JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Image Based Vitamin Assessment Using CNN

[1]Dhanush S Jadhav, [2]Shithej S Suvarna, [3]Sumanth, [4]Swathi S Bhat, [5]Dr. Parvathraj K M M,

[1,2,3] Student, [5]Assistant Professor [1,2,3,4]Artificial Intelligence And Machine Learning, Srinivas Institute of Technology,Mangalore,India

Abstract : This project presents a user-friendly system that uses deep learning to detect vitamin deficiencies by analyzing images of the skin, lips, eyes, tongue, and nails. It combines an intuitive web interface with a powerful ResNet-50 model to classify images and provide quick predictions along with personalized dietary advice. The system is built with React, FastAPI, Flask, and Streamlit, offering a secure, non-invasive, and accessible solution for early detection and health awareness.

IndexTerms **- Deep Learning, Vitamin Deficiencies, Image Analysis, ResNet-50, Classification, Dietary Advice, Web Interface**

I. INTRODUCTION

This project provides an easy, non-invasive way to detect vitamin deficiencies using machine learning and computer vision. By analyzing images of the skin, eyes, lips, tongue, and nails, the system can predict deficiencies and offer personalized dietary advice. Users upload images through a simple web interface built with React and Tailwind CSS, while the backend, powered by FastAPI and Flask, ensures secure and scalable data handling. The system uses a fine-tuned ResNet-50 model for accurate predictions and a Streamlit app to visualize results. This solution makes it easier for people, especially in resource-limited areas, to identify potential health issues early and take preventive action with tailored advice.

II. *LITERATURE SURVEY.*

[1].“VITAMIN DEFICIENCY DETECTION USING IMAGE PROCESSING AND NEURAL NETWORKS” (2024) The literature review on vitamin deficiency detection using image processing and CNNs highlights a shift towards non-invasive diagnostic methods leveraging advancements in artificial intelligence. Traditional approaches, such as blood tests, are costly and invasive, whereas image-based systems analyze visual markers like changes in the eyes, lips, tongue, and nails. Recent studies emphasize the effectiveness of Convolutional Neural Networks (CNNs) for feature extraction and classification, achieving high accuracy in identifying deficiencies like vitamins A, B12, and D. These systems utilize pre-trained models and diverse datasets, often coupled with mobile or desktop applications, for real-time detection and monitoring.

[2]."NON-INVASIVE VITAMIN DEFICIENCY DETECTION USING IMAGE PROCESSING AND DEEP LEARNING TECHNIQUES: A CNN-BASED APPROACH” (2024).
The development of non-invasive systems for vitamin deficiency detection using image processing and neural networks represents a significant advancement in healthcare diagnostics. Traditional methods, such as blood tests, though reliable, are invasive, time consuming, and costly. Recent studies have demonstrated the potential of deep learning, particularly Convolutional Neural Networks (CNNs), in identifying visual biomarkers associated with deficiencies in vitamins like A, B12, and D. For instance, features extracted from images of the eyes, lips, tongue, and nails enable systems to diagnose deficiencies accurately without clinical intervention. In their proposed model, researchers utilized a CNN-based framework to train datasets of facial and physical features. Preprocessing steps, including image enhancement and feature detection, facilitated high accuracy in predicting deficiencies. Mobile Net and ANN methods have also been applied to augment model robustness, with additional potential for real-time and portable diagnostic applications. While the results are promising, challenges such as dataset diversity, computational intensity, and scalability require further exploration.

[3]. “IMAGE PROCESSING FOR VITAMIN DEFICIENCY DETECTION” (2023).
Vitamin deficiencies are a global health concern affecting over 2 billion individuals, with significant implications for physical and cognitive development. Traditional diagnostic methods, such as blood tests, are invasive and resource-intensive, prompting th exploration of alternative approaches. Image processing and artificial intelligence (AI), particularly Convolutional Neural Networks (CNNs), have emerged as innovative tools in this domain. By analyzing visual features from images of body parts like the tongue, lips, nails, and eyes, these methods provide non-invasive and cost-effective diagnostics.
This paper proposes an NLIDB system that allows natural language queries instead of SQL, using an expert system in Prolog for semantic analysis. It maps synonymous terms to database attributes, improving accuracy through a knowledge base and inference engine. Future enhancements include image-based query detection and Persian language support.

III. METHODOLOGY

In this project, users upload images of their skin, eyes, lips, tongue, or nails through a web interface built with React and styled using Tailwind CSS. These images are first preprocessed by resizing, enhancing, and normalizing them to improve clarity and consistency. The system then uses a fine-tuned, pre-trained ResNet-50 model to analyze the images and detect visible signs of vitamin deficiencies. Based on the analysis, the model predicts possible deficiencies and provides personalized dietary recommendations to help address them. The backend, developed with FastAPI and Flask, ensures secure data handling and smooth communication between the interface and the AI model. Finally, a Streamlit application presents the results in a simple, user-friendly format, offering both predictions and helpful health advice. This makes the entire process non-invasive, quick, and accessible for users looking to monitor their nutritional health.

IV. PROPOSED MODEL

The proposed model uses a fine-tuned, pre-trained ResNet-50 deep learning network to detect vitamin deficiencies by analyzing images of the skin, eyes, lips, tongue, and nails. Users upload images through a React-based web interface, where the images are pre processed and then examined by the model for signs of deficiencies. Based on its analysis, the system predicts possible vitamin deficiencies and provides personalized dietary advice. The backend, built with FastAPI and Flask, securely handles data processing, while a Streamlit app presents the results in a simple, user-friendly format, offering a non-invasive, fast, and accessible health monitoring tool.

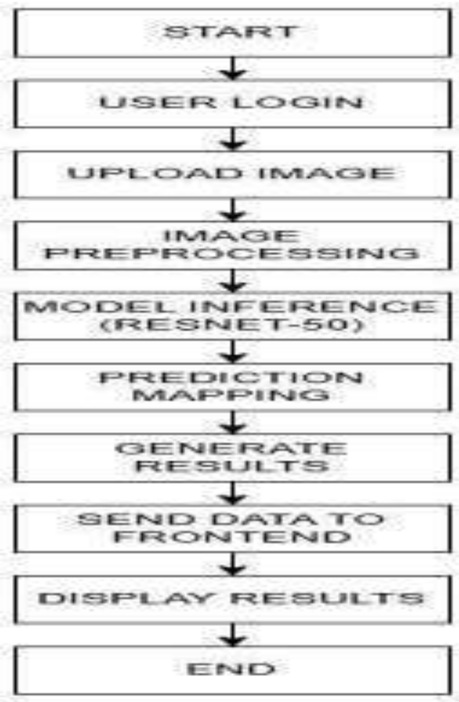

Fig 1 : System Architecture of Image Based Vitamin Assessment

This diagram is a flowchart representing the process of an image-based prediction system using a deep learning model, specifically ResNet-50. Here's an explanation of each step

1. **1. Start**:
   The beginning of the process.
2. **User Login**:
   The user authenticates by logging into the system.
3. **Upload Image**:
   The user uploads an image that they want to analyze or get predictions for.Image Preprocessing:
   The uploaded image is processed to make it suitable for the model input. This typically includes resizing, normalization, and format conversion.
4. **Model Inference (ResNet-50)**:
   The pre processed image is passed through a pretrained ResNet-50 model, which extracts features and makes predictions based on the image content.
5. **Prediction Mapping**:
   The raw output (such as class probabilities or feature vectors) from the model is mapped to human-readable categories or classes.
6. **Generate Results**:
   The mapped predictions are formatted into a result set, possibly including labels, confidence scores, or other relevant data.
7. **Send Data to Frontend**:
   The generated results are sent to the frontend interface where the user can view them.

8. **Display Results**:
   The results are visually presented to the user, often with image annotations or textual descriptions.
9. **End**:
   Marks the end of the prediction process

V. RESULT AND DISCUSSION

The evaluation of the model's performance is based on various metrics, including accuracy, model loss, and heat maps.
Model Performance Evaluation

1.Accuracy and Model Loss: The model was trained using a batch size=16 and the accuracy of the generated SQL queries was evaluated. The accuracy was found to be satisfactory, indicating that the model is successfully able to translate natural language queries into SQL. As expected, with the increased number of training epochs, the model showed improvement in accuracy, which was captured in the accuracy graph. Similarly, the model loss decreased over time, which suggests the successful convergence of the model during training.
Evaluation Loss: 0.668834924697876
Evaluation Accuracy: 0.8958249688148499

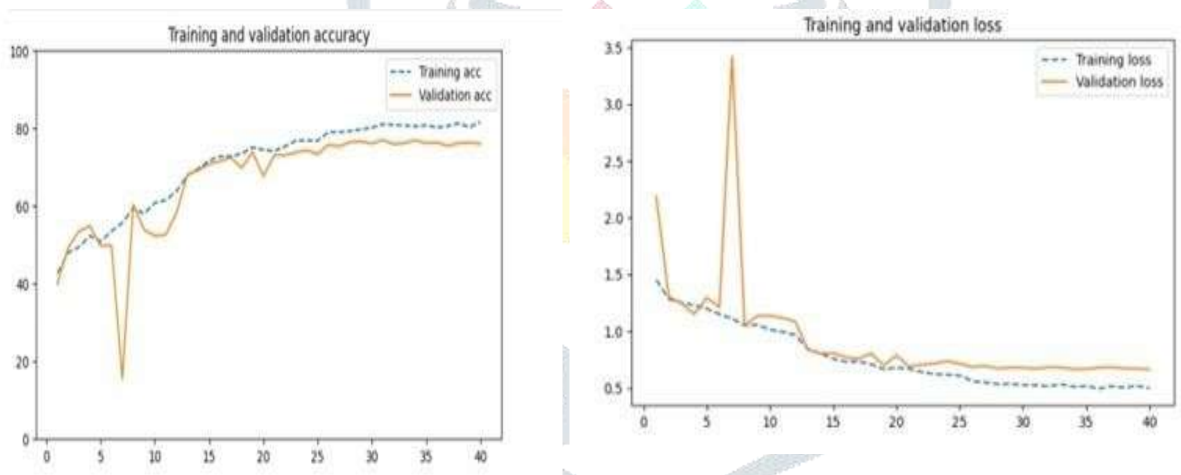

Fig 2: ***Accuracy and model loss result obtained***

The model starts off making mistakes but quickly improves. There's a brief spike in validation error, likely due to noisy data, but it stabilizes. Overall, both training and validation loss decrease steadily, showing good learning and no overfitting.

VI. CONCLUSION AND FUTURE WORK

This vitamin deficiency detection system uses smart machine learning to analyze skin images and spot possible vitamin issues. It's built with a friendly design, using a strong ResNet-50 model to recognize skin conditions and suggest helpful diet tips. The system runs smoothly thanks to a modern front-end (React) and a solid back-end (Python), making it both easy to use and reliable. In the future, it could be improved by detecting more skin problems, adding telemedicine features, boosting security, and moving to cloudplatforms for better access and trust. These upgrades would make it even more useful for supporting skin health and overall well- being.

REFERENCES

[1]. Cynthia Hayat, Barens Abian, "The Modeling of Artificial Neural Network of Early Diagnosis for Malnutrition with Backpropagation Method", 2018.

[2].Bambang Lareno, Liliana Swastina, Husnul MaadJunaidi, "IT Application to Mapping The Potential Of Malnutrition Problems, 2018.

[3].Sri Winiarti, Sri Kusumadewi, Izzati Muhimmah, Herman Yuliansyah, "Determining The Nutrition of Patient Based on Food Packaging Product Using Fuzzy C Means Algorithm", 2017

[4].Archana Ajith, VrindaGoel, "Digital Dermatology Skin Disease Detection. Model using Image Processing". 2017.
https://thebiostation.com/bioblog/nutrient-iv-therapy/do-youhavevitamin-deficiency/.

[5].Adult blindness secondary to vitamin A deficiency associated with an eating disorder. [online] Available at: https://www.ncbi.nlm.nih.gov/pubmed/15850971.

[6].Vitamin a deficiency and clinical disease: an historical overview. [online] Available at: https://www.ncbi.nlm.nih.gov/pubmed/18806089

[7].Glossitis with linear lesions: an early sign of vitamin B12 deficiency. [online] Available at: https://www.ncbi.nlm.nih.gov/pubmed/19231648.

[8]."Angular Cheilitis, Part 1: Local Etiologies" (PDF). www.skinandallergynews. Archived from the original (PDF) on 2013- 12- 16. Retrieved 2014-04-21

[9].https://www.researchgate.net/publication/344432204_Vitamin_B12_deficiency_in_chil d ren_from_Northern_India_Time_to_reconsider_nutritional_handicaps

[10]“ Vitamin Deficiency Detection Using Image Processing and Neural Network” by Ahmed Saif Eldeen, Mohamed AitGacem, Saifeddin Alghlayini, Wessam Shehieb and MustahsanMir (2020).

1