

Malnutrition Detection Using Convolution Neural Network

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Abstract: *Malnutrition is directly or indirectly responsible for the deaths of children younger than 5 years in many countries. Proof of identity of underweight children will help to prevent the risk of death and can reduce physical and health issues by taking necessary actions or treatment. The proposed system uses a Convolutional Neural Network (CNN), a Deep Learning algorithm that takes input, analyzes the images, and differentiates one from the other. The architecture we used here is Alex Net for the training process and Transfer Learning. The system takes the image of a child as the input and classifies the image into a malnourished or normal child by comparing the image with the trained model. The objective of the system is to detect malnutrition in children that can help people and healthcare providers to reduce the effects caused by malnutrition by automation implementation instead of a manual process. The aim of this paper is to analyse home health monitoring data and classification data using machine learning optimization techniques-decision trees and low-quality electronics, prediction method for processing big data to clarify research and prevention. Malnutrition questionnaire dataset.*

Keywords: *Malnutrition, Convolutional neural Network, Alexnet, Data Set.*

I. INTRODUCTION

Malnutrition is a condition that occurs due to fewer intakes or over intake of nutrients. This can lead to health issues such as diabetes, heart disease, eye problems, and stunted growth. Malnutrition is directly or indirectly responsible for the deaths of children younger than 5 years in many countries. According to the World Health Organization's (WHO) 2020 edition, stunting has affected 21.3% or 144 million children under 5 years of age globally. Wasting has affected or threatened the lives of 6.9% or 47 million children under the same age group. About 5.6% or 38.3 million children under the age of 5 years were overweight around the world [1]. Yet, while there has been an improvement, it has been slow and patchy as shown in the Fig 1. Undernutrition leads to physical health issues and growth issues. According to UNICEF's The State of the World's Children 2019 report, globally out of 3 children at least 1 is not growing well due to malnutrition, and 1 out of 2 children is suffering from hidden hunger.

Approximately 45% of deaths of children under the age of five years are due to undernutrition. The National Family Health Survey 2019-2020 (NFHS-5) reported that in India, 30.0% of children under age 5 years were stunted, 27% were wasted, 10.4% were severely wasted and 28.5% were underweight. The National Family Health Survey 2015-16 (NFHS-4) reported that 38.4% were stunted, 21.0% were wasted, 7.5% were severely wasted and 35.8% were underweight. Over the decade there was a slight decline in stunted and underweight children but wasted remains alarming. Children were suffered more with malnutrition and the detection of malnutrition will help to prevent the risk of death and can reduce physical or growth issues by taking necessary measures. Detection of malnutrition in children can help people and healthcare providers to take preventive measures and can reduce the effect caused by malnutrition on children. To detect the undernourishment in kids, a type of artificial neural network called convolutional neural network (CNN) is used. The planning we used here is Alex Net, which is a convolutional neural network that is a powerful model skilled of realizing high precisions on challenging datasets.

PROBLEM STATEMENT

Malnutrition is one of the biggest public health problems in developing countries. India accounts of one-third of the malnourished children in the world, with a prevalence rate of 29.4%. The aim of this study is to evaluate the relationship between malnutrition and academic performance in data of 8–12-year-old children for clinical data analysis. This cross-sectional study was conducted on children aged 8–12-year, with data entry in the 50% range and 10% accuracy.

II. LITERATURE SURVEY

[1] ARJUN RAJ LAXMINARAYANA: Malnutrition is directly or indirectly responsible for the deaths of children younger than 5 years in many countries. Proof of identity of malnourished children will help to avoid the risk of death and can diminish physical and health matters by taking necessary measures or treatment. The projected system uses a Convolutional Neural Network (CNN), a Bottomless Learning algorithm that takes input, examines the images, and differentiates one from the other. The architecture we used here is Alex Net for the training process and Transfer Learning.

[2] DHARA SHAH: That An imperative part of a healthy eating regimen is the understanding and maintenance of nutritional data and comprehension of how extraordinary food items and nutrition constituents influence our bodies. This dissertation is the descriptive form of developing a procedure to encapsulate Deep Learning along with Computer Vision based algorithm for extracting nutritional information from nutritional labels (NLs) accessible on most packaged food items which is most important for proactive nutrition management.

[3] NEHA KADAM: The system analyzes the human parts and gives probable disease for a person including a healthy case. Here, for disease guess image color (average RGB) value used as an image features. This model gives more precise results than the human eye like partiality and determination power. This may give a more accurate result for identifying human health conditions using the machine learning algorithm.

[4] CYNTIYA HAYAT: In this paper that was established could facilitate in identifying malnutrition in children with the symptoms that have been determined through interviews with the expert, rule-based, optimal network architecture settings, such as epoch maximum: 1000, goal error: 0.0001, learning rate:0.65 and the number of hidden layers: 10 neurons, and the activation functions used were binary sigmoid or losing functions.

III. RESEARCH GAP

In the developing countries, the use of accessible electronic healthcare services can help to realize a sustainable healthcare, which provide benefits for the patients and healthcare professionals through the better medical decision-making. Malnutrition in developing countries can also be helped through the use of agent technology that can help detecting malnutrition and spreading the knowledge concerning malnutrition to the people. Meanwhile, the use of ANN method to assist the detection process of malnutrition, especially in children, can also provide a fairly high level of accuracy up to 77%. The use of ANN may also provide a low error rate in detecting malnutrition. In addition, beside provide good results in detecting malnutrition, the ANN is also widely used to detect various diseases. There are several previous studies which stated that ANN can be applied to the process of diagnosis of the diseases, such as urinary diseases, heart diseases, chest diseases, liver diseases, tuberculosis, as well as providing a high level of accuracy.

OBJECTIVE

- The main purpose of the system is to detect malnutrition in the absence of doctor as are early stage and treatment is taken.
- To reducing the percentage of children who do not eat before experiencing different health problem.
- To decrease the physical process and computerization applied with accurate result.
- Detection of malnutrition in children can help people and healthcare providers to take preventive measures and can reduce the effect caused by malnutrition on children.
- To detect the malnutrition in children, a type of artificial neural network entitled convolutional neural network (CNN) is used.
- The architecture we use here is Alex Net, a powerful model convolutional neural network that can achieve high accuracy and complex data.

METHODOLOGY

1.Identity Problem: Malnutrition is directly or indirectly responsible for the deaths of children younger than 5 years in many countries. Proof of identity of underweight children will help to prevent the risk of death and can reduce physical and health issues by taking necessary actions or treatment.

2.Literature Review: This is the initial stage in project where the comparison is done with conventional neural network studying with different children's data.

3.Design Automation: CNN structure performs computations based on the structure of human visual cortex and is a popular choice for automatic extraction of relevant features from large amounts of data

4.Development: Under-nutrition reduces immunological capacity to defend against diseases, and recurrent infections, in turn reduce and deprive the body from essential nutrients. This leads to the dismal growth of children. affect

5. Making Programmed: after finalizing the method I will make the programmed in python /java software
6. Trial on Set up: Once programmed is done we conduct actual testing on Children’s data to store in Convolutional Neural Network.
7. Analysis: The second mode of Food Tracker where user can select a local image to do food detection along with nutrition analysis.
8. Conclusion: Images of children are used as input. Alex net is a CNN used to find patterns in images to recognize faces and objects and performs classification tasks.

IV. SYSTEM DEVELOPMENT

1. Nutrition Label Tracking: Image based NL recognition uses the mobile phone’s camera to capture the image of the NL and extract the product information for future processing. This includes limiting NL to images and using deep learning to read data from NL. Angle is the angle that a line in digital image makes with the horizontal. In this case, the text is rotated or distorted, destroying the performance of further processing, and can affect the performance of the next segmentation and validation stage, as today’s Optical character recognition framework cannot handle text changes and only replaces text in Detected linearly.
2. Convolution Neural Network: In deep learning, convolutional neural network (CNN or ConvNet) is a type Artificial neural network (ANN) commonly used to analyses visual images. CNNs also known as shift-invariant or space- invariant artificial neural networks (SIANNs), rely on a weighted combination of convolutional kernels or filters that slide across the input and provide a balanced response, called an equivalent property sheet. Contrary to intuition, most convolutional neural networks are not translation-invariant as they use a down sampling operation for the input. It has applications in image and video, recognition, image classification, medical image analysis, natural language processing, brain-computer interfaces, and financial technology time series. CNN uses a small priority compared to other image classification algorithms. This means that the network learns to develop filters (or cores) through machine learning, while in traditional algorithms these filters are created by hand. This freedom from prior knowledge and human intervention in features extraction is even better.

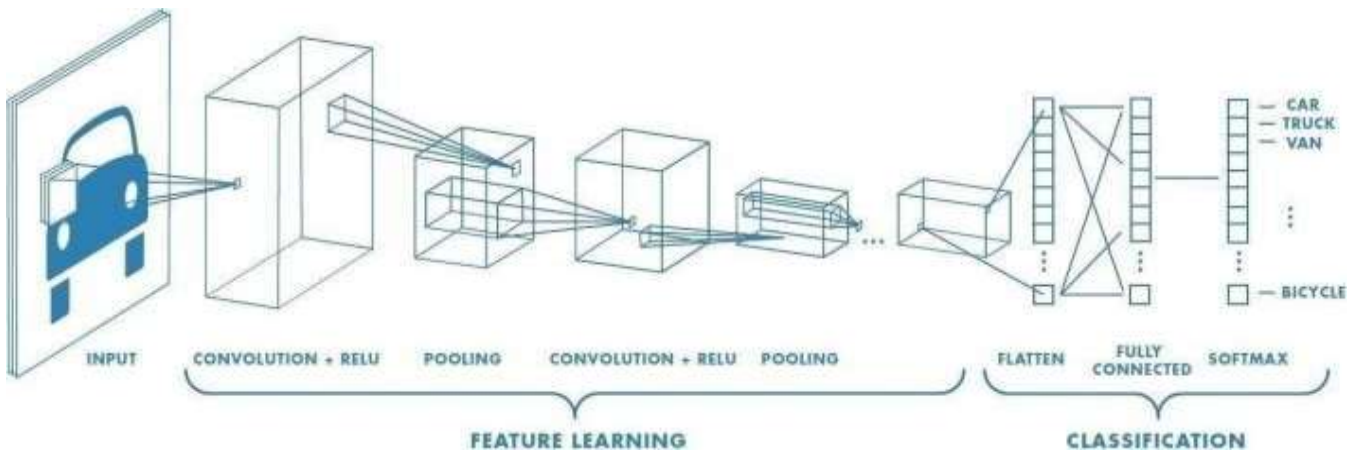


Fig 1: Convolution Neural Network

3. Training and Transfer Learning: To perform the classification on a new set of images, the pertained network is used as a starting point to learn the task then the final layers are replaced by the new small set of images. Fine-tuning a network with transfer learning is generally a lot quicker and simpler than training anetwork with randomly

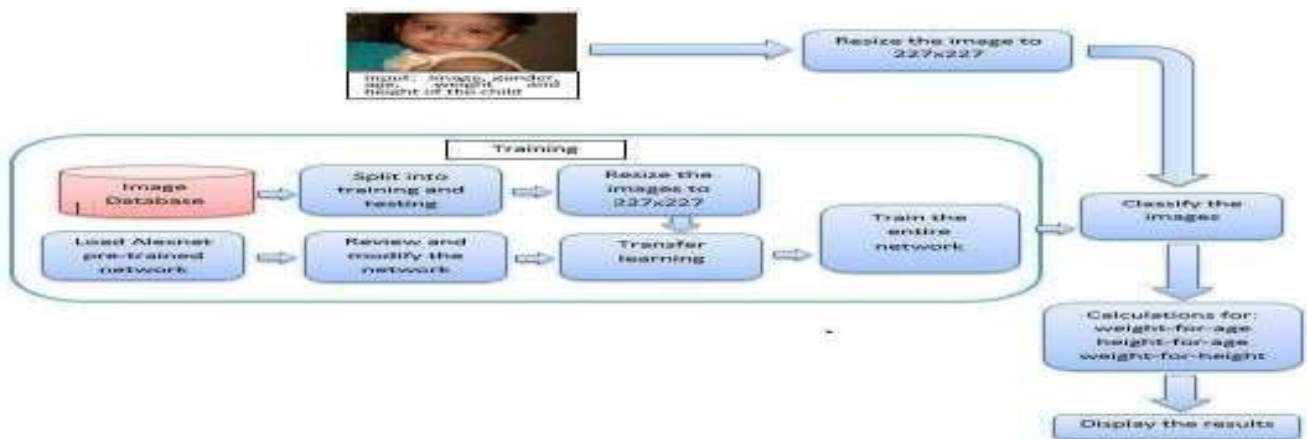


Figure 2: Architecture of Malnutrition Detection

initialized weights from scratch. This step performs Transfer learning with the modified pre-trained network and mentioned parameters. Then, it trains the entire network to classify the images, here the images for training requires with the dimension of 227×227 , a function is used so all the images get resized to 227×227 for training by using resize function.

Architecture: Convolutional Neural Network consists of input layer, hidden layer and output layer. in a feedforward neural network, a middleware is called a hidden layer because their inputs and outputs are masked by activation functions and final convolutions.

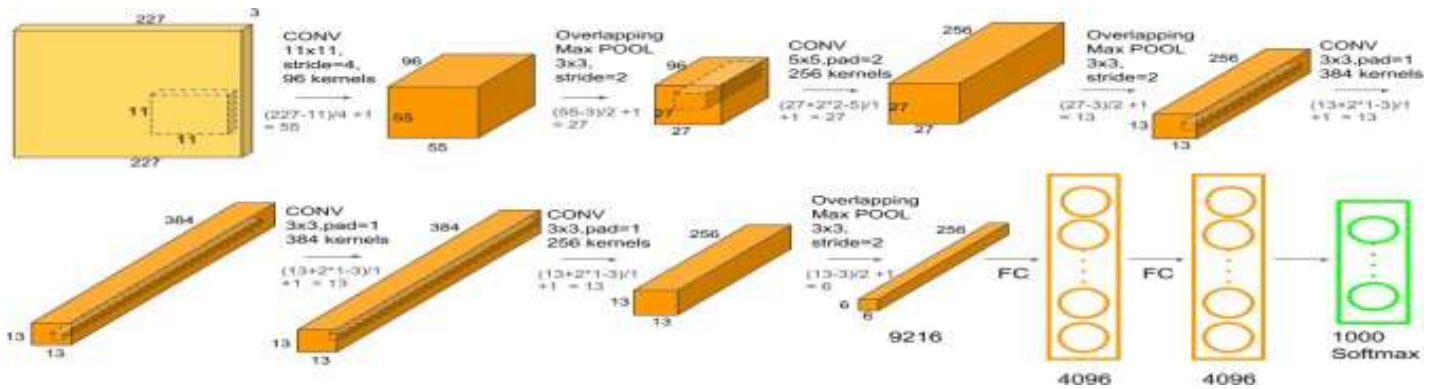


Figure 3: Alex Network

Convolutional Layers: In CNNs, the input is a tensor of the shape: (number of inputs) x (input height) x (input width) x (input channels). After going through the convolution process, the image is abstracted into feature maps, also known as activation maps, which are: (number of entries) x (height of feature map) x (width of feature map) x (number of channels of feature map).

Pooling layers: Convolutional networks can contain local and/or global pooling layer as regular convolutional layers. Pooling layers reduce the dimensions of data by combining the outputs of neuron clusters at one layer into a single neuron in the next layer. Local pooling combines small clusters, tiling sizes such as 2×2 are commonly used.

Fully connected layers: Fully connected layers connect every neuron in one layer to every neuron in another layer. It is the same as a traditional multilayer perceptron neural network (MLP). The flattened matrix goes through a fully connected layer to classify the images.

Proposed System

Image Dataset

As we have to give results for the malnutrition using some of the inputs. For this purpose, we have to store somewhat data which will be compared with input data and gives the appropriate results. For more and more accuracy we have to store more data in image data set.

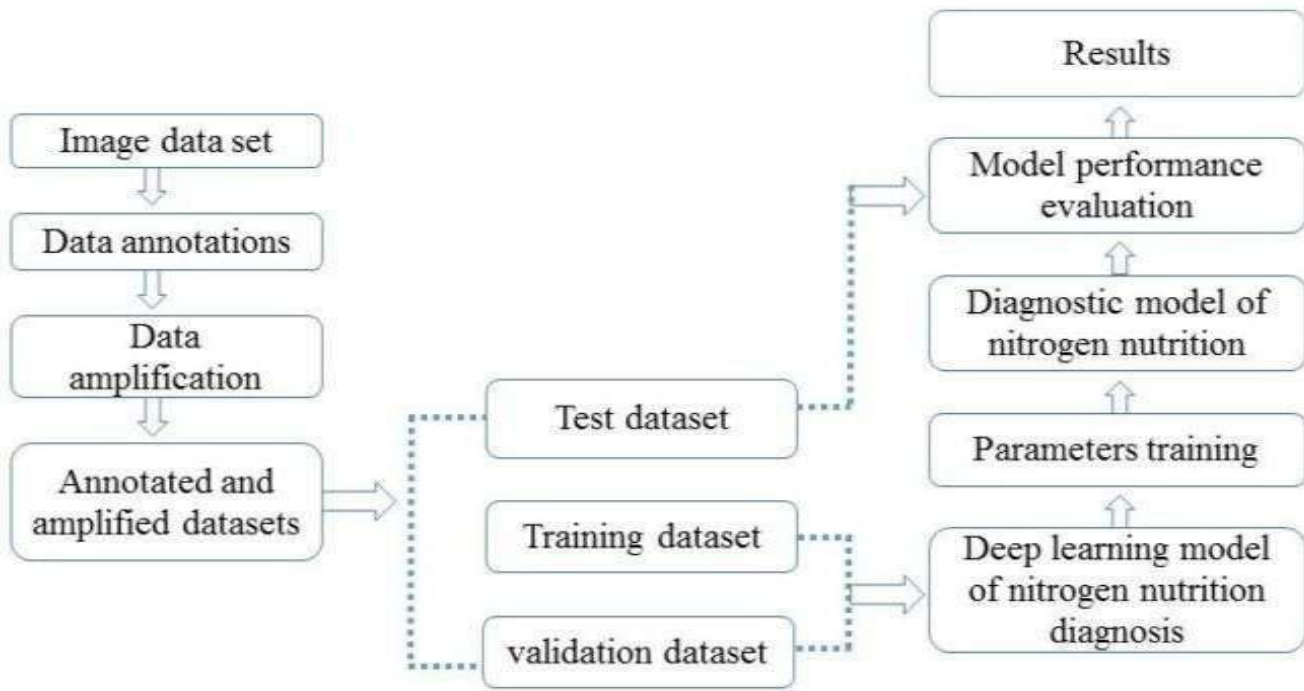


Figure 4: Flow Chart

Date annotations

A data note is a human activity that records such as text, pictures, and videos for learning models to recognize and use them to make predictions.

Data Amplification

Amplification, also known as range or resolution, is the process of taking out small signals from the sensor and amplifying them, so that they can easily recorded from the information found. Sampling is the process of sampling from one continuous signal at a time to create a representative digital signal.

Test Data set

A test database in machine learning is a secondary (or tertiary) dataset used to test a learning machine program after it has been trained on the original training data. The idea is that a predictive model always has some sort of unknowns that needs to be tested, rather than defined from a theoretical perspective.

Training Data sets

Training datasets are large dataset used to train a machine learning models. The training data is used to teach predictive model machine learning algorithms how to extract features related to specific business objectives. The training data for the supervised machine learning model is labeled. The data used to train the unsupervised machine learning model is anonymous.

Validation Data sets

A validation set is a dataset used to train artificial intelligence (AI) with the aim of finding and optimizing the best model for a given problem. The Validation process is also known as the development process. The AI supervisor is trained on a body of training data. Perform Training, maintained, model selection and testing using three different datasets: the training set, the validation set and the testing set. Validation sets are used to select and tune the final AI model. The Training process accounts for most of the data, 60% on average.

ADVANTAGES

1. The main advantage of CNN compared to its predecessors is that it automatically detects the important features without any human supervision.
2. The system predicts whether children are affected by malnutrition or not.
3. This system can also detect which type of malnutrition is there.
4. CNN is also computationally efficient

CONCLUSION

Malnutrition is extravagantly high and has affected many countries in the world by one or more forms. Detecting or predicting malnutrition will help the government or health services to take preventive measures. Conventional Neural Network (CNN or ConvNet) algorithm is used to detect the children affected with malnutrition under age five. Images of children are used as input. Alex net is a CNN used to find patterns in images to recognize faces and objects and performs classification tasks.

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