LITERATURE SURVEY

AI- POWERED NUTRITION ANALYSER FOR FITNESS ENTHUSIASTS

Abstract

Artificial intelligence (AI) as a branch of computer science, the purpose of which is to imitate thought processes, learning abilities and knowledge management, finds more and more applications in experimental and clinical medicine. In recent decades, there has been an expansion of AI applications in biomedical sciences. The possibilities of artificial intelligence in the field of medical diagnostics, risk prediction and support of therapeutic techniques are growing rapidly. The aim of the article is to analyze the current use of AI in nutrients science research. The literature review was conducted in PubMed. A total of 399 records published between 1987 and 2020 were obtained, of which, after analyzing the titles and abstracts, 261 were rejected. In the next stages, the remaining records were analyzed using the full-text versions and, finally, 55 papers were selected. These papers were divided into three areas: AI in biomedical nutrients research (20 studies), AI in clinical nutrients research (22 studies) and AI in nutritional epidemiology (13 studies). It was found that the artificial neural network (ANN) methodology was dominant in the group of research on food composition study and production of nutrients. However, machine learning (ML) algorithms were widely used in studies on the influence of nutrients on the functioning of the human body in health and disease and in studies on the gut microbiota. Deep learning (DL) algorithms prevailed in a group of research works on clinical nutrients intake. The development of dietary systems using AI

technology may lead to the creation of a global network that will be able to both actively support and monitor the personalized supply of nutrients.

Keywords: artificial intelligence, artificial neural networks, machine learning, nutrients

Introduction

The term “artificial intelligence” was first proposed in 1955 by the American computer scientist John McCarthy (1927–2011) in the proposal of a research project, which was carried out the following year at Dartmouth College in Hanover, New Hampshire .

Artificial intelligence (AI) as a branch of computer science, the purpose of which is to imitate thought processes, learning abilities and knowledge management, finds more and more applications in experimental and clinical medicine. In recent decades, there has been an expansion of AI applications in medicine and biomedical sciences. The possibilities of artificial intelligence in the field of medical diagnostics, risk prediction and support of therapeutic techniques are growing rapidly. Thanks to the use of AI in ophthalmological , radiological and cardiac diagnostics, measurable clinical benefits have been obtained. AI was used in research on new pharmaceuticals . The development of AI also provides new opportunities for research on nutrients and medical sensing technology .

1. Artificial Neural Networks (ANNs)

ANNs as a currently widely used modeling technique in the field of AI were inspired by the structure of natural neurons of

the human brain. ANNs are mathematical models designed to process and calculate input signals through rows of processing elements, called artificial neurons, connected to each other by artificial synapses. There are three types of layers forming ANNs. The input layer captures the raw data and passes them to the hidden layer. In this second layer, the learning process takes place. The results of the analysis are collected in the output layer and the output data are created. A neural network may consist of hundreds of single units. An ANN is a parameterized system that has weights as adjustable parameters. Due to the need for estimation of these parameters, ANNs require large training sets. ANNs acquire knowledge by detecting patterns and relationships between data, i.e., through experience, not as a result of programming.

Recognizing different kinds of vegetables and fruits is a difficult task in supermarkets, since the cashier must point out the categories of a particular fruit to determine its price. The use of barcodes has mostly ended this problem for packaged products but given that most consumers want to pick their products, they cannot be pre-packaged, and thus must be weighed. A solution is issuing codes for every fruit, but the memorization is problematic leading to pricing errors. Another solution is to issue the cashier an inventory with pictures and codes, however, flipping over the booklet is time consuming. Automatic classification of fruits via computer vision is still a complicated task due to the various properties of many types of fruits. The fruit quality detection technique which was based on external properties of fruits such as shape, size and color.

The proposed method is based on the use of Support Vector Machine (SVM) with the desirable goal of accurate and fast classification of fruits. Support Vector Machines (SVMs) is a classification method based on machine learning theory. SVMs have significant advantages because of their high accuracy, elegant mathematical tractability, and direct geometric

interpretation. Besides, they do not need a large number of training samples to avoid overfitting. The task here is to automatically detect and classify the fruits image acquired from database. Assuming that the different images are present and some are overlapped on one another. The proposed work mainly gives a review that what steps are performed throughout the entire process to detect particular fruit. Since image is captured under different natural condition. The framework mainly consists of two phases. In the first phase textural features are extracted from fruit and in the second phase fruit is classified as detected fruit. The measurements obtained from the study of textural feature are given as input to the SVM classifier for training in order to classify it. Finally, system will detect objects and will display as an output. The objective of Fruit Recognition using image processing is to design a incremental model to recognize the fruits based on size, shape and colour of the fruit ignoring external features like environment, noise and background. This just focus the image of particular fruit and identify the fruit. An approach of classification using Support Vector Machine Classifier that has very good working efficiency produces the accurate results. The system helps to improve the performance. Maintaining the project is easy and manageable.

1. RELATED WORK

In [1], they have recognized nine different classes of fruits. Fruit image dataset are obtained from web as well as certain images are acquired by using mobile phone camera. These images are pre-processed to subtract the background and extract the blob representing fruit. For representing fruits and capturing their visual characteristics, combination of color, shape and texture features are used. These feature datasets is further passed to two different classifiers multiclass SVM and KNN. The color image is firstly

converted to grayscale by GLCM (Gray Level Co-occurrence Matrix). The image is further converted to binary image. Further, Morphological operations are used to fill the holes and extract the largest blob or object from the image which would further be considered as fruit. After that this largest blob is cropped and the binary values are replaced with original intensity values. From the experiments it can be concluded that the combination of color texture and shape gives better or comparable results in most of the cases than when any two categories of features are used. Also, the second conclusion which can be made is that KNN gives better results for this case than SVM.

In [2], has different steps of the training process in this research which are as follows: Initially collect fruits image, then feature extraction process using FCH & MI method to get the characteristic of fruits image then transformed into vector feature form which will be stored in the database. Later clustering process is done using the K-Means Clustering method on the vector of the fruits image in the database. The steps of the testing process in this research are as follows: Open file image query to detect fruits. The next step is to get the feature of the face image then transformed into the vector feature form same as training process. Then, the process of recognition using the KNN method by calculating the distance between the new fruits image features and features of the existing on the database by using Euclidian distance which then matched with the clustering results.

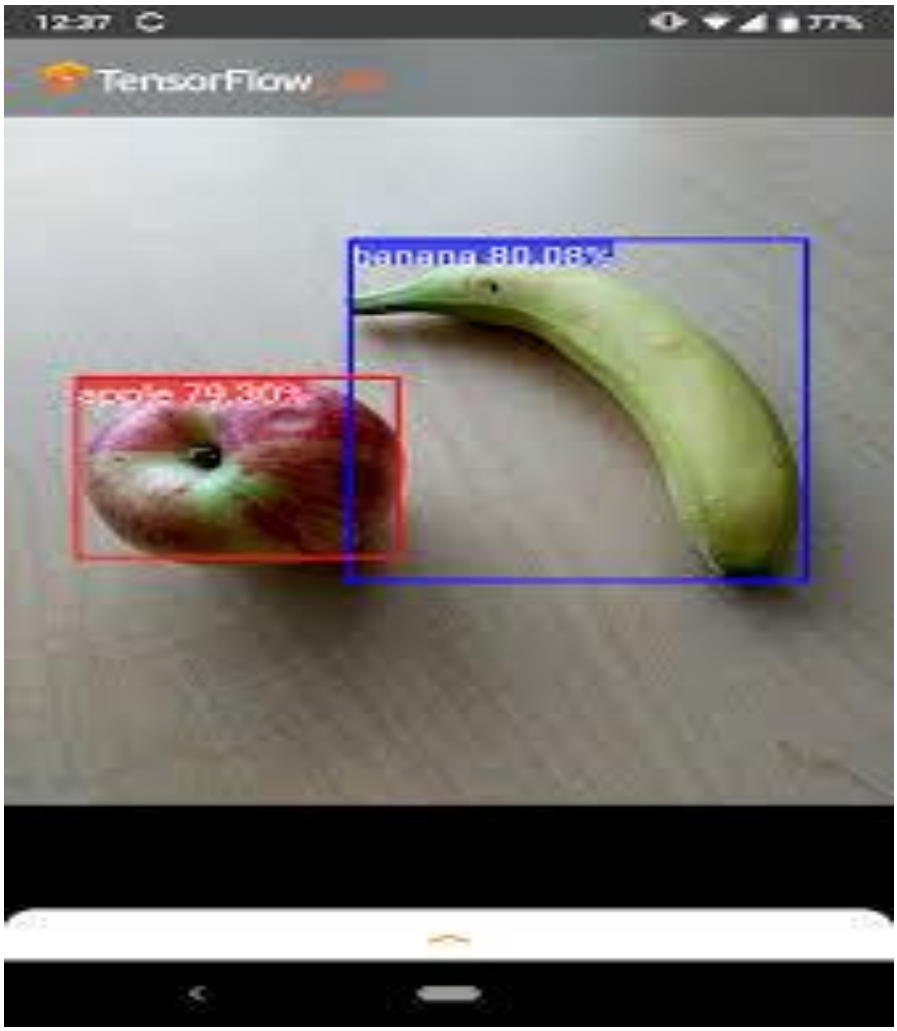
This paper [3] is based on the use of speeded up robust feature. The method extracts the local feature of the segmented image and describes the object recognition. The basic steps are to create a database of image to be classified. Then image pre-processing done by means of various image processing techniques to improve the

quality of the image and later several filters are applied to de-noise the image. Finally, image classifiers are used for classification. Image is converted from RGB image to intensity image. Based on speeded up robust technique local feature is extracted and described. To characterize the texture of the input image, statistical measurement of randomness. Other features extracted such as object recognition, image registration, recognizing parameter and image retrieval. Objects and boundary lines of images are obtained by image segmentation. Then feature extraction like shape, size, color and texture of fruits are calculated using algorithm. Then for disease classification pattern matching is applied. The system also includes specific skin defect detection algorithms not only to locate them, but also to determine their distribution, which can affect to their assignment to a standard category.

CONCLUSION :

In this paper [4], two-dimensional fruit images are classified on shape and color based on analysis methods.

Used a method to increase the accuracy of the fruit quality detection by using artificial neural network [ANN]. The first step is to get the image of fruit. Image of the fruit samples are captured by using regular digital camera with white background with the help of a stand. In the second step the image of the fruit is loaded into the matlab to include the feature extraction of each and every sample in dataset for training of neural network. In third step features of the fruit samples are extracted. In fourth step neural network is used for training the data. In fifth step fruit sample is selected for testing from database. In step sixth testing is performed by using ANN training module button. Finally, ANN based results are obtained where user has the option to select the sample of fruit which it wants to test and finally want to obtain it.


12:37
TensorFlow
banana 80.08%
apple 79.30%