genetic mutations and other risk factors.

- Detecting breast cancer in its early stages is critical for increasing the chances of successful treatment.

Dataset:

-The research employs a breast cancer dataset collected from a reputable source to achieve a classification goal. This dataset comprises a balanced collection of mammography images, including both benign and malignant breast masses.Each image in the dataset has a standardized resolution.

-The dataset is categorized into two classes: benign breast masses and malignant breast masses.

Solution:

The paper presents the utilization and evaluation of deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), for breast cancer classification.It provides detailed information on the model architectures, training processes, and prediction insights, highlighting their capabilities and implications for improving breast cancer diagnosis.The evaluation is conducted on the breast cancer dataset, and training involves multiple epochs with adaptive learning rate adjustments.

Technology:

- The technology utilized in this study involves deep learning architectures like CNNs and RNNs.
- CNNs are chosen for their ability to extract features from medical images efficiently.
- RNNs are employed to process sequential data, such as patient histories and genetic information.
- The paper may also discuss the use of transfer learning techniques and the selection of hyperparameters for optimal model performance.

Conclusion:

The research demonstrates that deep learning models can be applied effectively to diagnose breast cancer with high accuracy.The results obtained by employing these models show accuracy rates above a certain threshold (e.g., 90%). The paper may conclude by discussing the comparative performance of different deep learning models for breast cancer diagnosis, potentially identifying the most promising approach.

Paper 3, Revolutionizing Breast Cancer Diagnosis: A Deep Learning Paradigm.

Introduction:

Increased incidence of cancer in recent years and its impact on different physical, mental, and social dimensions of human life have turned it to a major problem of the century . The incidence of this disease in developed countries varies from 1 to 2 percent, with almost 5% yearly increase in less developed countries . According to estimates, more than 7 million people globally die from cancer. It is predicted that the number of new cancerous cases rises from 10 to 15 million by 2020 . Meanwhile, breast cancer is the most prevalent type of malignant neoplasms among women with more than one million new cases per year . In Iran, breast cancer accounts for the major type of cancer among women with the incidence of 21.4 , or 32% . Breast cancer is the most common type of cancer among women in the US with the incidence rate of 12.5%. The risk of an individual dying from breast cancer is 1-in-35 . At present, the chance of developing breast cancer over lifespan is 12% (1-in-8) in the United States . Regarding the importance of this issue, this study sought to investigate breast cancer and its associated factors.

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 demographic data and risk factors were analyzed by SPSS (ver. 20, Chicago, IL, USA). 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.

Solution:

The buffy coat samples were used for DNA extraction using the phenol–chloroform–isoamyl alcohol method, as described in a previous study . PCR was performed using the repetitive element (*RE*) gene amplifying a region of 529 base pairs (bp) fragments. The primers are highly sensitive and specific for *T. gondii* due to 200–300 replications in the *T. gondii* genome . The PCR primers and cycling conditions were described in previous reports . For each reaction, a positive control (DNA extracted from the RH strain of *T. gondii*) and a negative control (double-distilled water) were included. PCR products were electrophoresed in 2% agarose gel, stained with safe stain (Sinaclon, Iran), and visualized under a UV transilluminator.

Technology:

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:

There findings showed a high seroprevalence rate of anti-*T. gondii* IgG in breast cancer patients. Although we did not detect active infection, reactivation of chronic infection due to immunosuppression should not be neglected among patients with malignancies. Nonetheless, such studies need to be done in a larger sample. Screening programs for detection of toxoplasmosis (due to reactivation of chronic infection) could be recommended as a routine follow-up among breast cancer patients.