LITERATURE SURVEY

Artificial intelligence (AI) is a rapidly evolving area that offers unparalleled opportunities of progress and applications in many healthcare fields. In this review, we provide an overview of the main and latest applications of AI in nutrition research and identify gaps to address to potentialize this emerging field. AI algorithms may help better understand and predict the complex and non-linear interactions between nutrition-related data and health outcomes, particularly when large amounts of data need to be structured and integrated, such as in metabolomics. AI-based approaches, including image recognition, may also improve dietary assessment by maximizing efficiency and addressing systematic and random errors associated with self-reported measurements of dietary intakes.

Finally, AI applications can extract, structure and analyze large amounts of data from social media platforms to better understand dietary behaviours and perceptions among the population.

In summary, AI-based approaches will likely improve and advance nutrition research as well as help explore new applications. However, further research is needed to identify areas where AI does deliver added value compared with traditional approaches, and other areas where AI is simply not likely to advance the field.

Earlier this year, spice giant McCormick partnered with IBM Research for their assistance in using artificial intelligence to create new flavors. McCormick, which was founded 130 years ago, has collected a staggering amount of information on past recipes and flavors and their reception by consumers. IBM's AI can sift through that data, recognize patterns, and create new flavor profiles according to desired outcomes.

A. Prabha et al., [20] proposed a Smart Log system that performs automated nutrition monitoring and meal prediction. The smart sensor board consisting of Piezo Electric sensors is used for nutrition quantification. The nutrient data acquisition is done using Optical Character Recognition and by linking open source Application Program Interfaces (APIs) through barcodes. The meal prediction is done by collecting nutritional value of the leftover food along with the user's feedback on the type of food that is desired. The SR8 database available through the US Department of Agriculture website is also analysed using their API which provides a food report of associated nutrient values for a particular food item and a nutrient report which gives an extensive list of food and their nutrient values for a selected amount of nutrients. The results have been analysed by creating an AttributeRelation File Format which inputs the Waikato Environment for Knowledge Analysis (WEKA) tool which builds a better prediction model and is observed that the Bayesian classifiers provided better results. The open dataset consisted of multiple redundant logs and psychological monitoring mechanisms have not been incorporated which in turn leads to lack of accurate prediction.

B. Manal et al., [21] proposed a machine learning based pipelined approach for predicting the calories from food images. The system takes an image of the food item and passes it through Mathworks Image Processing which extracts the raw features and improves the quality. The image is passed through a compression phase which helps to reduce the number of features using the Principal Component Analysis (PCA) method and scale the subsequent learning phases. The food type classification is done by inputting the compressed image to the classifier. The food size prediction is done by passing the compressed image to a regressor. Calories are predicted by passing the compressed image and predicted values to another regressor. This is based on supervised learning model. The dataset is limited to a small category and the image cannot be diversified.

C. Kohila et al., [22] proposed a calorific value prediction mechanism using image processing and machine learning. The image of the food is transmitted through a mobile device and it initially undergoes segmentation with Fuzzy C-means Clustering Segmentation which fixes the cluster centre based on the group data unlike the K-means Clustering which can be erroneous if the cluster centre is not defined properly by the user. The mathematical morphology is utilized as a tool for extracting the image components and the region shape description such as erosion, dilation, opening and closing. Feature extraction is performed to retrieve interesting parts of the image and then calorie measurement is done. It has limited scalability and diversely mixed food images have not been considered.

D. Sangita et al., [23] proposed a nutritional status investigation system based on machine learning. A logical regression model was considered for the major four variables namely BMI (Body Mass Index), HAZ (Height for Age Z score, also known as stunting), WHZ (Weight for Age Z score, also known as wasting) and WAZ (Weight for Age Z score, also known as underweight) individually. The study predicts the nutrition state of the child in two phases. Phase I pre-processes the dataset using SMOTE Resampling method. Feature extraction is done using machine learning techniques with Entropy based Gain Ratio concept. Phase II uses Nominal logistic regression using iterative reweight least squares algorithm which predicts the characteristic features. The dataset is based on a very specific geographical area and over a particular period of time and it also considers only the basic features.

E. Oscar et al., [24] proposed a menu-match: restaurant-specific food logging from images. An image recognition framework based on the bag of visual words approach which extracts the base features from the images and then encoded with localityconstrained linear coding (LLC).

The extracted features are pooled using max-pooling in a rotation-invariant pooling scheme. A regression based method estimates the calories and along with feature representation mapped the feature space to calories using Support Vector Regression. The approach is limited for discrete serving sizes and custom menu and is also dependent on the GPSS of food consumption. The system lacks user customization and requires cost-sensitive learning to directly minimize calorie estimation errors during the training.

F. Kiran et al., [25] proposed a method for measuring the calories and nutrition from food images using machine learning techniques. The images got from the mobile device are pre-processed followed by the segmentation step to extract the colour and texture features through K Means clustering. The extracted options are used for food classification using Support Vector Machine (SVM). The food portion volume measurement is done by superimposing a grid of squares onto the image segment which matches the irregular shape of the food images easily. The calorie measurement is done based on the food mass and nutritional tables. The system has limited cuisine varieties mixed food images have not been considered.

M. Bahman et al., [32] proposed a smart nutrition monitoring system using heterogeneous Internet of Things Platform. The proposed architecture is based on emerging Fog computing concepts in which pre-processing and lightweight analytics are done by data collection points after which the data is sent to the cloud. The data collection points (i.e., kiosks capture the food image from different angles and pass them to the cloud server which generates a 3D model of the food. The Smart Nutrition Monitoring Engine has 4 components namely Collection Management, Data Analytics, Data store and Visualization. The Collection Management is responsible to upload the data to the cloud server and also for information storage. The Data Analytics component does the statistical analysis and machine learning activities in the system.

The data store stores the raw data as well as the processed data. The visualisation module displays charts portraying the food consumption. As a future work, the author aims to adopt new sensors to the system and also a fault-tolerant system thereby increasing the accuracy.

We will use Deep Learning, machine learning etc.,.

CAPTURE AND CONTOUR

When the user clicks the food item, we will have contours. Through this contours which we are obtaining, we will be recognizing the food item coorectly. After the recognition, we will calculate the volume of food present in the medium sized plate. Then these details will sent to the API. The API will give the correct details of the food such as amount of carbohybrates, proteins, vitamins etc.,.Additionally it provides whether the food is healthy to the person or not. Image Capturing is done through ImgBox.

Mask-RCNN algorithm is used for object detection and calculating the masked surface area.

Steps involved in this:

1. Food Image Acquisition

2. Food segmentation

3. Food recognition

4. Food volume estimation

5. Nutrient estimation

6. Pipeline setup

7.Diet charts based on age, BMI, likes and dislikes, weight gain, weight loss etc.,.

8.Benefits of foods also available.

This project contains nutrition analysis for all types of aged persons & fitness diet charts and exercising tips for the people. Through this project, the user can able to know their diet chart based on their age, likes and dislikes, weight and based on their health condtions.