

A Survey Paper on Various Techniques used in Detection of Vitamin Deficiency using Image Processing and Neural Network

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Abstract—Numerous vitamin deficiencies might manifest as one or more easily recognizable signs and symptoms that emerge in various parts of the body. Through examination of photos of their eyes, lips, tongue, and nails, the program gives users the opportunity to identify any vitamin deficiencies they may have without giving blood samples. The CNN algorithm, which is based on deep learning, is used to carry out this operation. Here, the dataset of the eyes, lips, tongue, and lips has been considered. Following the analysis of the dataset, pre-processing is carried out, and the data is subsequently trained using the CNN method. Following training, the model is stored, and OpenCV is used for testing.

Index Terms— Vitamin deficiency, deep learning, CNN, OpenCV.

I. INTRODUCTION

The condition known as vitamin deficiency is brought on by a persistent vitamin deficiency. A secondary deficiency is one brought on by an underlying illness like malabsorption, whereas a primary deficiency is one brought on by inadequate vitamin ingestion. A metabolic problem may be the underlying cause, such as a genetic flaw that prevents tryptophan from being converted to niacin, or lifestyle factors like smoking and alcohol consumption that raise vitamin requirements. According to government recommendations on vitamin deficiency, healthy adults should consume particular amounts of vitamins, with various recommendations for women, men, newborns, the elderly, and women who are pregnant or breastfeed. To combat the most prevalent vitamin deficiencies, many nations have established laws requiring vitamin food fortification.

On the other hand, symptoms brought on by excessive vitamin consumption, particularly of fat-soluble vitamins that can build up in human tissues, are referred to as hyper vitaminosis. The history of the discovery of vitamin deficiencies developed over many centuries, starting with observations that certain illnesses, like scurvy, could be prevented or cured with certain foods having a high amount of a vital vitamins. For their efforts in the discovery of vitamins, numerous scientists received the Nobel Prize in Physiology or Medicine or the Nobel Prize in Chemistry throughout the 20th century.

Vitamin deficit is a condition that results from a sustained vitamin insufficiency. Inadequate vitamin intake causes a primary deficit; an underlying disease, such as malabsorption, causes a secondary deficit. A metabolic problem may be the underlying cause, such as a genetic flaw that prevents tryptophan from being converted to

niacin, or lifestyle factors like smoking and alcohol consumption that raise vitamin requirements. According to government recommendations on vitamin deficiency, healthy adults should consume particular amounts of vitamins, with the different recommendations for women, men, newborns, the elderly, and women who are pregnant or breastfeed. To combat the most prevalent vitamin deficiencies, many nations have established laws requiring vitamin food fortification.

On the other hand, symptoms brought on excessive vitamin consumption, particularly of fat-soluble vitamins that can build in the human tissues, are referred to as hyper vitaminosis. By the observations that certain foods with a high content of a necessary vitamin could treat or prevent certain conditions, like scurvy, to the identification and description of specific molecules necessary for life and health, the history of the discovery of vitamin deficiencies advanced over the centuries. For their efforts in the discovery of vitamins, numerous scientists have received the Nobel Prize in Physiology or Medicine or the Nobel Prize in Chemistry throughout in 20th century.

II. RELATED WORKS

The most crucial stage of the software development process in literature review. Determine the time factor, the economics, and the company strength before to building the instrument. The following ten phases are involved in deciding which operating system and language can be used to construct the tool if these requirements are present. As soon as they begin creating the tool, programmers require a lot of outside assistance. You can find this support of online, in books, or from senior programmers. The aforementioned factors are considered before constructing the system for the proposed system.

Vitamin a deficiency and clinical disease: Numerous clinical signs and symptoms of vitamin A insufficiency exist, from the nearly pathognomonic exophthalmia to development abnormalities and vulnerability to life-threatening infections (far more protean). Some of the signs and symptoms of exophthalmia, like other basic vitamin deficiency diseases (scurvy, rickets), have been known for a very long time. It is helpful to categorize reports of vitamin A deficiency and/or its symptoms into "ancient" tales, clinical descriptions from the eighteenth to nineteenth centuries (and their alleged causal links), and reports from more recent times. The existence of this unique nutrient and the symptoms of its deficiency were first discovered in early 20th-century laboratory animal studies, clinical and epidemiologic observations more recently, a burgeoning of meticulously conducted clinical studies and field-based randomized trials reveals the full extent and impact of deficiency among the poor of low- and middle-income countries, which in turn changed global health policy.

Summary: Numerous clinical signs and symptoms of vitamin A insufficiency exist, from the nearly pathognomonic exophthalmia to development abnormalities and vulnerability to life-threatening infections (far more protean). Some of the signs and symptoms of exophthalmia, like other basic vitamin deficiency diseases (scurvy, rickets), have been known for a very long time. A convenient division of reports on vitamin A deficiency and/or symptoms into "ancient" accounts, clinical descriptions from the 18th to 19th centuries (and the alleged etiologic associations), early in 20th-century laboratory animal experiments, and clinical and epidemiologic observations that are established in the existence of this special nutrient and symptoms of its deficiency.

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 individuals with vitamin B(12) insufficiency are described here. At the time of diagnosis, patients had no anaemia or neurological symptoms. Glossitis with linear lesions, in our opinion, is a clinical indicator of vitamin B(12) insufficiency. Even in the absence of anaemia, we advise measuring vitamin B(12) levels in these individuals.

Summary: The typical oral symptoms of vitamin B(12) insufficiency are thought to be non-specific. The oral linear lesions of 4 individuals with vitamin B(12) insufficiency are described.

M. C.Chuang, J. N.Hwang, and C. Rose: There are a variety of causes for glossodynia, or the painful sensation of tongue, including localised infection, trauma, nerve injury, glossitis, the mysterious neuropathic pain syndrome, and burning mouth condition (BMD also known as burning mouth syndrome). Careful history-taking, of the physical examination, appropriate laboratory tests, and subsequent treatment can help distinguish between these glossodynia causes. A 73-year-old lady who had been previously identified as having primary BMD by her primary care physician came with glossodynia for a few months. She next saw an otolaryngologist, who conducted more diagnostic testing. A meaty, red, smooth tongue was discovered during an examination, and additional laboratory testing confirmed macrocytosis and a low blood vitamin B (12) level. Three months of oral vitamin B (12) treatment resulted in a slight improvement in symptoms and a partial restoration of blood vitamin

B (12) levels. Her final diagnosis was pernicious anemia with atrophic glossitis and glossodynia attributable to vitamin B (12) deficiency.

Summary: The outcomes of this case have significant clinical ramifications for diagnosing, assessing, and treating individuals glossodynia and apparent BMD. We explore the pathogenic pathways of nutrient deficit in the atrophic glossitis.

III. METHODOLOGY

A. Proposed System

Through examination of photographs of their eyes, lips, tongue, and nails, the application gives users the ability to identify any vitamin deficiencies they may have without giving blood samples. 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.

Block Diagram:

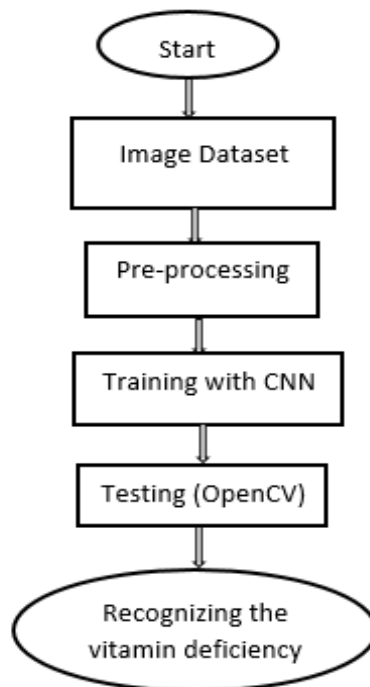


Fig 1. Block diagram of proposed method

Advantages of proposed method:

- Accurate classification
- Less complexity
- High performance

IV. IMPLEMENTATION

The project was carried out by using the algorithms indicated below.

A. Convolutional Neural Network

Step1: convolutional operation

The first part of the process is the convolution operation. Since feature detectors effectively serve as filters for neural networks, we shall cover all of them in this phase. We will also discuss about the feature maps and their parameters, the methods used to identify the patterns and detection layers, and results.

The Convolution Operation

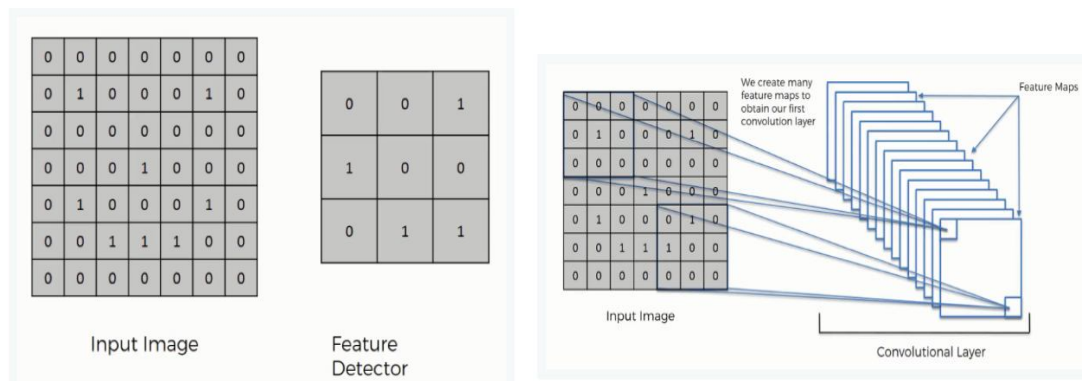


Fig.2 ReLU layer

Step 1: ReLU Layer

The second stage of the process will make use of the Rectified Linear Unit or ReLU. We'll talk about ReLU layers and look at how linearity functions are present in convolutional neural networks.

Even though it's not necessary, it wouldn't hurt to take a quick course to broaden your knowledge in order to understand the CNN's Algorithm. To close out this section will certainly help you understand the full concept.

Step 3: Flattening

Here is a brief description about the flattening process and how the convolutional neural networks can switch between pooling and flattened layers.

Step 4: Full Connection

In this consists of all we covered in the previous one. You may better visualise convolutional neural networks and comprehend how the "neurons" they produce finally learn to categorise images by comprehending this.

Summary

Finally, we combine the context and give a succinct overview of the concept covered in this part. If you believe it will be used to you (and it most likely will), you should have a look at the supplemental tutorial that covers Cross-Entropy and Softmax. Although it is not necessary for the course, it will be very useful for you if you are aware of these concepts because you will likely run into them when working with convolutional neural networks.

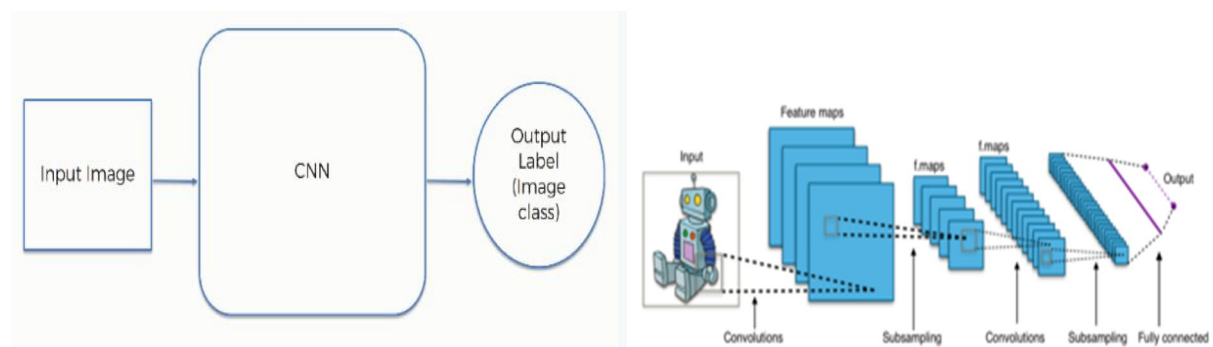


Fig.4 CNN Architecture

V. RESULTS AND DISCUSSION

The following images (Fig 5 & Fig 6) will visualise what we can learn about the project.

VI. CONCLUSION

In our proposed model, by using the Convolution Neural Network (CNN) from deep learning and OpenCV, we predict vitamin deficiencies. We used the CNN algorithm deep learning method to train while taking into account a dataset of the eye, lips, tongue, and nails. After the training is finished, we utilised OpenCV to identify and predict vitamin deficiencies.



Fig.5 Glucoma eye prediction: Here we can observe the predicted output for the eye having glucoma

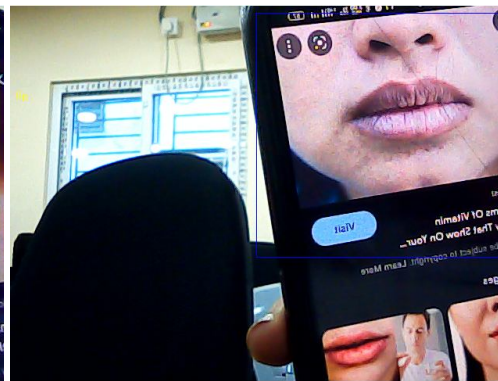


Fig.6 Detected Lip vitamin deficiency: Here we observe the lip with vitamin deficiency

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