

# VITAMIN DEFICIENCY DETECTION USING CNN AND ARTIFICIAL INTELLIGENCE

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## ABSTRACT

Any diseases and ailments that can manifest visible signs and indications at different body regions may be brought on by an innutritious diet. Many shortages can be avoided by eating a balanced diet that includes a variety of foods. The application gives users the capacity to independently identify any vitamin deficiencies they may have by analyzing photographs of their eyes, lips, tongue, and nails without the need for blood samples. This app will provide you with a report on any vitamin deficiencies you may have, along with recommendations for foods to increase your vitamin intake and combat deficiencies. Convolutional neural networks with a deep learning foundation are used to implement this technique. Here, the dataset of the tongue, lips, and eyes are considered. Preprocessing follows consideration of the dataset.

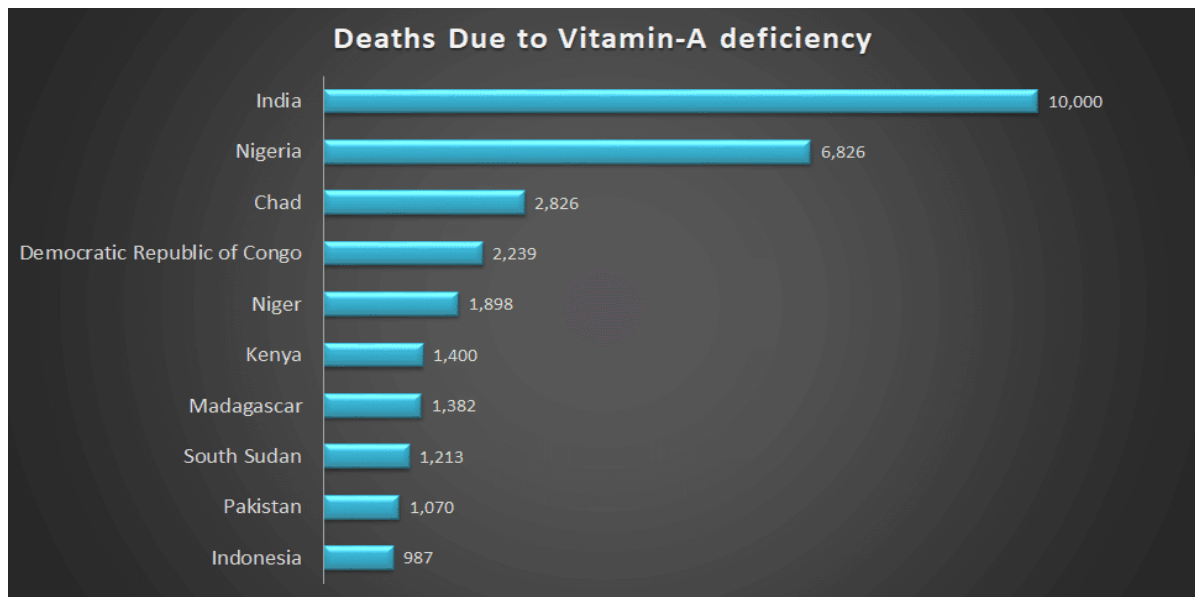
**Key words:** Vitamin deficiency, deep learning, CNN, Open CV

## INTRODUCTION

Vitamin deficiency is the condition of a long-term lack of a vitamin. Vitamin is a micronutrient that is not prepared by the body in sufficient amounts. This is the reason why it is necessary to take in from outside sources for the normal functioning of the body. Inadequate intake of vitamins results in vitamin deficiency diseases.

More than seven out of ten Indians lack vitamins, most of them suffer from Vitamin D deficiency. India is coming to grips with a stage of nutrition transition. According to the Food Safety and Standards Authority of India (FSSAI), preventable micronutrient deficiency is arising public health precedence in India. According to the Comprehensive National Nutrition Survey of children (CNNSC) between 0 and 19 years in 2019 in India, zinc deficiency was observed in 19 % of pre-school children and 32 % of adolescents, whereas 23 % of pre-school children and 37 % of adolescents were deficient in folate. Vitamin B12, vitamin A and vitamin D deficiencies (VDDs) range between 14 and 31 % for pre-school children and adolescents. In a community-based cross-sectional study in rural India from eight states, the prevalence of Bitot's spots was 0.8 %, while the prevalence of anaemia was 67 % among pre-school children and 69 % among adolescents, and the prevalence of IDD measured by Goitre prevalence was 3.9%.

A balanced diet is crucial for a person's overall health. Any dietary imbalance could cause a person to consume too much or too little of a certain nutrient. A deficiency illness can result from consuming insufficient amounts of a certain nutrient. The project's primary objective is to help people identify their nutritional deficiencies and learn about the necessary foods to prevent them.



### LITERATURE SURVEY

**Glossitis with linear lesions:** The typical oral symptoms of vitamin B(12) insufficiency are thought to be non-specific. The oral linear lesions of 4 patients with vitamin B(12) insufficiency are described here. At the time of diagnosis, patients had no anaemia or neurological symptoms. According to the research, glossitis with linear lesions is a clinical indicator of vitamin B(12) insufficiency. Even when anaemia is not present in such patients, measuring their vitamin B(12) levels is advised.

**Vitamin D in health and disease:** In response to sunshine, the prohormone vitamin D, which is fat-soluble, is produced. In addition to altering blood calcium and phosphate levels, vitamin D has a number of functions in the body that affect bone health. According to experimental data, vitamin D may lower the risk of cancer through controlling cellular differentiation and proliferation as well as preventing angiogenesis. The active vitamin D metabolite 10,25 (OH)D inhibits the proliferation of cancer cells. 87% of patients with triple-negative breast cancer had insufficient serum 25(OH)D levels. The amount of UV light, which is the main source of vitamin D, is inversely associated to the mortality rate from prostate cancer.

**Atrophic glossitis from vitamin B12 deficiency: a case misdiagnosed as burning mouth disorder:** There are a variety of causes for glossodynia, or the painful sensation of the tongue, including localised infection, trauma, nerve injury, glossitis, the mysterious neuropathic pain syndrome, and burning mouth condition (BMD; also known as burning mouth syndrome). Several causes of glossodynia can be distinguished with careful history-taking, physical examination, and proper laboratory tests, which can also guide subsequent treatment. A 73-year-old woman presented with several months of glossodynia subsequently consulted an otolaryngologist, who pursued further diagnostic evaluation. A meaty, red, smooth tongue was discovered during an examination, and additional laboratory testing confirmed macrocytosis and a low serum vitamin B(12) level. Three months of oral vitamin B(12) treatment resulted in a slight improvement in symptoms and a partial restoration of serum vitamin B(12) levels.

Atrophic glossitis and glossodynia owing to vitamin B(12) deficiency, most likely caused by pernicious anaemia, were the ultimate diagnoses made for her.

Adult blindness secondary to vitamin A deficiency associated with an eating disorder: This case report includes a review of the medical literature along with a clinical, ophthalmologic, and laboratory description. A 33-year-old lady who had an eating disorder for 17 years was diagnosed with bilateral conjunctival xerosis, a right eye corneal ulcer that was inflamed, and a significant descemetocele in the left eye. Clinical and laboratory results supported a vitamin A deficit. Her left eye perforated despite a tectonic penetrating keratoplasty, necessitating evisceration. The ocular findings in her right eye and her clinical condition were both improved by vitamin A treatment. According to the current study, individuals with severe dry eye and corneal ulcers should have vitamin A insufficiency owing to eating disorders taken into account when making a differential diagnosis.

Vitamins and Oral Health: Vitamins are necessary organic substances that speed up metabolic processes. Moreover, they serve as antioxidants, electron donors, or transcription effectors. Vitamin A deficiency has been linked to periodontitis, hypoplasia of the enamel, delayed tooth development, and decreased oral epithelial growth. A lack of vitamin D during tooth formation may cause non-syndromic hypoplasia and dysplasia of the enamel and dentin as well as amelogenesis and dentinogenesis imperfecta. Vitamin B deficiencies are linked to recurrent aphthous stomatitis, enamel hypomineralization, cheilosis, cheilitis, halitosis, gingivitis, glossitis, atrophy of the lingual papillae, and stomatitis, whereas vitamin C deficiencies cause alterations in the gingivae and bone as well as xerostomia. An oral injury or undergoing oral surgery may be affected by vitamin K's systemic action, which raises the risk of haemorrhage.

The Diagnosis and Treatment of Nail Disorders: Around 50% of nail diseases are caused by infectious agents, 15% by inflammatory or metabolic issues, and 5% by malignancies and pigment issues. Clinical examination, dermatoscopy, diagnostic imaging, microbiological (including mycological) tests, and histological analysis are used to evaluate nail problems. With a point frequency of about 15%, onychomycosis affects about 10% of the general population. More rarely than fungus colonisation, nail infections caused by bacteria. Dialysis patients, cancer patients, transplant recipients, and diabetics are among the high-risk populations for nail abnormalities. The average time it takes to diagnose subungual melanoma is about 2 years from the time the first symptom appears; this delay contributes to the disease's poor 10-year survival rate of about 43%. An essential tool for diagnosis is the evaluation of the nail organ. Important differential diagnoses, such as cancer, medication side effects, and bacterial infections must be taken into account in addition to the prevalent nail illness onychomycosis.

**Clinical manifestations of the mouth revealing Vitamin B12 deficiency before the onset of anaemia:** It is already recognized that a vitamin B12 deficiency and oral symptoms are related. Although the symptoms are not unique to vitamin B12 insufficiency, they may indicate it, and this is frequently overlooked and causes delays in diagnosis. There have been two occurrences of reported Vitamin B12 insufficiency, which were manifested by stomatodynia, glossitis, and oral erosions. Two women, one with atrophic glossitis and the other with stomatodynia that had gotten worse recently, both 51 and 76 years old, sought treatment. The biological tests

Identified a single case of macrocytosis without anaemia. The serum could not be used to assess vitamin B12. In less than a month after starting replacement therapy, the symptoms subsided. Similar to our two patients, the majority of cases of vitamin B12 insufficiency documented in the literature were either treated for other causes or only identified months or years after their onset. Severe neuropathies are caused by vitamin B12 deficiency. When replacement therapy is started at an early stage, the neurological damage is repairable. It is critical that these indicators be identified and diagnosed prior to the emergence of serious aftereffects since the oral signs manifest before the change in the systemic markers of insufficiency.

**METHODOLOGY**

The application provides individuals with the capability to diagnose their possible vitamin deficiencies without the need to provide blood samples through the analysis of photos taken of their eyes, lips, tongue, and nails. This process is implemented using the deep learning-based CNN algorithm. Here we have considered the dataset of eyes, lips, tongue and lips. Once after the consideration of dataset, the preprocessing is performed and then CNN algorithm is used to train the data. Once after the training, model is saved and the testing is performed using the OpenCV. The block diagram of the proposed system is shown in below diagram.

System:

Create Data set :The dataset containing images of human parts with vitamin deficiency which are to be classified is split into training and testing dataset with the test size of 30-20%.

Pre-processing: Resizing and reshaping the images into appropriate format to train our model.

Training: The pre-processed training dataset is used to train our model using CNN algorithm.

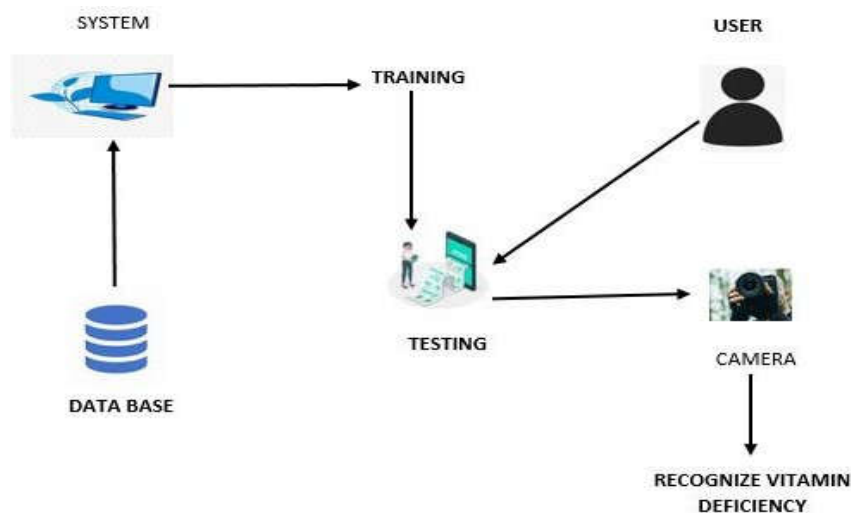
Classification: The result of our model is a display of classified vitamin deficiency.

User:

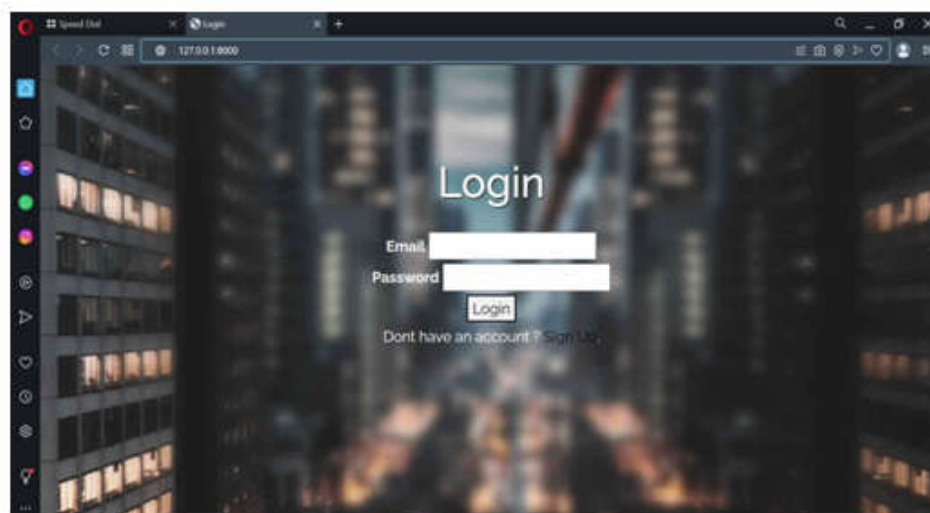
Input image: The user can give their specified body part image.

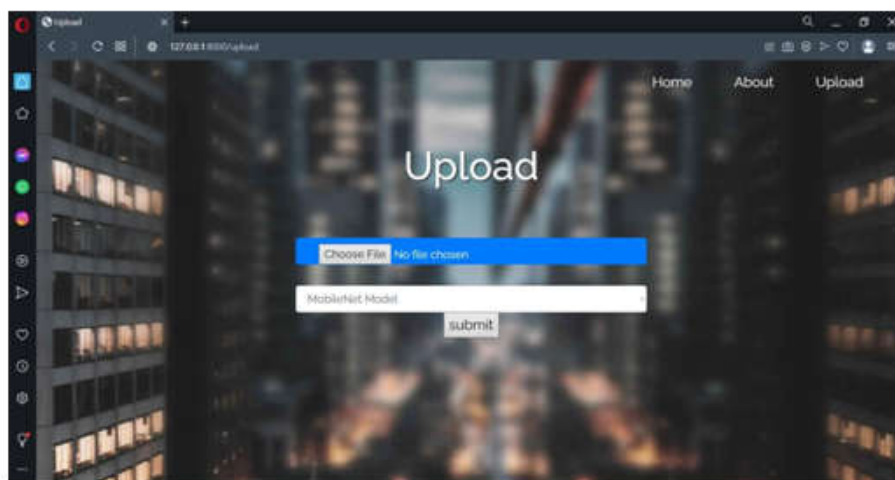
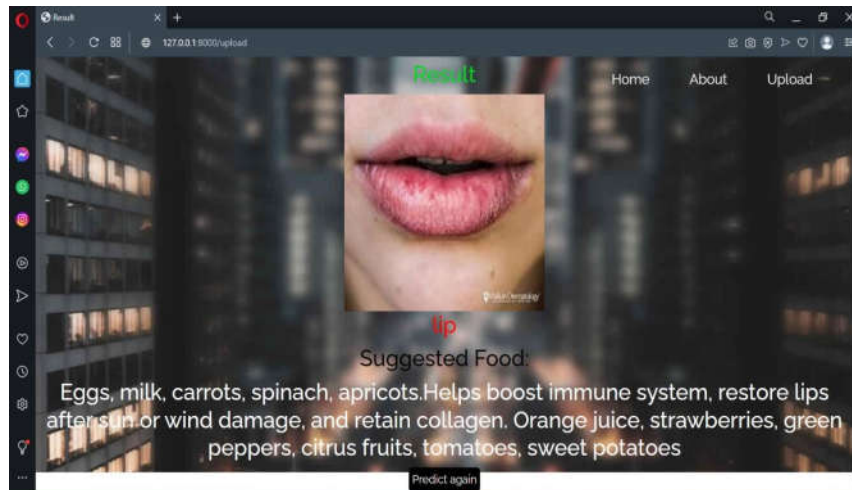
View Results: The classified image results are viewed by user.

Architecture:



**Results:**





## CONCLUSION

Using the Convolution Neural Network (CNN) from deep learning and Open CV, we predicted vitamin insufficiency in our suggested model. We used the CNN deep learning method to train while taking into account a dataset of the eye, lips, tongue, and nails. After the training is finished, we utilized Open CV to identify and predict vitamin deficiencies.

## FUTURE SCOPE

In the future, this technique can be expanded to classify more categories of predictions from various classifications, and we can utilize various transfer learning algorithms to provide better predictions.

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