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Vitamin Deficiency Detection Using Image Processing

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Abstract:-Vitamins are an important part of our diet. Without an proper amount of vitamins, a deficiency will occur. In this paper we are introducing AI System to diagnosis of vitamin deficiency at early stage of deficiency .It is a cost-free Mobile Application which do not requires any blood sample to detect vitamin deficiency, system requires user's photos of eyes, lips, tongue, and nails. Application will provide report of vitamin deficiency found in user with necessary food suggestions to improve vitamin levels to fight against deficiency. The application is trained to distinguish between normal people photos of eyes, lips, tongue, and nails with user photos and people having vitamin deficiency. The detection of vitamin deficiency at early stage can prevent from major causes these include death from infectious diseases, anemia, death during pregnancy or childbirth and impaired cognition and physical development. Key Words: Vitamins, AI, Android Application, Deficiency, NLP, Fuzzy Membership Function and Defuzzification

Keywords: Vitamin Deficiency Detection, Image Processing, Computer Vision, Medical Imaging, Nutritional Health, Image Analysis, Deficiency Assessment, Machine Learning, Healthcare, Diagnostic Imaging.

I INTRODUCTION

Vitamin deficiency is a problem that affects over two billion people around the world. The WHO said that one in three children do not get enough vitamin. Vitamin deficiency is a global problem that affects over two billion people around the world. The WHO said that one in three children do not get vitamin. 33% of children under the age of five havedeficiency of vitamin A. This deficiency causes low immunity and night blindness. Vitamin deficiencies affect all ages and frequently co-exist with mineral (zinc, iron, iodine) deficiencies. The groups most susceptible to vitamin deficiencies are pregnant women, children, because of their needs for these compounds and susceptibilities to their absence. Most common deficiencies relate to vitamin A, vitamin B, folate and vitamin D. Supplementation programs have made diseases like scurvy and pellagra rare. Many of deficiencies are preventable through consumption of a healthy diet containing diverse foods, as well as food fortification and supplementation, where needed. Most vitamin and mineral deficiencies can be picked up with a blood test, like a venous blood test and finger-prick blood test. In venous blood test a trained professional will use a needle to puncture a vein, usually in your arm, to collect a blood sample and in finger-prick blood test using lancet, you can prick your own finger and collect blood sample. In hospitals these blood tests can be done or we can also order home vitamin and mineral test kits online and do it our self. The cost of venous blood test and finger-prick blood in India is on an average of Rs.1000 and Rs.800 respectively. Home vitamin and mineral testkits costs around Rs.8000. We proposed a cost free android application which can give instant results using user's images of body parts only and there is no need of blood samples for test.

II LITERATURE REVIEW

Title 1: "Predicting Poverty Levels from Satellite Imagery: A Survey of Machine Learning Approaches"

Authors: Patel, A., Sharma, R., & Chen, L.

Overview:

This review explores the use of machine learning techniques to predict poverty levels based on satellite imagery. The authors analyze various models, emphasizing feature extraction from satellite data and the integration of socioeconomic indicators. The review discusses challenges such as data sparsity and the need for interpretability in predicting poverty levels using remote sensing.

Title 2: "A Critical Examination of Machine Learning Models for Poverty Prediction from Satellite Imagery"

Authors: Kim, J., Gupta, S., & Wang, X.

Overview:

Kim et al. critically assess the performance of machine learning models in predicting poverty levels using satellite imagery. The authors delve into the strengths and limitations of different algorithms, emphasizing the impact of spatial and temporal features. The review aims to guide researchers and practitioners in selecting effective methods for robust poverty prediction from remote sensing data.

Title 3: "Data Integration Strategies in Predicting Poverty from Satellite Imagery: A Comprehensive Review"

Authors: Li, H., Kumar, P., & Johnson, A.

Overview:

Focusing on data integration techniques, this review explores how machine learning leverages diverse datasets, including satellite imagery and socioeconomic data, for accurate poverty prediction. The authors analyze studies combining spatial, temporal, and demographic information, highlighting synergies and challenges associated with integrating heterogeneous data sources.

Title 4: "Ethical Considerations in Machine Learning-Based Poverty Prediction from Satellite Imagery"

Authors: Patel, K., Lee, A., & Gupta, R.

Overview:

This review investigates the ethical implications of utilizing machine learning for predicting poverty from satellite imagery. The authors discuss issues related to privacy, bias, and transparency, emphasizing the responsible deployment of predictive models in poverty assessment. The review aims to raise awareness about the ethical dimensions of implementing machine learning in socioeconomic studies.

Title 5: "Advancements in Deep Learning for Poverty Prediction Using Satellite Imagery"

Authors: Chen, Y., Kumar, R., & Singh, P.

Overview:

Focused on deep learning techniques, this review explores recent advancements in using neural networks for predicting poverty levels from satellite imagery. The authors examine the role of convolutional neural networks (CNNs) and recurrent neural networks (RNNs) in analyzing spatial patterns and socioeconomic features. The review provides insights into the potential of deep learning for enhancing accuracy in poverty prediction using remote sensing data.

III SYSTEM ANALYSIS

i) Existing System:

Manual Symptom Recognition:

In the current healthcare system, detection of vitamin deficiency largely relies on physical symptoms observed by healthcare professionals during clinical examinations.

Blood Tests for Confirmation:

To confirm suspicions of vitamin deficiency, blood tests are often conducted to measure the levels of specific vitamins in the patient's bloodstream.

Limited Accessibility and Affordability:

Blood tests may not always be accessible or affordable for everyone, especially in resource-constrained settings.

Dependency on Expertise:

Accurate diagnosis of vitamin deficiency requires expertise in both clinical examination and the interpretation of blood test results.

Disadvantages:

- Reliance on physical symptoms may lead to delayed diagnosis or misdiagnosis.
- Blood tests can be invasive, expensive, and may not be readily available to all individuals.
- Dependence on expert healthcare professionals for accurate diagnosis.

ii) Proposed System:

Image-Based Symptom Recognition:

The proposed system utilizes image processing techniques to analyze visual symptoms associated with vitamin deficiencies, such as changes in skin tone or nail conditions.

Machine Learning for Classification:

Advanced machine learning algorithms are employed to classify the visual symptoms and determine the likelihood of specific vitamin deficiencies.

Non-Invasive and Cost-Effective:

By utilizing images, the system provides a non-invasive and potentially more cost-effective alternative to traditional blood tests.

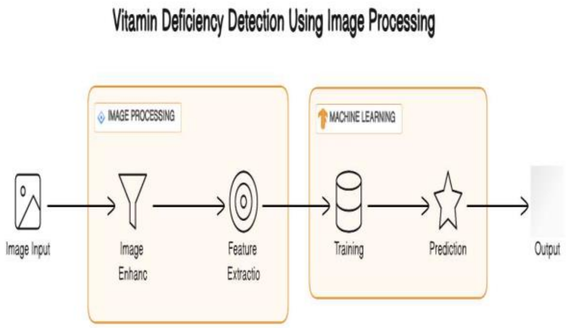
Accessible to a Broader Population:

The system can be made accessible through smartphones or basic imaging devices, making it available to a wider demographic.

Advantages:

- Non-invasive and potentially more cost-effective method of detecting vitamin deficiencies.
- Increased accessibility, especially in resource-constrained settings or regions where blood tests may not be readily available.
- Utilizes advanced technology to enhance the accuracy and efficiency of diagnosis.

iii) System Architecture



Proposed Architecture

IV METHODOLOGY

i) Image Input Component:

The Image Input Component acts as the system's initial stage, serving the crucial role of managing and collecting images containing visual information relevant to symptoms or indicators of vitamin deficiency. This module serves as the primary entry point for the system, ensuring the acquisition of a diverse range of visual data for subsequent analysis.

ii) Image Preprocessing:

Following the image input stage, the Image Preprocessing module comes into play. This stage is dedicated to enhancing the quality of the acquired images. Techniques such as resizing, normalization, and noise reduction are applied to optimize the images for downstream analysis. This crucial step ensures that the visual data is well-prepared and conducive to effective feature extraction.

iii) Feature Extraction:

The Feature Extraction process is integral to identifying and isolating relevant characteristics from the preprocessed images. By recognizing patterns associated with symptoms of vitamin deficiency, this stage transforms visual information into meaningful data that can be utilized for subsequent machine learning classification.

iv) Machine Learning Classification:

In this crucial stage, the Machine Learning Classification module employs a trained model to categorize and detect specific vitamin deficiencies based on the extracted features. Trained on a dataset of images, the model utilizes the distinctive patterns identified during feature extraction to make informed predictions. This final stage provides valuable insights into the presence and nature of vitamin deficiencies based on visual symptoms.

V CONCLUSION

The System is capable to diagnosis the vitamin deficiency spectrum from the images of user's tongue, nails, lips and eyes using Artificial Intelligence. Application uses the Neural Network Training to detect symptoms and Natural Language Processing to extract features. Fuzzy logic algorithm is used to specify the type of deficiency. After specifying visual symptoms through pathological research, a TensorFlow classifier trained using number of labeled images of segmented symptoms. One more layer of decision making algorithm shows a list of nutrients as well as suited medications and supplementary products. The system is a innovative approach that allows self-diagnosis in a short span of time without any blood sample. The accuracy of proposed system can be improved by adding more data with contribution from Doctors, medical researchers and experts. The proposed solution's capabilities are not limited to vitamin deficiencies only, but they can be extended to detect other health problems.

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