LITERATURE SURVEY

INTRODUCTION :

In the literature survey, a brief summary of the different methods have been proposed for AI powered nutrition analysis over the period of 2010 to 2021. Each of these 10 papers has a unique approach towards AI-powered nutrition analyzer for fitness enthusiasts in some parameter or the other. The summaries of each of the papers are provided as follows:

1. AN IMAGE ANALYSIS SYSTEM FOR DIETARY ASSESSMENT AND EVALUATION

There is a growing concern about chronic diseases and other health problems related to diet including obesity and cancer. Dietary intake provides valuable insights for mounting intervention programs for prevention of chronic diseases. Measuring accurate dietary intake is considered to be an open research problem in the nutrition and health fields. In this paper, we describe a novel mobile telephone food record that provides a measure of daily food and nutrient intake. Our approach includes the use of image analysis tools for identification and quantification of food that is consumed at a meal. Images obtained before and after foods are eaten are used to estimate the amount and type of food consumed. The mobile device provides a unique vehicle for collecting dietary information that reduces the burden on respondents that are obtained using more classical approaches for dietary assessment. We describe our approach to image analysis that includes the segmentation of food items, features used to identify foods, a method for automatic portion estimation, and our overall system architecture for collecting the food intake information.

2. ESTIMATION OF QUANTITY AND NUTRITIONAL INFORMATION OF FOOD USING IMAGE PROCESSING

Every edible food item—while sharing many common elements with others—uses a handful of ingredients that combine for unique flavor alongside providing calories and nutrients required for the functioning of human body. Our project aims at detecting and identifying the food item whose details are existing in the designed database and gives us certain details such as the calories and nutrients the food item consists of, and along with this, our project provides advice on how much amount of calories and nutrients the user must take according to the user's details and his/her required intake for healthy diet and fitness.

3. CALORIE AND NUTRITION MEASURMENT FROM FOOD IMAGE BY USING SVM & KNN

Measuring daily food consumption for obese patients is one of the challenges in obesity management. In this project, a computer vision based system to estimate energy intake based on food pictures taken. I propose a Food Recognition System (FRS) for calories and nutrient values assumption. The system then processes and classifies the images to detect the type of food and portion size, then uses the information to estimate the number of calories in the food. Emerging food classification methods play an important role in nowadays food recognition applications. For this purpose, a new recognition algorithm for food is presented, considering its shape, colour, size, and texture characteristics. Using various combinations of these features, a better classification will be achieved. Food calorie and nutrition measurement system that can

help dietitians to measure and manage daily food intake. Here the food image is segmented into multiple segments by using the K-Means clustering. After that the texture, shape, and size features are extracted from the food image by using the Gabor filter. The performance improvement of food classification will be obtained by the combination of Support Vector Machine and K-Nearest Neighbor method. The better classification will be obtained by these combined method. The volume of the food is measured. After the mass calculation the calorie and nutrition of each food can be derived using nutritional tables.Images are an important source of data and information in the agricultural sciences. The use of image-processing techniques has outstanding implications for the analysis of agricultural operations. Fruit and vegetable classification is one of the major applications that can be utilized in supermarkets to automatically detect the kinds of fruits or vegetables purchased by customers and to determine the appropriate price for the produce. Training on-site is the underlying prerequisite for this type of arrangement, which is generally caused by the users having little or no expert knowledge. We explored various methods used in addressing fruit and vegetable classification and in recognizing fruit disease problems. We surveyed image-processing approaches used for fruit disease detection, segmentation and classification. We also compared the performance of state-of-the-art methods under two scenarios, i.e., fruit and vegetable classification and fruit disease classification. The methods surveyed in this paper are able to distinguish among different kinds of fruits and their diseases that are very alike in color and texture.

4. OOD AND FORMALIN DETECTOR USING MACHINE LEARNING APPROACH

Unethical use of formalin, in the preservation of food items posturing threat to communal nutrition. Without chemical experts accurately Formalin detection is a time consuming and complicated task.

Moreover, the presence of naturally occurring formalin in food items may interfere in detecting artificially added formalin. This paper presents a dynamic and reliable food and formalin detection technique based on machine learning approaches. Different machine learning algorithms i.e., Naïve Bayes, Logistic regression, Support Vector Machine, K-NN Classifier are applied to the experimental dataset to build a predictive model. Conductive properties were used to detect the type of foods. The designed system is able to detect 1-50 ppm of formalin using VOC HCHO gas sensor combining with arduino-uno. Several Tests are conducted and polynomial regression has been applied to presume the application of formalin.

5. FOOD IMAGE RECOGNITION AND FOOD SAFETY DETECTION METHOD BASED ON DEEP LEARNING

With the development of machine learning, as a branch of machine learning, deep learning has been applied in many fields such as image recognition, image segmentation, video segmentation, and so on. In recent years, deep learning has also been gradually applied to food recognition. However, in the field of food recognition, the degree of complexity is high, the situation is complex, and the accuracy and speed of recognition are worrying. This paper tries to solve the above problems and proposes a food image recognition method based on neural network. Combining Tiny-YOLO and twin network, this method proposes a two-stage learning mode of YOLO-SIMM and designs two versions of YOLO-SiamV1 and YOLO-SiamV2. Through experiments, this method has a general recognition accuracy. However, there is no need for manual marking, and it has a good development prospect in practical popularization and application.

6. APPLICATION OF MACHINE VISION SYSTEM IN FOOD DETECTION

Food processing technology is an important part of modern life globally and will undoubtedly play an increasingly significant role in future development of industry. Food quality and safety are societal concerns, and food health is one of the most important aspects of food processing. However, ensuring food quality and safety is a complex process that necessitates huge investments in labor. Currently, machine vision system based image analysis is widely used in the food industry to monitor food quality, greatly assisting researchers and industry in improving food inspection efficiency. Meanwhile, the use of deep learning in machine vision has significantly improved food identification intelligence. This paper reviews the application of machine vision in food detection from the hardware and software of machine vision systems, introduces the current state of research on various forms of machine vision, and provides an outlook on the challenges that machine vision system faces.

7. DEEP LEARNING AND MACHINE VISION FOR FOOD PROCESSING: A SURVEY

The quality and safety of food is an important issue to the whole society, since it is at the basis of human health, social development and stability. Ensuring food quality and safety is a complex process, and all stages of food processing must be considered, from cultivating, harvesting and storage to preparation and consumption. However, these

processes are often labour-intensive. Nowadays, the development of machine vision can greatly assist researchers and industries in improving the efficiency of food processing. As a result, machine vision has been widely used in all aspects of food processing. At the same time, image processing is an important component of machine vision. Image processing can take advantage of machine learning and deep learning models to effectively identify the type and quality of food. Subsequently, follow-up design in the machine vision system can address tasks such as food grading, detecting locations of defective spots or foreign objects, and removing impurities. In this paper, we provide an overview on the traditional machine learning and deep learning methods, as well as the machine vision techniques that can be applied to the field of food processing. We present the current approaches and challenges, and the future trends.

8. IMAGE PROCESSING METHODS FOR FOOD INSPECTION

With the advances in computer technology, signal processing techniques are widely applied to many food safety applications. In this thesis, new methods are developed to solve two food safety problems using image processing techniques.First problem is the detection of fungal infection on popcorn kernel images. This is a damage called blue-eye caused by a fungus. A cepstrum based feature extraction method is applied to the kernel images for classification purposes. The results of this technique are compared with the results of a covariance based feature extraction method, and previous solutions to the problem. The tests are made on two different databases; reflectance and transmittance mode image databases, in which the method of the image acquisition

differs. Support Vector Machine (SVM) is used for image feature classification. It is experimentally observed that an overall success rate of 96% is possible with the covariance matrix based feature extraction method over transmittance database and 94% is achieved for the reflectance database. The second food inspection problem is the detection of acrylamide on cookies that is generated by cooking at high temperatures. Acrylamide is a neurotoxin and there have been various studies on detection of acrylamide during the baking process. Some of these detection routines include the correlation between the acrylamide level and the color values of the image of the cookies, resulting easier detection of acrylamide without the need of complex, expensive and time consuming chemical tests. Studies on the subject are tested on still images of the cookies, which are obtained after the cookies are removed from the oven. An active contour method is developed, that makes it possible to detect the cookies inside the oven or possibly on a moving tray, from the video captured .

9. QUALITY DETECTION OF FRUITS BY USING ANN TECHNIQUE

Grading and classification of fruits is based on observations and through experiences. The system utilizes image-processing techniques to classify and grade quality of fruits. Two dimensional fruit images are classified on shape and colour based analysis methods. However, different fruit images may have similar or identical colour and shape values. Hence, using colour or shape features analysis methods are still not effective enough to identify and distinguish fruits images. Therefore, we used a method to increase the accuracy of the fruit quality detection by using colour, shape, and size based method with combination of artificial neural network (ANN). Proposed method grades and classifies fruit images based on obtained feature values by using cascaded forward

network. The proposed system starts the process by capturing the fruit's image. Then, the image is transmitted to the processing level where the fruit features like colour, shape and size of fruit samples are extracted. After that by using artificial neural network fruit images are going through the training and testing. In this proposed paper neural network is used to detect shape, size and colour of fruit and with the combination of these three features the results obtained are very promising.

10. STUDY FOR FOOD RECOGNITION SYSTEM USING DEEP LEARNING

Accurate dietary appraisal has been found by literature to be very significant in the evaluation of weight loss treatments. Most current methods of dietary evaluation, however, depend on recollection. The development of a modern computer-based food recognition system for reliable food evaluation is now possible across comprehensive mobile devices as well as rich Cloud services. Fixing the problem of food detection and identification in photos of different kinds of foods. Given the variety of food products with low inter-and high intra-class variations and the limited information in a single picture, the problem is complicated. By propose the overall application of multiple fusion-trained classifiers to achieve increased identification and recognition capabilities on characteristics obtained from various deep models. This paper studied various techniques of food recognition using different approaches and based on several variables, compared their effectiveness. Our study results demonstrate that deep learning overcomes other strategies like manual feature extractors, standard ML algorithms, as well as DL as a practical tool for food hygiene and safety inspections. Keywords: Food Recognition, Neural Networks, Deep Learning, Classification, Clustering, Feature Selection.