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# Monitoring And Analysis Of Physical Health Care System Through Diet Using Artificial Intelligence

**Dibyahash Bordoloi** Head of the Department, Department of Computer Science & Engineering, Graphic Era Hill University, Dehradun, Uttarakhand India, 248002 [dibyahashbordoloi@geu.ac.in](mailto:dibyahashbordoloi@geu.ac.in)

**Kumud Pant** Department of Biotechnology, Graphic Era Deemed to be University, Dehradun, Uttarakhand India, 248002 [kumud.pant@geu.ac.in](mailto:kumud.pant@geu.ac.in)

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**Abstract** – As the quote stated ‘ Health is wealth’ gives a complete definition for an individual. To remain physically and mentally healthy, a person should maintain a diet so that every essential components that body needs can be obtained. Everyone has a dream of having a physically fit body, to obtain a physically fit health condition, the diet system must followed in their day to day life of an individual. The proposed diet management system is employed to monitor the day to day activities and gives alert to every single health concern through notifications. The amount of water that consumed and needed to consume, carbohydrates, proteins, minerals, fatty acids, sugar and salt levels are detected and monitored through the system through the artificial intelligence. Hence the proposed system plays a versatile role in the development of physical health through monitoring and remaining through notifications.

## I.Introduction

Artificial intelligence plays a vital role in diverse fields from industries to medical science. The artificial intelligence are enhanced because it plays the role as similar to humans. The machines are employed to work and function according to the activities of human brains [1]. They are simply the simulations of human brains. They include language processing, image processing, speech recognition, pattern analysis etc. They are employed to learn new things are produced better outputs to perform the activities of humans. The three types of artificial intelligence are artificial narrow intelligence, artificial general intelligence and artificial super intelligence [2]. The artificial intelligence is done by using the stages of combining the several set of data that tend to learn and function after the iterative algorithms that process through the image, patterns, voice etc to produce the desired output with lesser computational time [3].

The artificial intelligence also play a vital role in the health care systems by monitoring and controlling the physical health of an individual at particular intervals of time [4]. This helps to monitor the individual’s health at a regular basis to avoid several medical consequences of health at an earlier stage and to maintain a healthy body conditions. To maintain both the physical and mental health enhances one person to lead a peaceful life. This proposed methodology helps the individual in their day to day life through the alert notifications regarding the body’s health conditions [5]. This proposed

system monitors blood sugar levels, heart beat rate, hypertension, low blood pressure, the amount of water needed to be consumed are monitored and analyzed and given as notifications to the individual through the artificial intelligence. Hence the system is robust with accurate results, easy to handle and friendly in nature [6].

## II. Proposed system

The diet managing system with monitoring and controlling is done through the artificial intelligence technique by using android mobile phone as a medium of communication. The artificial intelligence is a humongous database. It is based on the learning and solving of problems at a diverse environments. It is simply defined as the ability of a machine that is controlled by human intelligence. This artificial intelligence helps to store the data of the desired value and gives the appropriate values that are required for the body system to function accordingly. It works as similar to the functioning based on the dietician and diet chart. The diet chart gives a complete information to the system to manage the individual's physical health conditions and to make them physically hale and healthy. It acquires the data from the user by prior asking and evaluating the health conditions of the user and to enable them in the right direction to make them physically stable. It stores the data and evaluates the appropriate nutrient contents that are needed to remain physically alert and active. There may have several difference in the nutrient and mineral content for every individual that needed to remain active in health conditions. These variations and different consequences are monitored and analyzed by the proposed system.

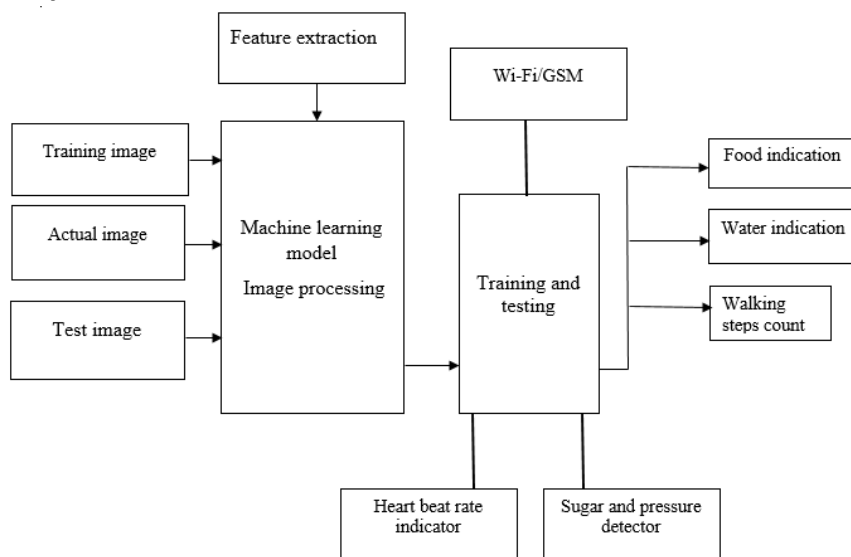


Fig 1: Proposed system

The figure 1 represents the proposed system functioning and monitoring through the artificial intelligence. It involves the machine learning with training and testing proceeded through the machine learning models with feature extraction techniques. The overall functioning is given as a notification to user by the use of GSM technology which denotes several indications such as the food and water needed

to consume at the particular period of time and the walking steps are recorded and counted. The heart beat rate in indicated with the increase or decrease in the sugar and pressure levels.

### III.Methodology

To remain hale and healthy, one person must follow a clear and complete diet chart. The diet chart represents the amount of vitamins, minerals, proteins, fatty acids and lipids that are needed for a person at a particular day. To remain physically active, a balanced diet is essential to follow.

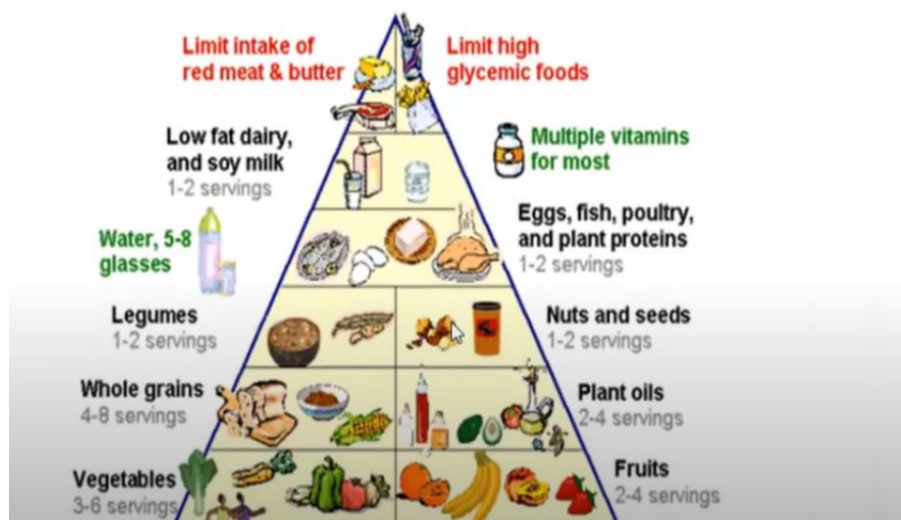


Fig 2: Food pyramid

The figure 2 shows the food pyramid representation. The food pyramid describes the amount of proteins, carbohydrates, minerals, oils, dairy products, poultry, vegetables that are needed to maintain health conditions at stable manner [7]. The amount of food consumption at a right time plays a significant role in the balance of a healthy state.

The development of the diet management system involves an application in the user's phone to monitor and control the health condition of a person at the particular intervals of time. This is done by training and learning algorithm. Artificial intelligence which makes the process faster and earlier through training and learning process [8]. This is an unsupervised learning technique that uses the way of automatic predictive analysis. Learning high level characteristics sequentially from data improves performance. The system enables to capture the food and gives instructions to the user by indicating the amount of nutrients and minerals are presented in the food item [9]. This is done by the image processing technique.

Image processing is a technique where the raw data is converted into digital images and extract information through an algorithm. The advantage of image processing is that it does not need to extract the image manually, the network itself extract the feature during the training phase [10]. The image itself is much enough to feed the network. The image must be in a pixel values. The accuracy of improvements, the decreased danger of overfitting, the accelerated learning process, and enhanced data visualization are the advantages of feature extraction [11].

The initial step involves the preparation of food chart that are needed for the individual based on the body weight of the person. The body weight is calculated by the body mass index (BMI). The body mass index defines the amount of calories that are tend to reduce to stay physically fit and active. The body mass index is calculated based on the height and weight of an individual [12]. The height of the person represents the appropriate weight to be gained or reduced. The application is initiated to calculate the body mass index to have a complete analysis of the person's health. These overall functioning are done by the programming code through the machine learning models that is the artificial intelligence. The various steps includes the following:

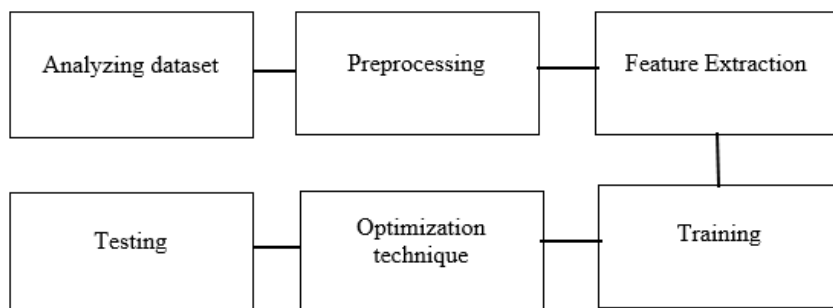


Fig 3 : Stages of artificial intelligence

The figure 3 represents the artificial intelligence demonstrating the dataset analysis that is done with the initial stage of the body mass index followed by the preprocessing and feature extraction techniques [13]. The obtained dataset through the feature extraction is trained and tested through several stages and forwarded with the optimization techniques. The preprocessing is a technique which obtains the raw data through data analyzing technique and convert them in useful machine learning models through training and testing. It includes data checking, data transformation, data reduction and data quality assessment. The feature extraction is a object based approach to distinguish the image and it decrease the integer of features in the obtained dataset. It starts with the initial set of data recognition [14]. To obtain the accurate results, the original dataset is programmed with the given raw dataset. The extraction of raw data into a possible numerical data in the given original data set is known as feature extraction. The two different types of feature extraction are:

- (i) Principle component analysis
- (ii) Linear discriminant analysis

The following steps are proceeded to the training and testing of data set to obtain the desired outcome. The optimization technique used here is genetic algorithm. During the training and testing the duplicate models are neglected. The problem of class imbalance is avoided by the count of each class. If few classes have the greater number of samples than the other class then it is termed as class imbalance [15]. The class unbalancing problem is solved by the oversampling of down sampling of the class.

The analysis and extraction of raw dataset and proceeded through preprocessing and thus the feature extraction is done with machine learning models provided with training and testing. The training involves comparison of various dataset with the desired outcome. After the training and testing, the obtained results are produced.

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Food_detection_Latest_Volume (3).ipynb ☆
File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

[29]
#Get Food Weight = Volume * Density
def get_weight(class_name,volume):
    return food_density_gm_per_cm3[class_name]*volume

[43]
class_names = ['BG','apples','cheeseburger_475cal','coconuts','fries_350cal','pizza','rice','samosa','sandwich','thumb']
from keras.preprocessing.image import load_img
from keras.preprocessing.image import img_to_array
from mrcnn.visualize import display_instances
from google.colab.patches import cv2_imshow
import cv2
img = io.imread('https://i.ytimg.com/vi/CJj84y5P3_g/maxresdefault.jpg')

#Demo part 1
#CLASS 1 : Real Apple Image from Kicthen
img = load_img('/content/Mask_RCNN/images9/jpgfiles/rice59.jpg')

#CLASS 2 : Pizza slice in hand
img = load_img('/content/drive/My Drive/Mask_RCNN/images9/jpgfiles/pizza51.jpg')

#CLASS 3 : Multiple samosas in plate
img = load_img('/content/Mask_RCNN/images9/jpgfiles/samosa56.jpg')

#CLASS 4 : Rice in plate
img = load_img('/content/Mask_RCNN/images9/jpgfiles/rice59.jpg')

```

Fig 4 : Food detection through testing and training

The figure 4 shows the food detection through training and testing stages. The training and testing is proceeded by the image processing technique. The image processing plays a significant role in the diet management system with identification of image and convert them and provide the information from the image [16]. The image are feeded through the pixels value and process them through an algorithm. Computer aided medical diagnosis and handwritten analysis are done through the pattern recognition [17]. The figure describes the food detection through image processing technique.

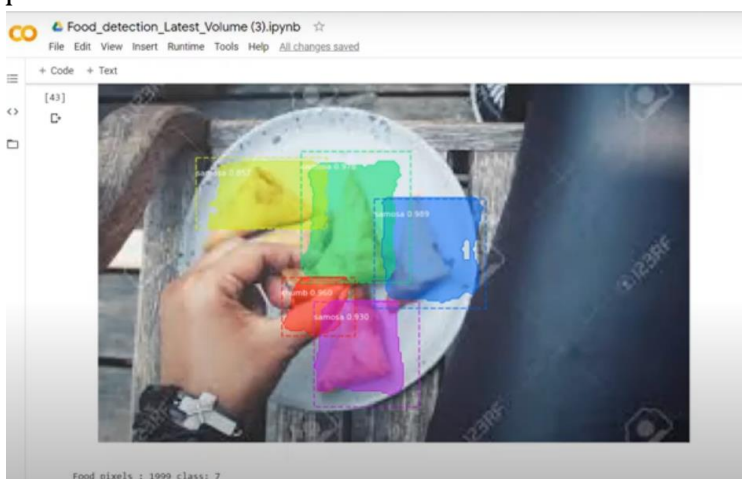


Fig 5: Food detection through image processing technique

#### IV.Simulation outcome

##### 1. BMI calculator

The BMI calculator is the first step in maintaining the diet system. The amount of calories that are needed is depicted through the body's weight of an individual. The weight of an individual gives idea

about the complete list of food that requires the body. The weight of the system is classified as underweight, normal and obese in the BMI calculator. Figure 6 shows the BMI calculator.

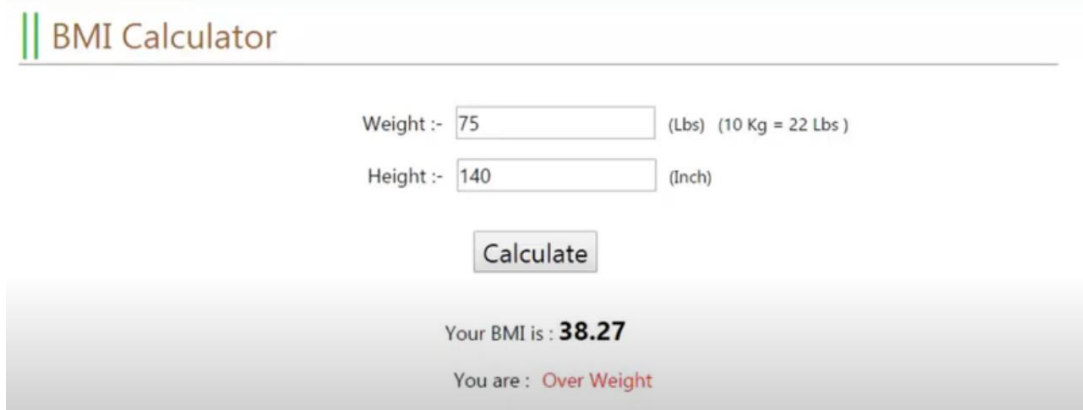


Fig 6: BMI calculator

## 2. Food chart

After calculating the obtaining the BMI results, the desired value of calories that are needed to intake are depicted through the food chart. The food chart gives a complete list of food that are needed to intake in the particular period of time. This will help to avoid the excessive intake at the late night conditions. They are classified into body building foods, energy foods and protective foods and categorized into various groups based on the calorie content.



Fig 7: Food chart

The other step is to create an account in the application to provide individual attention as shown in figure 7. This gives the complete details about the individual's diet plan to enhance the physical fitness levels. The user login includes the basic registration which gives details about the individual through the BMI calculator. The figure shows the basic step of user login credentials. The basic registration involves the necessary information with the medical complications that the individual is having at the particular period.

## Registration

The registration form contains the following fields and options:

- User ID :- 1003
- Name :-
- Address :-
- Mobile No :-
- Email :-
- Food Preferred :-  Veg  Non-Veg
- Disease :-  Diabetes  Blood Pressure  Cancer
- Password :-
- Confirm Password :-

Buttons: Submit, Cancel

Fig 8: Basic registration

After the registration is done, the system itself gives the user id and password as shown in figure 8. This credentials gives the complete details of the individual's health conditions. The analysis of the health condition is the fundamental process to monitor and give details about the individual to maintain physically stable and fit. This identification of the stage of individual by the basic registration gives the overall details regarding the further corrections and updating in food plan to everyday life. The correct amount of food in the day to day life enhanced the health conditions to remain physically fit and to get rid of various medical complications. The heart beat rate with pressure and sugar levels are indicated. The figure 9 shown below denotes the user ID and the password.

## User Login

The user login form contains the following fields:

- User ID | Enter User ID (Please fill out this field.)
- Password | Enter Password

Fig 9: User login

The developed application gives the information regarding the food that needed in the day to day life to have a balance diet. The plan is programmed based on the BMI results proceeded through the basic registration which includes the complete health conditions that depicts the consequences as well to monitor and provide the exact information.

Fig 10: Diet plan

The figure 10 represents the diet plan proceeded by monitoring and analyzing of the individual. The diet plan recognizes the individual's health condition and gives the necessary food to intake based on the calorie content and BMI values of an individual.

Type	Time	Food Item	Note
Breakfast	09:00	Toast	Have toast dip with tea
Breakfast	09:00	Bread-Butter	Toast the Bread
Lunch	13:30	Chapati	Two Chapaties
Lunch	13:30	Bhaaji	Any Bhaaji
Lunch	13:30	Daal	Avoid tadka on daal
Lunch	13:30	Rice	
Evening Snacks	17:30	Corn Flakes	Boiled Corns
Evening Snacks	17:30	Biscuit	Eat wheat biscuits
Dinner	21:00	Chapati	One Chapati
Dinner	21:00	Bhaaji	Eat Sprouts bhaaji
Dinner	21:00	Daal	Plain Daal
Dinner	21:00	Rice	

Fig 11: Diet plan with time

The figure 11 represents the diet plan with the timing the individual needed to take the amount of food to intake at the particular period of time to avoid several consequences.

After the application is completed with the basic information, the system enables to monitor and analyses the individual at the particular time to maintain the health through food. This complete setup is enhanced by providing information to the individual through the notifications.

#### V.Conclusion



The proposed system is recognized to provide a healthy environment to the individual by adopting a complete diet plan with monitoring and controlling the individuals health condition. This is user friendly in nature and provide a complete monitoring of the individual by sending notifications to the user mobile phone. Hence the system provides a complete instruction to maintain a healthy body through monitoring and control.

## Reference

- [1] Rajapaksha, Samantha, et al. "A Mobile Application to Predict and Manage High Blood Pressure and Personalized Recommendations." 2019 International Conference on Advancements in Computing (ICAC). IEEE, 2019.
- [2] Strickland, Eliza. "IBM Watson, heal thyself: How IBM overpromised and underdelivered on AI health care." IEEE Spectrum 56.4 (2019): 24-31.
- [3] Odeh, Ayman, Raghad Abdelhadi, and Hussien Odeh. "Medical patient appointments management using smart software system in UAE." 2019 International Arab Conference on Information Technology (ACIT). IEEE, 2019.
- [4] Liu, Junnan, et al. "The future development of traditional Chinese medicine from the perspective of artificial intelligence with big data." 2018 IEEE 4th International Conference on Big Data Security on Cloud (BigDataSecurity), IEEE International Conference on High Performance and Smart Computing,(HPSC) and IEEE International Conference on Intelligent Data and Security (IDS). IEEE, 2018.
- [5] Subhi, Mohammed Ahmed, Sawal Hamid Ali, and Mohammed Abulameer Mohammed. "Vision-based approaches for automatic food recognition and dietary assessment: A survey." IEEE Access 7 (2019): 35370-35381.
- [6] Concepcion, Ronnie S., et al. "The technology adoption and governance of artificial intelligence in the Philippines." 2019 IEEE 11th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM). IEEE, 2019.
- [7] Li, Xiuquan, and Tao Zhang. "An exploration on artificial intelligence application: From security, privacy and ethic perspective." 2017 IEEE 2nd International Conference on Cloud Computing and Big Data Analysis (ICCCBDA). IEEE, 2017.
- [8] Kalantarian, Haik, Nabil Alshurafa, and Majid Sarrafzadeh. "A survey of diet monitoring technology." IEEE Pervasive Computing 16.1 (2017): 57-65.
- [9] Agapito, Giuseppe, et al. "DIETOS: A recommender system for adaptive diet monitoring and personalized food suggestion." 2016 IEEE 12th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob). IEEE, 2016.
- [10] Zhang, Rui, Severin Bernhart, and Oliver Amft. "Diet eyeglasses: Recognising food chewing using EMG and smart eyeglasses." 2016 IEEE 13th International Conference on Wearable and Implantable Body Sensor Networks (BSN). IEEE, 2016.
- [11] Huang, Qianyi, Wei Wang, and Qian Zhang. "Your glasses know your diet: Dietary monitoring using electromyography sensors." IEEE Internet of Things Journal 4.3 (2017): 705-712.
- [12] Bryson, Joanna, and Alan Winfield. "Standardizing ethical design for artificial intelligence and autonomous systems." Computer 50.5 (2017): 116-119.

- [13] Mall, Shreejay, Mansi Gupta, and Rahul Chauhan. "Diet monitoring and management of diabetic patient using robot assistant based on Internet of Things." 2017 International Conference on Emerging Trends in Computing and Communication Technologies (ICETCCT). IEEE, 2017.
- [14] Shahriari, Kyarash, and Mana Shahriari. "IEEE standard review—Ethically aligned design: A vision for prioritizing human wellbeing with artificial intelligence and autonomous systems." 2017 IEEE Canada International Humanitarian Technology Conference (IHTC). IEEE, 2017.
- [15] Wang, Fei-Yue. "Artificial intelligence and intelligent transportation: Driving into the 3rd axial age with ITS." IEEE Intelligent transportation systems magazine 9.4 (2017): 6-9.
- [16] Jose M. Anton-Rodriguez, Peter Julyan, Ibrahim Djoukhadar, David Russell, D. Gareth Evans, Alan Jackson, and Julian C. Matthews "Comparison of a Standard Resolution PET-CT Scanner With an HRRT Brain Scanner for Imaging Small Tumors Within the Head" IEEE transactions on radiation and plasma medical sciences, vol. 3, no. 4, july 2019.
- [17] Xiaolong Xu, Wen Chen [15], Implementation and Performance Optimization of Dynamic Random Forest", IEEE (2017)