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Vitamin Deficiency Detection Using Image Processing and Machine Learning

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ABSTRACT: Vitamins square measure a crucial a part of our diet. While not a correct quantity of vitamins, a deficiency can occur. during this paper we have a tendency to square measure introducing AN AI System to designation of nutriment deficiency at AN early stage of deficiency .It is a cost-free Mobile Application that don't needs any blood sample to sight nutriment deficiency, system needs user's photos of eyes, lips, tongue, and nails. The appliance can offer report of nutriments Deficiency found in users with necessary food suggestions to enhance vitamin levels to fight against deficiency. The appliance is trained to tell apart between traditional individual's photos of eyes, lips, tongue, and nails with user photos and other people having nutriment deficiency. The detection of nutriment deficiency at AN early stage will stop major causes these embody death from infectious diseases, anemia, and death throughout physiological state or accouchement and impaired knowledge and physical development.

KEYWORDS: Vitamins, ML, Android Application, Deficiency, PyCharm, Tkinter, k-NN, CNN.

I. INTRODUCTION

Vitamin deficiency may be a drawback that affects over 2 billion individuals round the world. The United Nations agency aforementioned that one in 3 kids doesn't get enough vitamins. Vitamin deficiency may be an international drawback that affects over 2 billion individuals round the world. The United Nations agency aforementioned that one in 3 kids doesn't get vitamins. Thirty third of kids below the age of 5 have deficiency of fat-soluble vitamin. This deficiency causes low immunity and moon blindness. Vitamin deficiencies have an effect on all ages and regularly co-exist with mineral (zinc, iron, iodine) deficiencies. The teams most vulnerable to vitamins deficiencies square measure pregnant ladies, children, as a result of their wants for these compounds and susceptibilities to their absence. Commonest deficiencies relate to fat-soluble vitamin, vitamin B, folacin and viosterol. Supplementation programs have created diseases like scurvy and maidism rare.

Several of deficiencies square measure preventable through consumption of a healthy diet containing numerous foods, in addition as food fortification and supplementation, wherever required. Most vitamins and mineral deficiencies are often picked up with a biopsy, sort of a blood take a look at and finger-prick biopsy. In blood take a look at a trained skilled can use a needle to puncture a vein, sometimes in your arm, to gather a blood sample and in finger-prick biopsy mistreatment lancet, you'll be able to choose your own finger and collect blood sample. In hospitals these blood take a look at are often done or we are able to additionally order home vitamins and mineral test kits on-line and fuck our self. The price of blood takes a look at and finger-prick blood in Republic of India is on a mean of Rs.1000 and Rs.800 severally. Home vitamins and mineral take a look at kits prices around Rs.8000. we tend to projected a price free automaton application which may offer instant results mistreatment user's pictures of body components solely and there's no would like of blood samples for take a look at.

II. PROBLEM DEFINITION

A diet lacking in nutrients could cause some varied symptoms. These symptoms are body's manner of human action potential vitamins and mineral deficiencies. Recognizing them will facilitate to regulate diet consequently. The symptoms of a biological process deficiency depend upon that nutrient the body lacks. However, there are some general. These will include:

- Brittle nails
- Mouth ulcers or cracks within the corners of the mouth
- Poor twilight vision
- White growths on the eyes
- Redness of eyes

- Sleek Tongue

If the color of the nails is yellow, the condition normally signifies anemia. A deficiency of fat-soluble vitamin, B and C is additionally detected by brittle nails.

To detect these deficiencies people have to stop by doctors and get the blood tests done. So, we are putting forward a platform to look over the deficiencies at ease. This platform uses Image processing and artificial intelligence to get the results using the images of eyes, nails, and tongue. It analogizes the images and generates a report of the supplements and advise diet.

III. LITERATURE SURVEY

Vitamin Deficiency Detection Using Image Processing and Neural Network:

- In this paper, a cost-free computer science based mostly application permanently phones designed to search out nutrition deficiencies in human's victimization photos of specific body organs is introduced. Recent nutrition deficiency detection ways that want expensive laboratory analysis. An outsized spectrum of nutrition deficiencies can show one or a great deal of visually distinguishable symptoms and indications that appear in multiple locations inside the anatomy. The appliance provides folks with the power to diagnose their potential nutrition deficiencies whereas not the necessity to provide blood samples through the analysis of photos taken of their eyes, lips, tongue, and nails. The appliance then suggests a list of biological process sources to fight the detected deficiency and additionally the expected complications through biological process micro-correction. The intelligent software package was trained utterly totally differentiate to inform apart} and differentiate nutrition deficiencies with high confidence from imagination inputs of the chosen body parts that area unit known to show different symptoms in terms of changes inside the tissue's structure once the anatomy suffers a biological process deficit. The platform collectively permits doctors to assist in up the vary of detection and accuracy of the appliance through the contribution and verification of visual data of their patients effort a great deal of refined image analysis and have extraction capabilities with the potential to surpass human's ability to diagnose medical conditions. This application may well be a helpful gizmo people for people} to beat a worldwide disadvantage that affects various individuals worldwide within the main as results of inadequate biological process awareness, and it will facilitate tending workers inside the end of the day in obtaining a great deal of correct diagnoses.

As per a survey in May 2020

- More than eightieth of 200 patients hospitalized with COVID-19 had aliment deficiency. Patients with lower aliment levels collectively had higher blood levels of inflammatory markers. But the researchers found no link between low D levels and also the approach severe the illness was.
- Spanish researchers tested but prescription aliment might have a bearing on people hospitalized with COVID. Of the fifty United Nations agency received it, just one needed the medical aid unit (ICU), and none died. Among twenty six patients United Nations agency didn't receive the nutrition, 13 needed organization care and a couple of died.

IV. PROPOSED SYSTEM

Projected detection system uses image method and AL i.e. applied science, PyCharm, Tkinter, k-NN, CNN.

- **Image processing:**

Type of image method used here is digital image method. Digital image method is that the utilization of a laptop or electronic computer, computer computing, machine computing device data method of information processing system machine IP system to process digital footage through Associate in Nursing formula.

Digital image processing method focuses on a pair of major tasks –

- Improvement of pictorial data for human interpretation.
- Processing of image data for storage, transmission and illustration for autonomous machine perception.

Image processing method within the main embodies the following steps:

1. Commerce the image via image acquisition tools.
2. Analyzing and manipulating the image.
3. Output that in that among that } result square measure usually altered image or a report which depends on analyzing that image.



Fig. Converting image into pixels using image processing.

• **Fundamental steps in Digital Image Processing:**

1. Image Acquisition

2. Image acquisition could also be as straightforward as being given a picture that's already in digital kind. Generally, the image acquisition stage involves pre-processing, like scaling etc.

3. Image improvement

4. The idea behind improvement techniques is to bring out detail that's obscured, or just to spotlight bound selections of interest in associate degree extremely image. Such as, dynamic brightness & distinction etc.

5. Image Restoration

6. Image restoration could also be a region that along deals with raising the looks of a picture. Restoration techniques tend to be supported mathematical or probabilistic models of image degradation.

7. Colour Image technique

8. Colour image technique could also be a region that has been gaining its importance thanks to the assorted increase within the use of digital footage over Internet. This is able to probably embrace colour modelling associated technique in associate degree passing digital domain etc.

9. Wavelets and Multiresolution technique

10. Wavelets unit the inspiration for representing footage in varied degrees of resolution. Footage subdivision in turn into smaller regions for info compression and for pyramidal illustration.

11. Compression

12. Compression deals with techniques for reducing the storage needed to avoid wasting a picture or the information live to transmit it. Significantly within the uses of net it's with regards to necessary to compress info.

13. Morphological technique

14. Morphological technique deals with tools for extracting image parts that unit helpful within the illustration and outline of kind.

15. Segmentation

16. Segmentation procedures partition a picture into its constituent parts or objects.

17. Illustration and outline

18. Representation and outline nearly invariably follow the output of a segmentation stage that usually is raw part info, constituting either the boundary of an area or all the points within the region itself.

19. seeing

20. Recognition is that the strategy that assigns a label, such as, "vehicle" to associate object supported its descriptors.

21. Data Base

- 22. Knowledge is to boot as straightforward as detailing regions of a picture wherever the data of interest is understood to be placed, so limiting the search that need to be conducted in seeking that knowledge.

V. MACHINE LEARNING

Machine learning is associate application of applied science (AI) that offers systems the pliability to automatically learn and improve from experience whereas not being expressly programmed. Machine learning focuses on the event of computer programs that will access information and use it to seek out for themselves.

Machine learning could also be a strategy of knowledge analysis that automates analytical model building. It is a branch of applied science supported the thought that systems can learn from information, establish patterns and build alternatives with borderline human intervention.

Machine learning permits the user to feed a computer formula associate Brobdingnagian amount of knowledge and have the computer analyze and build data-driven recommendations and alternatives supported only the pc file.

- **ANDROID STUDIO**

Android Studio is that the official integrated development surroundings (IDE) for Google's golem coding system package, designed on JetBrains' IntelliJ got wind of package and designed specifically for golem development. It's offered for transfer on Windows, macOS and operative system} primarily based operative systems or as a subscription-based service in 2020. It is a replacement for the Eclipse golem Development Tools (E-ADT) as a results of the pri IDE for native golem application. **development mary**

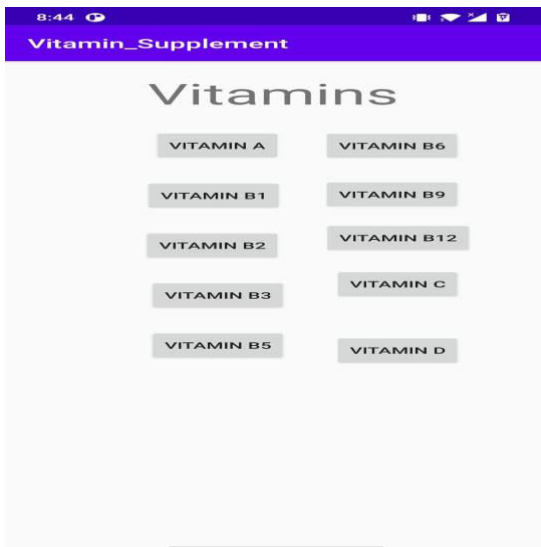


Fig1. Menu for the android application

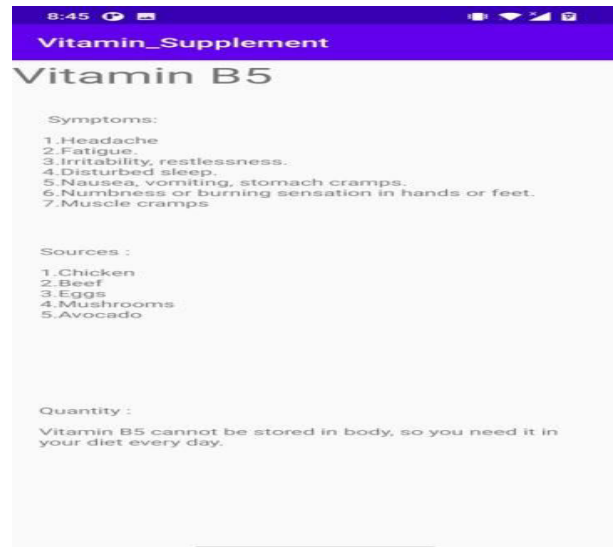


Fig2. Detailed report for Vitamin B5 deficiency

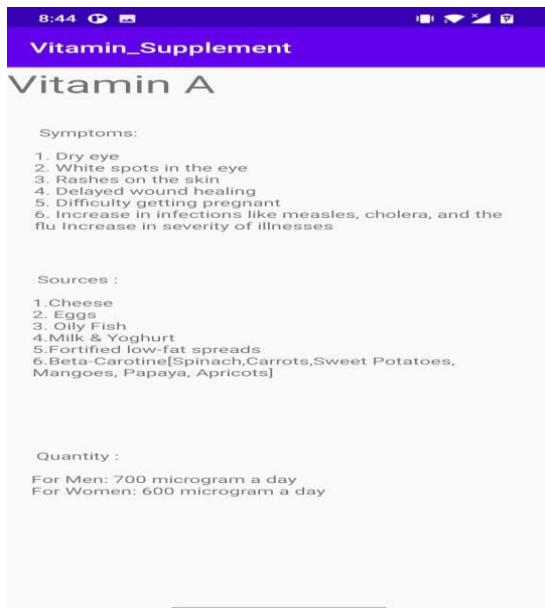


Fig3. Detailed report for Vitamin A deficiency



Fig4. Detailed report for Vitamin D deficiency

- **PyCharm**

PyCharm is an integrated development atmosphere (IDE) utilized in computer programming, specifically for the Python language. It's developed by the Czech company JetBrains (formerly referred to as IntelliJ). It provides code analysis, a graphical computer program, an integrated unit tester, integration with version management systems (VCSes), and supports internet development with Django.

- **Tkinter**

As with most alternative trendy Tk bindings, Tkinter is enforced as a Python wrapper around an entire Tcl interpreter embedded within the Python interpreter. Tkinter calls square measure translated into Tcl commands, that square measure fed to the present embedded interpreter, therefore creating it potential to combine Python and Tcl in an exceedingly single application.

There square measure many fashionable interface library alternatives offered, like wxPython, PyQt, PySide, Pygame, Pyglet, and PyGTK.

- **k-nearest neighbors rule (k-NN)**

K-NN could be a form of classification wherever they perform is merely approximated regionally and every one computation is postponed till perform analysis. Since this rule depends on distance for classification, if the options represent totally different completely different physical units or are available immensely different scales then normalizing the coaching information will improve its accuracy dramatically.

- **Convolutional Neural Networks (CNN)**

In deep learning, a convolutional neural network (CNN/ConvNet) could be a category of deep neural networks, most typically applied to research visual representational process.

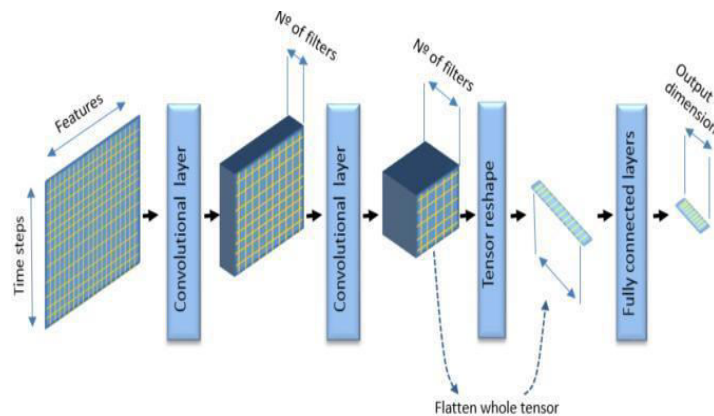


Fig. CNN Model

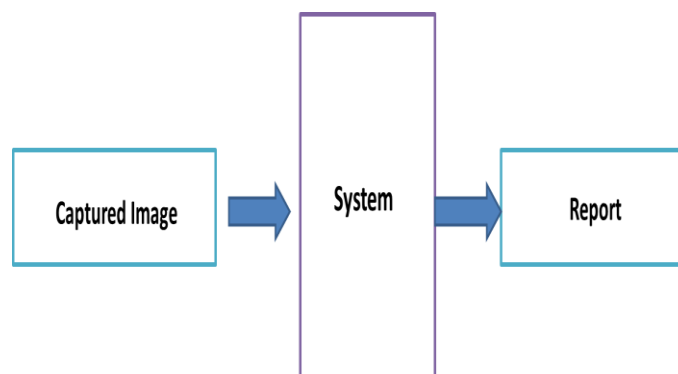
Now after we consider a neural network we predict about matrix multiplications however that's not the case with ConvNet. It uses a special technique known as Convolution. Currently in arithmetic convolution could be an operation on 2 operates that produces a 3rd function that expresses however the form of 1 is changed by the opposite.

PROJECT ADVANTAGES

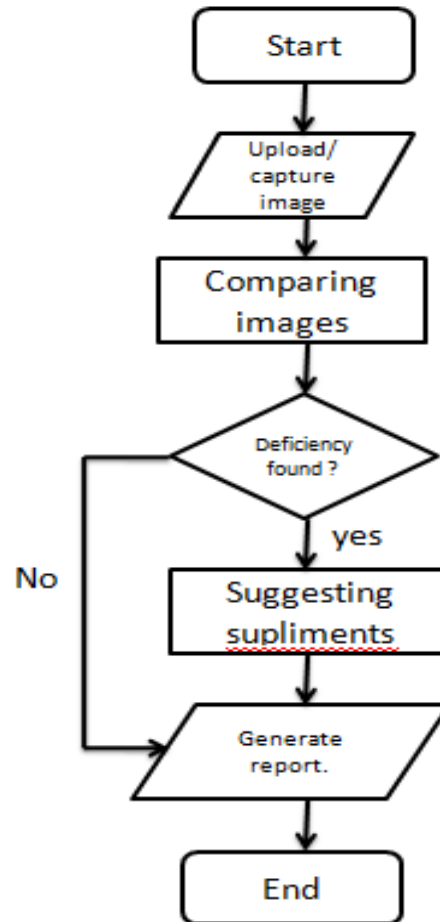
- Time efficient: It saves time in today’s busy schedule as we don’t have to go to doctors and diagnose centers.
- Booted Self health care: it gives a boot to you health care.
- No pain: no need to get injection pierced for diagnoses.
- Easy assistance: no complicated instructions so it is easy to use.
- App for all ages: convenient for every age group even a child can use.

DIAGRAMS

➤ **Block Diagram:**



➤ FLOWCHART:



V. RESULT ANALYSIS

Platform asks to click or upload image of the eyes. Through image processing it compares it with the dataset using k-NN algorithm it detects if any deficiency is present or not.

If not then it show that user has no deficiency. But if the algorithm found the changes in then color or the eye then it shows the deficiency the user has and generate a report contain the essentials required by the user.

After that if the user what's more detailed report then he/she can visit the android application where there is a menu of different vitamins, user have to click on the button containing names of vitamin to get the detailed report.

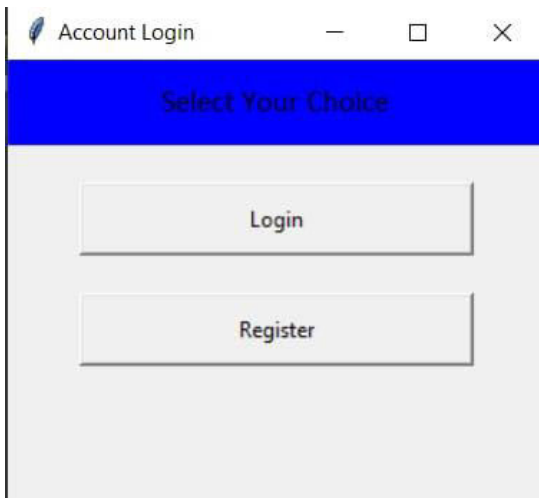


Fig5. Login/registration from user

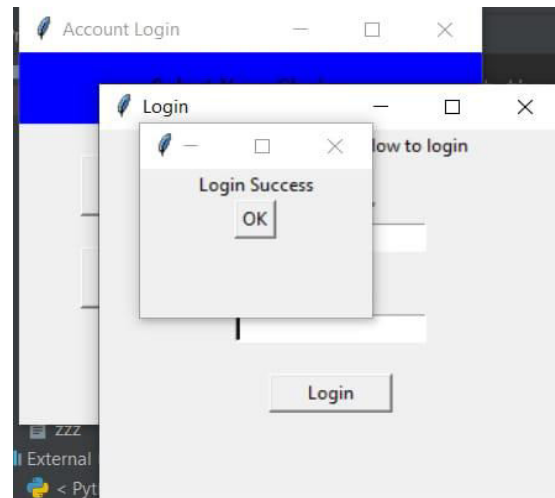


Fig6. Prompt to show login successful



Fig7. Upload the images of either eyes or nails

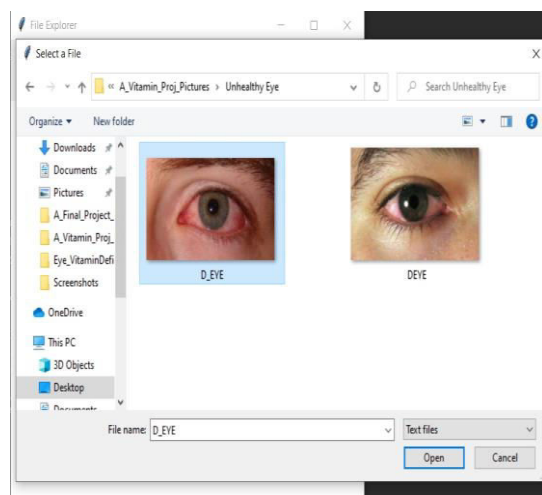


Fig8. Selecting the image to be diagnosed



Fig9. If no deficiency is found

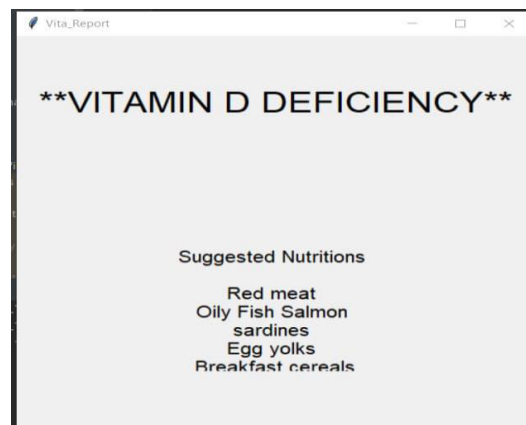


Fig10. Detailed report if any deficiency is found



VII. FUTURE SCOPE

1. Lay out the facility of adding additional parameters like tongue, lips for finer detection.
2. Depository of previous data and collate it with the new report generated that gives a personified report on the improvement.

VIII. 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 k- nearest neighbor algorithm to detect symptoms and Natural Language Processing to extract features. One more layer of decision making algorithm is added to show a list of nutrients as well as suited medications and supplementary products.

The system is an 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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