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NOVEL METHOD VITAMIN DEFICIENCY DETECTION USING ALEXNET DNN ALGORITHM

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ABSTRACT
Vitamin deficiencies can have significant impacts on overall health and well-being. Early detection plays a crucial role in preventing complications and improving outcomes. However, traditional methods for detecting deficiencies can be time-consuming and costly. This project aims to develop a novel method for detecting vitamin deficiencies using the AlexNet DNN algorithm, a powerful deep learning model for image classification. The purpose of this project is to explore the feasibility of using image analysis and deep learning techniques to detect vitamin deficiencies accurately and efficiently. The objectives include improving the accuracy of detection, reducing false positives and negatives, and developing a reliable and accessible tool for early detection. To achieve our objectives, we will gather a large dataset of images depicting various vitamin deficiencies. These images will be preprocessed to enhance features and reduce noise. The AlexNet DNN algorithm will be trained on this dataset, learning to recognize patterns and features associated with different deficiencies. The algorithm will undergo rigorous testing and evaluation to ensure its effectiveness.
KEYWORDS – *Vitamins, Deficiency, AlexNet, Deep Neural Network(DNN), Effectiveness*

I. INTRODUCTION

Vitamins are essential nutrients that our bodies cannot produce on their own. They play a crucial role in maintaining good health and preventing diseases. Vitamin deficiencies can have significant impacts on overall health and well-being. Early detection plays a crucial role in preventing complications and improving outcomes. Traditional methods for detecting vitamin deficiencies, such as blood tests and physical examinations, can be time-consuming, invasive, and expensive. However, traditional methods for detecting deficiencies can be time-consuming and costly. This project aims to develop a novel method for detecting vitamin deficiencies using the AlexNet DNN algorithm, a powerful deep learning model for image classification. This project aims to develop a novel method for vitamin deficiency detection using the AlexNet deep convolutional neural network (DNN) algorithm. The goal is to create a non-invasive, fast, and accurate method for diagnosing vitamin deficiencies that can be used in a variety of clinical settings.

One problem that affects more than two billion people globally is vitamin deficiency. One in three children do not get enough vitamins, according to the WHO. A common problem, vitamin deficiency affects over two billion individuals globally. One out of every three children does not get enough vitamins, according to the WHO. Thirty-three percent of young children under five suffer from a vitamin A deficiency. This syndrome manifests as night blindness and low immunity. Vitamin deficiencies can affect people of any age, and they often accompany deficiencies in minerals (such as iron, zinc, and iodine). The populations most at risk for vitamin deficiencies are youngsters and pregnant women because of their needs for these compounds and susceptibilities to their absence. The most prevalent A lack of vitamins highlights hundreds of health problems that we face on a daily basis, many of which are caused by inadequate diet and/or mineral acquisition. Accurately monitoring our dietary requirements is challenging, particularly when people lack medical guidance and are unaware of the specific type of shortage they may be experiencing. Almost 2 billion people globally are deficient in certain vitamins . Every year, half a million people who are zinc deficient die, numbering over 1.2 billion. In a similar vein, anaemia brought on by an iron shortage claims the lives of over 100,000 individuals. Locally, deficits in several vitamins affect about 90% of the population in the United Arab Emirates. Even though there isn't a famine crisis affecting the entire nation, data gathered on American soil indicates that over 92% of people have at least one vitamin or mineral deficit. Because cheap, readily available processed junk food is so widely available, nutrient-rich meals are now seen as expensive and have shifted from being the usual daily food intake to more of a status symbol.
vitamin deficits are related to folate, vitamin D, vitamin A, and vitamin B. Diseases like pellagra and scurvy have become infrequent because to supplementation programs Vitamin deficits emphasize many of the health issues we deal with on a daily basis. Our incapacity to receive the necessary variety of important minerals and nourishment is the cause of many of these problems. Measuring our nutritional needs is difficult, especially when people don't know what kind of shortfall they might be going through and don't have access to medical counsel. Insufficient amounts of vitamins impact around 2 billion individuals worldwide. Over 1.2 billion people globally are zinc deficient, and 500,000 of them die each year as a result.

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II. METHODOLOGY

1. Proposed System

In the proposed system, high-quality image processing utilizes AlexNet DNN for improved accuracy and comprehensive detection of multiple vitamin deficiencies simultaneously. Alexnet is a deep convolutional network that was developed for image classification and was a breakthrough in the field of computer vision AlexNet was one of the first CNNs to successfully utilize techniques such as ReLU (Rectified Linear Unit) activation functions, dropout regularization, and data augmentation. These techniques helped improve the training speed and generalization performance of deep neural networks. Which gives better performance compared to other algorithms giving high accurate results.

2. AlexNet Deep Neural Network(DNN):

Eight layers make up the architecture: three fully-connected layers and five convolutional layers. However, these are not the qualities that set AlexNet apart; instead, they are some of the novel methods to convolutional neural networks that it uses. AlexNet is a very strong model that can achieve high accuracy on very difficult datasets. However, AlexNet's performance will be significantly reduced if any of the convolutional layers are removed. With its superior architecture for all object-detection tasks, AlexNet holds great potential for use in solving computer vision-related artificial intelligence challenges. AlexNet might be used more often for picture jobs in the future than CNNs. AlexNet is also recognized for introducing deep learning to related domains like medical image analysis and natural language processing, which is a significant step toward expanding the field's applicability.

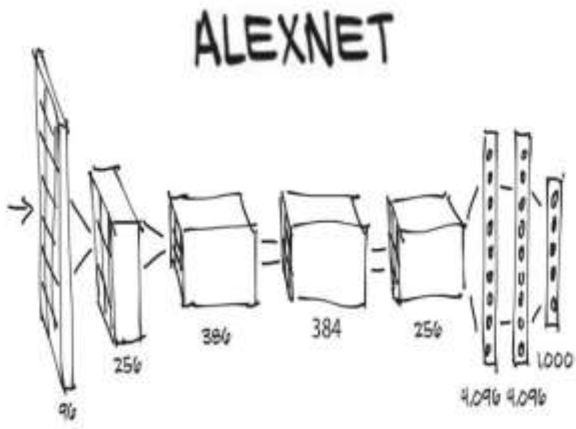

Fig1: AlexNetDNNArchitecture

3. Overview Of Proposed System:

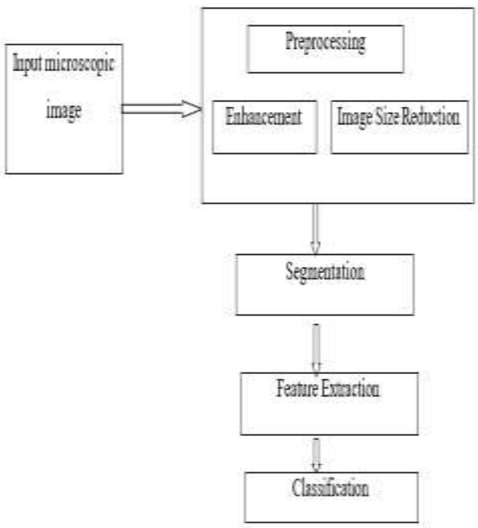

Fig : General Block Diagram Of Proposed System

3.1. Input Microscopic Image:

The cell samples collected are placed under a light microscope and digitized using a customized digital camera. The images are properly labeled and stored. The sputum cytology images are so chosen such that the target region contains glandular cells.

3.2. Preprocessing Stage

The input digital images may contain noises of various types as physical and biological. The physical noise such as impulse noise or due to power line frequency may possibly interferes with the image. These kinds of noises need to be dealt at an earlier stage otherwise can affect the proper functioning of the algorithm. The biological noises are of various types. In this work, focus is given for glandular cells only so anything other than this type of cell may have to be considered as biological noise. These usually include the presence of blood cells, leukocytes, or other non-cellular objects like mucus, pollen etc. All these types are to be marked as unwanted and have to be removed from further processing

3.3. Segmentation Stage

This stage properly marks out the position of glandular cells in the image. Various image processing algorithms are needed for this purpose. Sometimes a single algorithm may not give satisfactory segmentation and hence different algorithms are in parallel and chose the best output. Since clusters are dealt rather than individual cells it is often not possible to separate the clusters in a proper manner. So it is necessary to make segmentation an approximate one keeping the margin of error at a very low level.

3.4. Feature Extraction Stage

The segmentation results are fed into a feature extraction module. There using various image analysis techniques morphological, textural, color and scale based features are extracted. All these features are properly labeled and stored for further analysis.

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3.5. Classification Stage

Classification is the crucial step in the entire operation as it is in this stage that the decision is taken whether the sample is malignant or benign. To train the system, the initial sample images are used.

III. IMPLEMENTATION

The lack of nutrition detection using neural networks and image processing entails building a model that can examine people's photos and spot nutrient deficiency symptoms. The effectiveness of the model is critical to correctly identifying and classifying different kinds of deficiencies, such as deficiencies in vitamins A, B, C, D, or E. A dataset of photos featuring people with and without nutrient deficits is gathered in order to put this model into practice. The neural network uses this dataset as training data. Preprocessing is applied to the photos in order to standardize the data and improve attributes connected to defects. The pre-processed images are then used to create and train a AlexNet Deep Neural Network(DNN).Multiple layers make up the AlexNet, which predicts the shortcomings by extracting pertinent information from the input images. Gradient descent algorithms are used to optimize the model once it has been trained using a suitable loss function. After training, the model's accuracy and performance are assessed using a different test dataset. The model's accuracy in classifying nutrient deficits is measured using evaluation measures. When people's photos are sent into the trained neural network, the deployed model may identify vitamin deficiencies in real-time.

Fig 3:Images From Dataset

IV. LITERATURE SURVEY

"Deep Learning for Medical Image Analysis" by Daniel Rueckert et al. (2017):

This book provides an overview of various deep learning techniques applied to medical image analysis, including convolutional neural networks (CNNs) like AlexNet. It discusses the potential of CNNs in detecting patterns related to diseases, which can be extended to detecting symptoms of vitamin deficiency in medical images.

"Automated Diagnosis of Nutrient Deficiency in Plant Images Using Machine Learning" by S. M. Kamrul Hasan et al. (2018):

Although focused on plant images, this paper presents a similar concept of using deep learning algorithms for detecting nutrient deficiency. It discusses the effectiveness of CNNs, such as AlexNet, in analysing images for specific features indicative of deficiencies, which could be adapted for detecting symptoms in human subjects.

"Automated Diabetic Retinopathy Detection in Smartphone-Based Fundus Photography Using Artificial Intelligence" by Michael D. Abramoff et al. (2018):

While not directly related to vitamin deficiency, this paper showcases the application of deep learning, including CNNs, in medical image analysis. It highlights the potential for using similar techniques to detect health conditions from images, which could be extended to detecting symptoms of vitamin deficiency.

"Deep Learning for Health Informatics" by Shuiwang Ji et al. (2017):

This comprehensive book covers various applications of deep learning in health informatics, including medical image analysis. It provides insights into the state-of-the-art techniques and methodologies, offering valuable guidance for implementing deep learning algorithms like AlexNet for detecting symptoms of vitamin deficiency from medical images.

"Detection of Diabetic Retinopathy Using Deep Convolutional Neural Networks" by Gulshan et al. (2016):

This seminal paper demonstrates the effectiveness of deep learning, particularly CNNs, in detecting diabetic retinopathy from retinal fundus photographs. While focusing on a different medical condition, the methodology and insights presented can be adapted for detecting symptoms of vitamin deficiency using similar deep learning approaches

V. TEST RESULTS

The test results of the considering project i.e; vitamin deficiency detection using AlexNet Deep Neural Network(DNN) is shown below:

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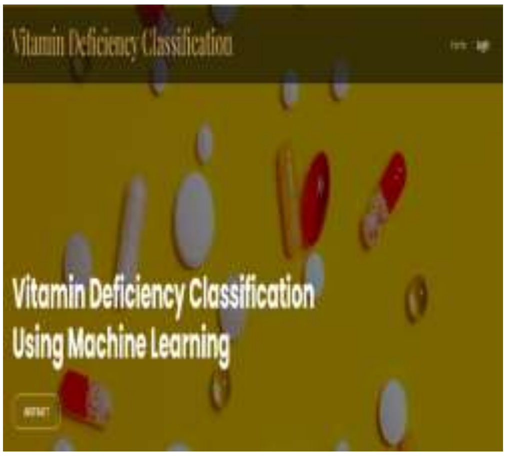

Fig 4: Home Page

Fig 5 : Login Page

Fig 6: Clustering Page

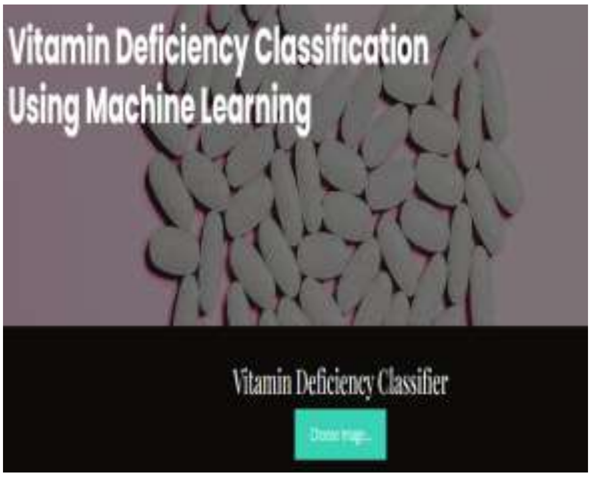

Fig 6 : Prediction page

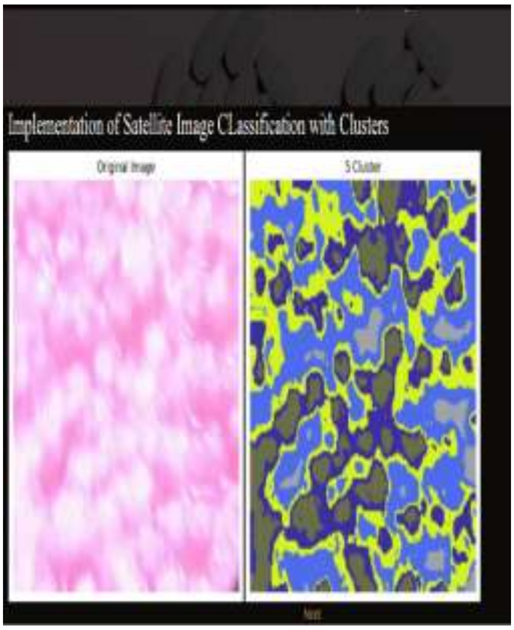

Fig 7: Output of Predicted Image with Clustered Image

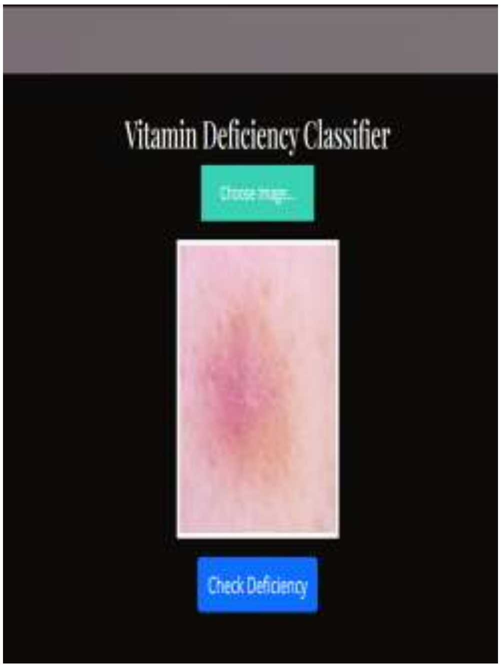

Fig 8:Analysis Page

Fig 4:Output Image

VI. CONCLUSION AND DISCUSSIONS

The objective of our study is to investigate a good method for automated analysis of tissue images for the purpose of detecting and recognizing Vitamin Deficiency diseases .The proposed method can recognize with accurately, in comparison to other methods and is potentially a powerful tool for the recognition of Vitamin Related diseases. The platform also enables medical experts to enhance the application's detection range and accuracy by contributing and verifying visual data from their patients. This study proposes a novel approach for detecting vitamin deficiencies using image processing techniques and Deep Neural Networks (DNNs). In this project, a classic image processing algorithm is designed to segment the lesion picture for shape analysis. After demonstrating the dataset and method used in this project, performance analysis shows that the algorithm can have an even better performance on extracting shapes than the labels do. Finally, some improvement suggestions are proposed to have further optimization of the algorithm.

In the future, advancements in this project could include the development of more accurate and sophisticated algorithms for analysing images. Additionally, there may be advancements in imaging technologies that can capture more detailed and precise images, allowing for even more accurate analysis.

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