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Micronutrient Deficiency Using Image Processing and Neural Network

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***Abstract:** Vitamin and micronutrient deficiencies are a significant global health concern, leading to various adverse health consequences. Early detection and intervention are essential in addressing these issues. The project introduces an intelligent system that utilizes advanced deep learning techniques to identify and differentiate vitamin deficiencies in human tissue through image analysis. The approach involves an initial step of image clustering to separate and isolate problem areas from the input images. The goal is to evaluate the productivity of image segmentation methods, extract relevant characteristics, and compare classification results with other methods. To accomplish the objectives, a diverse dataset of facial images is gathered and pre-processed, focusing on individuals both with and without visible signs of vitamin deficiencies Following this, a CNN algorithm, inspired by models like Alex Net, is created and trained using the pre-processed dataset. The CNN isused to identify and classify features based on different types of vitamin deficiencies, enabling an automated andaccurate assessment based on facial images.*
***Keywords:** Micronutrient deficiency, Image Clustering, Preprocessing, Convolutional Neural Networks (CNNs),Feature Extraction, Nutrition Deficiency Symptoms*

I. INTRODUCTION

Micronutrient deficiency detection is the process of identifying insufficient levels of essential vitamins in the human body. These nutrients plays a important role in our health, influencing functions like energy production, immune response, and overall well-being. Identifying micronutrient deficiencies early can help prevent healthissues and promote a balanced lifestyle.

The skin is a dense organ, and its health is directly tied to overall health and wellness. Thus, proper attention should be paid to skin health and the early detection of skin disorders and diseases, including skin cancers. By doing so, individuals can take proactive measures to maintain their skin health and improve their chances of avoiding serious conditions such as skin diseases.

The goal is to acknowledge the patterns and characteristics associated with the deficiency and to categorize the images according to the information.The medical and health sciences fields have shown growing interest in employing Machine Learning (ML) and Deep Learning(DL) techniques to enhance clinical decision making.

The CNN algorithm is trained on this dataset, learning to recognize distinctive features and patterns that differentiate between normal and deficient states. Once trained, the CNN is capable of accurately classifying new images and identifying potential micronutrient deficiencies based on learned patterns. This automated approach provides a rapid and objective means of detection.

Micronutrients, like vitamin A, B, C, D, and E, each of these vitamins plays a unique role in supporting different perspective of well-being.

Vitamin A enhances our immune system, defending our body against illnesses and supporting our eyes for better vision in low light.

Vitamin B can result in various health issues through supplementation or dietary changes can bring advantages, such as improved energy levels.

Vitamin C protects us from getting sick, and it also makes sure our skin, blood vessels, and bones stay strong.

Vitamin D helps human body, making sure it absorbs calcium, which is important for keeping bones and teeth strong.

Vitamin E is like a shield for our cells, acting as an antioxidant that protects them from damage. It also supportsa healthy immune system.

II. LITERATURE SURVEY

1) Authors: - Diaa Adden Abuhani, Jowaria Khan, Hana Sulieman.

Vitamin A deficiency is usually detected through clinical assessments of eye signs or biochemically determined by measuring the concentrations . The medical and health sciences fields have shown growing interest in employing Machine Learning (ML) and Deep Learning (DL) techniques to enhance clinical decision making. To tackle this problem, researchers investigated. using machine learning (ML) techniques on existing health records to detect Vitamin A deficiency in children.

2) Authors:- K.V. Satyanarayana, Gangireddy Pujitha, Battulavishal, Indukuru pranay varma.
Two technological advancements for healthy eating habits: a personalized diet recommendation system and a vitamin deficiency detection and recommendation project. The firstsystem analyses user data to suggest customized meal plans,while the second project focuses on identifying deficienciesand recommending nutrient-rich foods.

3) Authors: - Rutuja Moholkar, Mansi Kamble, Gauri Bobade,Sai Jyoti Shinde.
Develop an Android Application and cost-free desktop app that uses images to detect vitamin deficiencies instead of expensive and inconvenient blood tests. Users upload images of specific body parts like tongue and nails, and image processing techniques are used to analyse and extract features, Neural Network and Fuzzy Membership Function and Defuzzification. study focuses on automated facial skindisease detection using algorithms. This approach aims for a faster and easier alternative to traditional blood tests.

4) Authors: - Elavarasi K, Shanmugapriya K.
Support Vector Machine and Blur Trace (BT) techniques Region-based Convolutional Neural Network. diagnosing vitamin deficiency by above algorithms for skin images. this will help us to Early detection of skin conditions, like Normal, Benign, or Malignant. this is crucial for improvingsurvival rates, emphasizing the significance of skin health.

5) Authors: - Dr. Arati Dandavate, Priyanka Gore, Namita Naikwadi, Shrushti Sable, Muskan Tilwani.
By introducing AI System to diagnosis of vitamin deficiency at early stage of 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.

6) Authors: - Mrs Shivani Devakar, Dr. Sachin Bere S.
It consists of image acquisition, preprocessing, and segmentation, alongside feature extraction and classification. Analysing symptoms and their correlations isessential for accurate detection. Functional requirements include implementing video surveillance with automated convolutional neural network technology. The use of CNN algorithm also played a very crucial role in the entire programming and evaluation of the current situations of theneurons

III. METHODOLOGY

To detect vitamin deficiencies using Convolutional Neural Networks (CNN), we begin by collecting different medical images that show symptoms of various deficiencies. We clean and organize these images carefully. Then project uses the AlexNet model for image classification, we create a smart computer model (CNN) that learns from these pictures to recognize patterns connected to specific vitamin issues.

1) *Input the Image:* - Start by uploading or inputting the image containing physical symptoms potentially indicative of micronutrient deficiencies into the system.
2) *Image Cropping:* -Utilize techniques to crop the input image, focusing on isolating specific regions or areas that exhibit notable symptoms related to vitamin deficiencies.
3) Formation of Clustered Image:-Group similar regions or clusters within the cropped image based on visual similarities, allowing for more targeted analysis and featureextraction.
4) *Feature Extraction:* - Feature extraction involves identifying and isolating important characteristics from clustered images, such as texture, colour, shape, and intensity variations. These extracted features are essential for recognizing distinct patterns *linked to particular nutrientdeficiencies.*
5) *Classification:* -Utilize classification algorithms like convolutional neural networks or other machine learning models to evaluate the extracted features. This process categorizes the clustered images into various deficiency classes, aiding precise diagnosis and intervention strategies.
6) *Predict deficiency:* - The result display presents the detected deficiency and its corresponding description to the user. This information is generated based on the analysis ofthe uploaded image using the neural network model. Users receive concise feedback regarding the identified deficiency.

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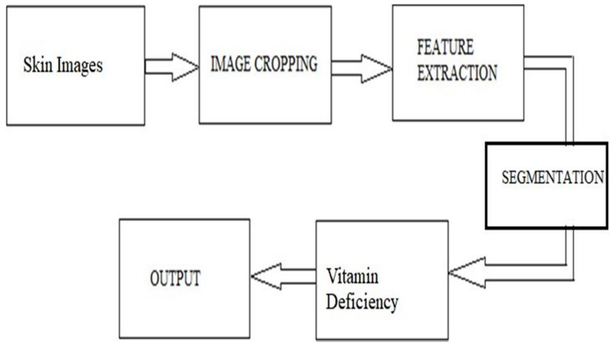

Fig 1 (A) methodology process

A. Use Case Diagram:

The User uploads an image, triggering the system to detect vitamin deficiencies, annotate the image accordingly, and display relevant deficiency information for user awareness.

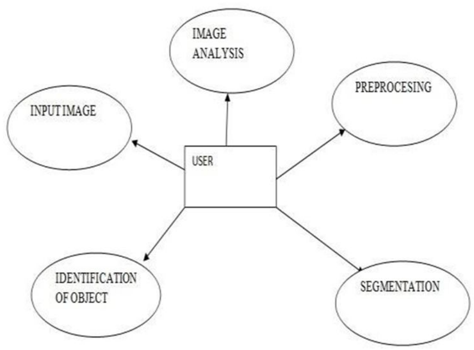

Fig 1 (B) use case diagram

Author	Year	Algorithm	Observation
Mrs. Shivani Devakar R, DrSachin Bere S	2023	CNN	Detecting vitamin deficiency using AI and programming techniques. It outlines a systematic approach involving, image analysis, feature extraction, and classification.
K.V. Satyanarayana, Gangireddy Pujitha,	2023	KNN, decision trees, randomforests, logistic regression	Micronutrients proposes a comprehensive solution involvingmachine learning techniques to identify deficiencies and recommend appropriate foods rich in the deficient vitamins.
Rutuja Moholkar	2023	Image processing,neural networks, fuzzy membership functions, and defuzzification	Using image processing and neural networks, eliminating the need for blood samples. By analyzing images of the eyes, lips, tongue, and nails, the system can identify deficiencies and provide dietary recommendations.
Elavarasi.K, Shanmugapriya K.	2023	SVM	By integrating advanced image processing techniques withmachine learning algorithms, the system achieves high accuracy in categorizing skin images into normal, benign,or malignant categories.
Dr. Arati Dandavate, Priyanka Gore	2021	AI, NLP, and Fuzzy Logic fordetection	Detecting vitamin deficiencies using image processing, NLP, and fuzzy logic algorithms. By analyzing user-submitted images of skin the system can diagnose deficiencies without the need for blood samples.

Diaa Adden Abuhani Jowaria Khan, Hana Sulieman.	2023	KNN, LGB, Logistic Regression,Extreme Gradient Boosting (XGB), Categorical Boosting (CB),Random, SVC.	Uses machine learning model to detect Vitamin A deficiency in humans using symptoms and diagnoses from routine eye exams. By applying target encoding and various machine learning techniques, the model achieves significant improvements in accuracy, sensitivity, and specificity compared to previous methods
Ms. A. Bhavana	2014	Random Tree, Knapsack, orTOPSIS.	Utilizing various algorithms and datasets, it aims to accurately predict deficiencies and recommend suitable foods.

B. Dataset Images

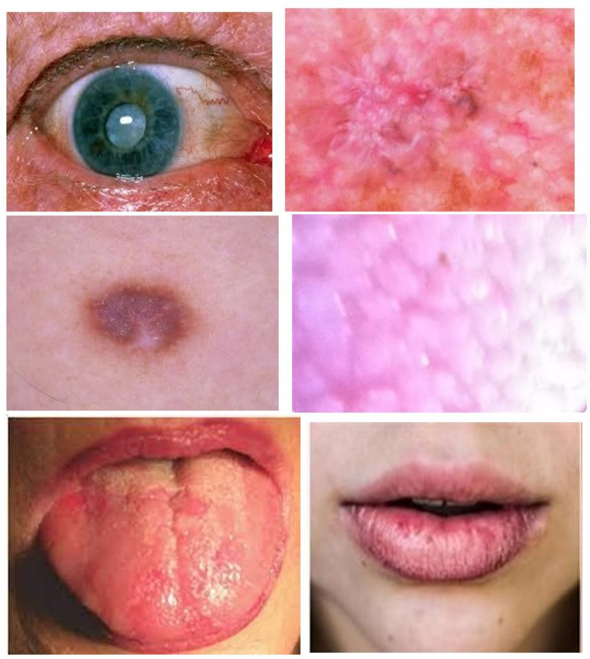

Fig 2: - image datasets

Fig 3: - Front-end picture for uploading image

C. *Cluster Image*

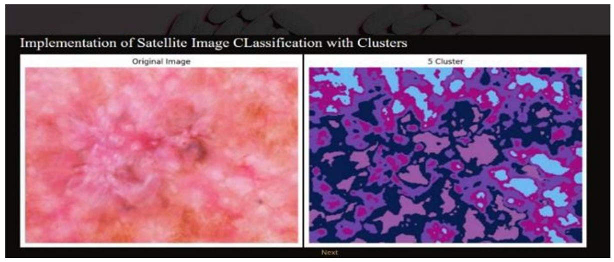

Fig 4: - clustered copy

Fig 5: - final output image with deficiency

The project output consists of annotated images depicting detected vitamin deficiencies in individuals, utilizing image processing and convolutional neural network. Each deficiency isclearly labelled, providing visual feedback for personal diagnosis. Furthermore, alongside the deficiency annotations, dietary intervention suggestions are included, showcasing specific foods known to address each deficiency. This personalized approach aims to enhance awareness and facilitate informed decision-making regarding individual nutritional health, empowering users to take proactive steps towards improving their well-being.

IV. RESULTS AND DISCUSSIONS

The utilization of Convolutional Neural Network (CNN) models, drawing inspiration from architectures like Alex Net, has advanced the field of Micronutrient deficiency detection through skin image analysis. With an impressive accuracy, this methodology showcases significant advancements in identifying deficiencies in vitamin A, B, C, D, and E. This method is really good at spotting signs of vitamin deficiencies. It works so well because it uses smart techniques to break down pictures of affected skin and find specific areas that might show signs of lacking certain vitamins. This helps make the method work better for everyone. It helps doctors figure out what's wrong and howto assist individuals who might not have enough vitamins. So, using this technology to look at affected skin areas might help doctors to determine if someone has vitamin problemsearly on, which implies they can obtain help more. This could be a big deal in healthcare because it could change how we find and treat vitamin deficiencies.

V. FUTURE SCOPE

The future scope for detecting vitamin deficiencies using CNN (Convolutional Neural Networks) involves leveragingthis technology to analyse medical images like skin scans. CNNs excel at pattern recognition, making them eligible foridentifying subtle signs of deficiency. This approach could lead to more precise and quicker diagnosis through automated systems, improving efficiency in healthcare. Additionally, integrating CNNs with portable devices couldenable easy and accessible at-home screenings, enhancing the overall management of vitamin deficiencies.

VI. CONCLUSION

Employing a systematic approach for detecting vitamin deficiencies in vitamin A, B, C, D, and E is crucial for maintaining overall health. By monitoring these essential vitamins, potential imbalances or deficiencies can be identified early, allowing for timely intervention and correction. This proactive strategy serves as a preventive measure, ensuring that individuals receive adequate nutritional support to support various bodily functions. The incorporation of reliable detection methods contributes to a holistic approach to healthcare, emphasizing the significance of balanced vitamin levelsfor optimal well-being.

REFERENCES

[1] S.Khare, “Identification Of Vitamin D Deficiency,” National Library Of Medicine Journal, vol. 05, no. 03, pp. 3456-3465, 2023.

[2] D. A. Abhuhani, “Detecting Vitamin A Deficiency Using Machine Learning,” IEEE Publisher, vol. 05, no. 10, p. 709, 2023.

[3] K.V.Satyanarayana, “Identification Of Vitamin Deficiency And Recommendation Of Rich Vitamin Food Using Machine Learning,” Journal Of Survey In Fisheries Sciences, vol. 10, no. 02, pp. 2766-2777,2023.

[4] R. Moholkar, “Vitamin Deficieny Detection Using Image Processing And Neural Network,” International Journal Of Advance Research And Innovative Ideas In Education, vol. 09, no. 03, pp. 4175-4183, 2023

[5] E. K, “Diagnosis Of Vitamin Deficiency In Human Beings Using DNN Algorithm,” IEEE publisher, vol. 10, no. 03, pp. 1627- 1632, 2023.

[6] D. Dandavate, “Vitamin Deficiency Detection Using Image Processing And Artificial Intelligence,” International Research Journal Of Engineering And Technology, vol. 08, no. 04, pp. 3421- 3424, 2021.

[7] H. Tamune, “Efficient Prediction Of Vitamin B Deficiencies Using Machine Learning,” Frontiers, vol. 10, no. 06, pp. 1-9, 2020.

[8] M. D. R, “Review Paper Writing For Vitamin Deficiency Detection,” Journal Of Emerging Technologies And Innovative Research, vol. 10, no. 03, pp. 386-392, 2023.

[9] Ms.A.Bhavana, “Vitamin Deficiency And Food Recommendation System Using Machine Learning,” Journal Of Emerging Technologies And Innovative Research, vol. 09, no. 05, pp. 413-417, 2022

[10] J.J.Knapik, “Clinically Diagnosed Vitamin Deficiencies And Disorder In Entire United State Military Population,” Nutrition Journal, vol. 08, no. 03, pp. 601-609, 2021.