Literature Review

Title	**:**	Nutrition Assistant Application
Domain	**:**	Cloud Application
Team member	**:**	Srinivas S (TL) Sunil Kumar Pavan Kumar Parthasarathy

A. Machine learning based prediction using OCR and APIs

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 analyzed 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 analyzed by creating an Attribute Relation 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.

Advantages: Automated nutrition monitoring and meal prediction.

Disadvantages: Psychological monitoring mechanism is not incorporated

B. Machine learning based pipelined approach using PCA

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.

Advantages:

The pipelined approach is very effective when compared to the baseline

Disadvantages:

The dataset is limited to a small category and lacks realistic scenario

C. Machine learning based Fuzzy means clustering for segmentation and Morphological operation for extracting image components

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.

Advantages:

The approach has efficient feature extraction mechanism

Disadvantages:

Lacks mobility and there is a deviation in calorific value between the observed and calculated values

D. Machine Learning based K Means clustering and SVM:

It is 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.

Advantages:

Img2 calories app that determines the calorie intake and estimation.

Disadvantages:

It lacks user customization and is GPSS dependent

E. SCiO – NIR sensor and regression techniques

An approach to measure the food nutrition using pocket-size Near Infrared Sensor. A SCiO scanner was used to acquire the nutritional facts using the NIR spectra. The reflected spectrum is uploaded to the SCiO web server through the SCiO application on a smart phone. Based on the varied absorption level of the wavelength, the distinction between the foods is made. The system used 14 off-the-shelf drinks as the input data. The model is trained by correlating features of NIR spectra with energy and carbohydrate contents of different drinks. Finally, the accuracy of prediction model is assessed. The Partial Least Square (PLS) regression and Support Vector Regression (SVR) were used and the analysis proved that SVR with RBF (Radial Basis Function) performed better.

Advantages:

Liquid food nutrients were predicted

Disadvantages:

The nutrients were estimated only through percentages