HEALTHY NUTRITION SUGGESTION MODEL FOR WOMEN SPORTS PLAYERS BASED ON LONG SHORT-TERM MEMORY

By

R. KEERTHANA

20PCS003

Project Report Submitted

In partial fulfillment of the requirements for the Award of

Master of Science in Computer Science

DEPARTMENT OF COMPUTER SCIENCE

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN

COIMBATORE-641043

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Signature of the Head of the Department **Signature of the Supervisor**

Viva-voce Examination held on_____

Signature of Examiner

ACKNOWLEDGEMENT

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I would like to express my sincere thanks to **God** Almighty, for his constant love and grace that he has showed upon me, which kept me in good health, and sound mind without which my project would not have reached a successful end.

I would like to express my deep sense of reverential gratitude and sincere thanks to Prof. **S.P. Thyagarajan**, Chancellor, Avinashilingam Institute of Home Science and Higher Education for Women, Coimbatore, for the opportunity given to me for undertaking this study and for providing all the needed facilities during the course of my study.

I owe my great deal of gratitude to **Dr.V. Bharathi Harishankar,** Ph.D., FRSA Vice Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for extending all resources that facilitated the conduct of the present study.

I express my gratitude to **Dr. S. Kowsalya,** Registrar, M.Sc., M.Phil., Ph.D. Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for providing all facilities necessary for the study.

I would express my boundless thanks to **Dr. G. Padmavathi,** M.Sc., M.Phil., Ph.D., and Dean**,** School of Physical Sciences & Computational Sciences, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, for granting the facility required.

I wish to place on record my deep sense of gratitude to **Dr. Vasantha Kalyani David, M.Sc.**, M.Phil. (Maths)., M.Phil. (CS)., Ph.D., Professor and Head, Department of Computer Science for support and encouragement to complete the project.

I am grateful to the project coordinator **Dr. (Mrs.). I. Elizabeth shanthi** M.Sc., M.Phil., Ph.D., Professor Department of Computer Science, who was instrumental in granting me the facilities required for doing project

I express my heart full gratitude to esteemed mentor **Dr**. **N. VALLIAMMAL** M.Sc., M.Phil. Ph. D, Assistant Professor(SG), Department of Computer Science for imparting the tremendous assistance and well-timed sthe upport for triumph of our project with guidance and constant supervision as well as for providing necessary resources for the project and also for her support in completing the project.

I'd also like to extend my gratitude to **Dr. (Mrs.) P. Subashini,** M.C.A., M.Phil., M.Sc. (Psychology), Ph.D., Professor, Department of Computer Science, Project Coordinator, DST CURIE-AI, always supported me and nurtured me with valuable advice and profound belief in my work and abilities.

I wish to convey my heartfelt gratitude to **Dr. T.T. Dhivyaprabha**, M.Sc., M. Phil, Ph.D., Research Associate DST CURIE-AI, for her guidance and constant supervision and for providing the necessary helps to complete my project and for her help in completing the project.

Finally, yet importantly, I would like to thank my **parents, family members and friends** for their kind inspiration, support, encouragement, blessings and prayers, which were instrumental in the successful completion of the project.

I have great pleasure in expressing my deep sense of gratitude to all other teaching and non-teaching staff members of the Department of Computer Science, who stood behind the screen for the completion of the project.

I would extend my hearty thanks to one and all that helped me directly or indirectly for the successful completion of my project.

ABSTRACT

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Nutrition planning for Indian women athletes and active youth focus on maintain and improving food changes. There is a vast number of systems for improving health, sports, but similar systems for Indian women players are limited. Nutrition has become one of the main things need in this era. The changes in our food habits are the causes effect in nutrition. Though there are some suggestion systems has been proposed to recommend a healthy meal planning for general but no similar solution as our proposed model. Nutrition for athletes and sports persons is important as it provide source of energy required to perform the activity. The proper diet has to planned and the amount of food. Nutrition help in enhancing performance for persons in sports. With the proper diet and food in intake, one can achieve the desired result. Eating a good diet can help provide the energy you need to finish a race, or just enjoy a casual sport or activity. As there no particular system which improves the nutrition of women sports players, the proposed model is built. A nutrition suggestion model for Indian women players is proposed to give female athlete and active youth a proper diet intake per day based on their age with Indian foods and particularly in an interactive system with visualization. The aim of the system is to develop a intelligent recommender system using LSTM and GUI. Nutrition suggestion model is an effective way to get a balanced diet and adjust their eating behaviour, achieve the goal of healthier food and diet. The suggestion model comprises of (1) Nutrition composition (2) Model building (3) GUI to provide meal suggestion to women sports players and Active youth (women). The purpose of this study is to review the nutrition of women sports players and recommending per day food according to age.

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INTRODUCTION

1.INTRODUCTION

Sports is a sector which unites everyone in world including women. From the American Time Use Survey of 1,12,000 individuals, found that 28% of women have been participated in individual s ports. The participate rate of women in Olympic has been increased approximately 40-45%. Indian sports have a massive number of rises in female athletes who are shining at world stage. Female athletes have occupied a vast place in society other than being a mother and homemaker. People's mindset has been changed and female athletes are making revolution and considering them admirable. There is a gradual increase in number of women towards sports each time. In 2000 there were only 21 women, 25 in 2004, 25 in 2008,23 in 2012 and it has been doubled to 54 athletes in 2016 competing in the Tokyo Games. Generally female athletes need more amount of energy, water, sodium and certain vitamins like thaimin, riboflavin, niacin for immunity. It is foremost to ensure nutrition plans which helps women athletes to have enough energy to decrease fatigue, minimize the risk of injury and to perform as best as possible without any interruption. In India, the major challenge is to maintain heath of women athletes. It's because of their cultural habits, poverty, lack of knowledge in food intake and improper diet. The impact of poverty in India leads the athletes to malnutrition or does not fit them for long training sessions. Most of female athletes are from a lower middle-class and they don't have proper diet intake. In recent years, government gives preferences to female athletes and supports them financially to have proper nutrition for better performance. While women participate equal to men in all sports, the amount of nutrition they gain is a question, this is because of lack of knowledge about nutrition. If an women athlete has a suitable diet, it provides them enough energy and nutrition which helps them to meet the demands of training and exercise. If a proper diet in taken, women players can stay fit and boosts the immune system. Meal planning is most important for athletes about listing precisely what type of food to be taken and the amount. While planning a day of food for women athletes, they should focus on eat a plant-rich-diet with a greater number of vegetables. fruits, grains, meat, beans and nuts. Women athletes need enough energy and nutrients to sustain training and to maintain their health. Women athletes need more nutrition compared to men due to their bod composition Indian women athletes need to take a lot of nutrition because most of them suffer with malnutrition. In recent years, the participation of women in sports has increased. Most of women players does not meet the nutrition requirements, so a proper action should be planned for improving athlete's diet. The first and foremost phase is to collected the food data for further

analysis. The data used is Nutritive value of Indian foods and the data is pre-processed by checking the null values and normalization.

The model is constructed using machine learning algorithm like LSTM with all pre-processing steps and a graphical user interface is created for suggesting the food to athletes and active youth for age wise. The GUI is mainly used for recommending the food to user based on their age, height, weight for active youth and female athletes. The food intake helps them improving strength, training and recovery. It is important for nutrition of amount and food they take throughout a day. Another important feature of this proposed model is the real time data is also collected using google form a certain age group of Indian female active youth, the meal recommendation is created according to the real time data. The model is built in a way that recommends a per day meal to the women athlete's and active youth according to their age. Proper food makes a person healthier both physically and mentally, this proposed system is built to make a women athlete fit in both areas. The model is highly useful for the persons who does not have a knowledge about proper nutrition and make them healthy. A nutrition composition table is drawn for further mapping of the data to meal suggestion. With the base of nutrition composition table, a further data is fetched and implemented for suggestion model. The result or goal of proposed model is to recommend a proper diet to Indian women athletes and active youth according to their age per day with all essential nutrients like energy, carbohydrate, protein, calcium, iron. The model is implemented using deep learning algorithm LSTM (Long short-term memory) which helps to build a recommendation model with neural network layers. An interactive GUI recommends the breakfast, lunch, dinner for each age group. To get easy understanding of how much protein, carbs, calories, calcium, iron have taken plots are made to show the amount to nutrition form the food suggested.

1.1 Problem definition

A Nutrition recommender system is developed based on GUI and LSTM which suggests nutrition to women players and active youth, particularly with Indian foods

1.2 Objective of project

The main goal of the proposed system is to develop a daily recommendation to suggest a diet based on nutrition values for women sports players

SYSTEM SPECIFICATION

2. SYSTEM SPECIFICATION

2.1 HARDWARE SPECIFICATION

Processor : AMD A6-9225 CORES 2C+3G 2.60GHz

Ram : 4.00GB

2.2 SOFTWARE SPECIFICATION

Operating System : Windows 10

Front end and back end : Python

2.2.1 ABOUT THE SOFTWARE

PYTHON:

Python is object-oriented high level programming language with dynamic semantics. There are no type declarations of variables, parameters, functions, or methods in source code. This makes the code short and flexible, and you lose the compile-time type checking of the source code. Since Python is a general-purpose language, it can do a set of complex machine learning tasks and enable you to build prototypes quickly that allow you to test your product for machine learning purposes. While complex algorithms and versatile workflows stand behind machine learning and AI, Python's simplicity allows developers to write reliable systems. Developers get to put all their effort into solving an ML problem instead of focusing on the technical nuances of the language. Machine learning requires continuous data processing and Python has in-built libraries and packages for almost every task. This helps machine learning engineers reduce development time and improve productivity when working with complex machine learning applications. Python is one of the emerging languages for any analysis, deep learning and machine learning problems. It has a wide range of compilers to execute the python programs like PyCharm, PyDev, Jupyter Notebook, Visual Studio Code, and many more. The algorithm is implemented and model is built using Jupiter notebook which is a user friendly. Python offers multiple options for developing GUI (Graphical User Interface). Out of all the

GUI methods, tkinter is the most commonly used method. It is a standard Python interface to the Tk GUI toolkit shipped with Python. Python with tkinter is the fastest and easiest way to create the GUI applications.

Advantages

- Easy to Read, Learn and Write. Python is a high-level programming language that has English-like syntax.
- Interpreted Language
- Dynamically Typed.
- Free and Open-Source.
- Vast Libraries Support.
- Portability.

JUPYTER NOTEBOOK

Jupyter notebook is one of the most popular tools to create and share documents that contain interactive code, visualization, text, etc as web applications. The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations, and narrative text. Its uses include data cleaning and transformation, numerical simulation, statistical modelling, data visualization, machine learning, and much more. Jupyter notebook is an open-source interactive web application that allows users to create documents that contain interactive calculations. Users can combine data, code, and visualization into single notebook. The Jupyter notebook is widely used and well documented and offers an easy-to-use interface for creating, editing and running notebooks. The notebook runs as web application called the dashboard or control panel that shows local files and allows users to open notebook documents and run code. The outputs formatted and displayed on the browser. The other component of the notebook is kernel, the kernel is a computational engine that executes the code written in the notebook. It is a back-end application, another reason why Jupyter Notebook is such a common tool in data science is that Jupyter Notebook makes it easy to explore and plot the data. The benefits of Jupiter notebook are as follows They're great for displaying the work, both the code and the results is shown. Very easy to host server side, which is useful for security purposes.

2.2.2 PYTHON IN MACHINE LEARNING

Python has libraries that enables developers to use optimized algorithms. Python facilitates developers to increase the confidence and productivity about their developing software from development to deployment and maintenance. The benefits of making Python the perfect solution for machine learning and AI-driven projects include simplicity and consistency, flexibility, access to powerful AI and machine learning (ML) libraries and frameworks, platform independence, and large communities. These things increase the popularity of the language. It implements popular machine learning techniques such as recommendation, classification and clustering. The developed machine learning algorithms are used in various applications like vision processing, language processing, Forecasting, Pattern recognition, games, datamining, expert systems etc. The steps involved in building these systems are define a problem, prepare the data, evaluate algorithms, improving results, presenting results. The best way to start these machine learning models is using python because it is an end-end and cover the key steps like loading data, summarizing data, evaluating and making predictions.

2.2.3 VISUALIZATION

Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets. Sigma plot and excel are used to visualize the results and outcomes. Sigma plot is a technical graphical program designed for the visualization. It can be used effectively to produce all types of the graphs and charts including a non-linear curve filter, worksheets that accommodate large data sets and summary statistics. It has mathematical transform language that allows to manipulate and analyse data. Sigma plots enables to create graphs quickly. It has easy-to-read icons on the graph toolbar and the interactive graph wizard, which promotes for each step of graph creation. Sigma plot graphs can be copied and pasted to another page, report, or into any other window application that supports pictures. Sigma plot is same as excel. Charts and graphs in Microsoft Excel provide a method to visualize numeric data. While both graphs and charts display sets of data points in relation to one another, charts tend to be more complex, varied, and dynamic. It's easy to create charts and graphs in Excel, especially since you can also store your data directly in an Excel Workbook, rather than importing data from another program. Excel also has a variety of pre-set chart and graph types so you can select one that best represents the data relationship(s) you want to highlight.

NEED FOR THE STUDY

3.NEED FOR THE STUDY

3.1 LITERATURE STUDY

Meal recommender system suggests an excellent meal planning for users. Generally, most of them have few layers of processes before recommendation like gathering information and providing suggestion. Intelligence system should focus on receiving the user data and produce output as recommendation plan. Meal recommender system are considered as a multi-dimensional problem as it includes several constraints. In recent years, general meal planning system are created and it just aims to provide nutrition to normal users. It is not easy to build any model; it has enormous processes and knowledge acquisition about the model is vital important processes for a suggestion system. It takes lot of time-consuming and quite challenging task, without this a system cannot be made. The knowledge can be gained from books, research papers, documents etc. Norashikin Mustafa, Abdul Hadi Abd Rahman et.al[2020] illustrated iDietScore:Meal recommender system for athletes and active individuals which has attained about the rule-based suggestion of foods to users like suggesting meal for training hours, suggestion of meal plan with user preferences, meal plan for users having food allergies. It also talks about the application which is user friendly and tracks the user's nutrients intake for previous days. Nutrition required for women athletes and active youth differ from age, height, weight etc. The nutrition composition for athletes cannot be randomly provided; it has certain criteria of amount of nutrition intake per day. The proper knowledge about the nutrition composition should be gained. From the study of another article, the accurate composition of nutrition like calcium, carbohydrate, protein, calories, iron for range of age particularly for Indian female athletes and female active youth. Working of machine learning algorithm and deep learning algorithms is studied. With the use of deep learning model, the system can be deployed for enterprise use. From the study of The Runner: -Recommender system of workout and nutrition for runners by Mihnea Donciu, et.al illustrated about the runner's workout and recommend nutrition for runners. Personalized nutrition is a healthy eating advice suits to an individual and they able to eat the food they like without hesitation. Raciel Year Toledo et.al in 'A Food Recommender System Considering Nutritional Information and User Preferences' illustrated a good recommender system recommender's food to users according to their preferences.

S.No	Author name	Tittle	Year	Study form the paper
1	Norashikm Mustafa, Abdul Hadi	iDietScore:Meal Recommender system for athlete's and active individuals	2021 International journal of Advanced Computer Science and Applications	To suggest food to users according to the height and weight.
2	Mihnea Donciu,Madalina Lonita	The Runner-Recommender system for workout and nutrition for runners.	2012 – Conference paper published in ResearchGate	To know about the runners workout and recommend nutrition for runners
3.	Ben Desbrow	Youth Athlete Development and Nutrition	Journal of Sports Medicine Volume 2015, Article Id 734649	To know about the nutrition value needed for young athletes

3.2 EXISTING SYSTEM

The existing system have the limitation of dealing with real time data. The previous models use the Convolution Neural Network. The system can evaluate food properties by through the model based on Convolutional Neural Networks (CNN) and the results obtained to tackle with some problems. The drawback of existing model is, there is no proper meal recommender system which gives essential nutrition for Indian sports players particularly for women athletes and active youth. Another drawback of these previous systems does not give the users Indian foods, it suggests the food which Indian women athletes cannot affordable or can't able to take over a period of time and a vast number of foods are not available in Indian regions. The system is not built in an interactive user-friendly manner. A nutrition rule should be taken while preparing a model while suggesting for women athletes, the system does not have nutrition rules which have been considered as a mandatory constraint.

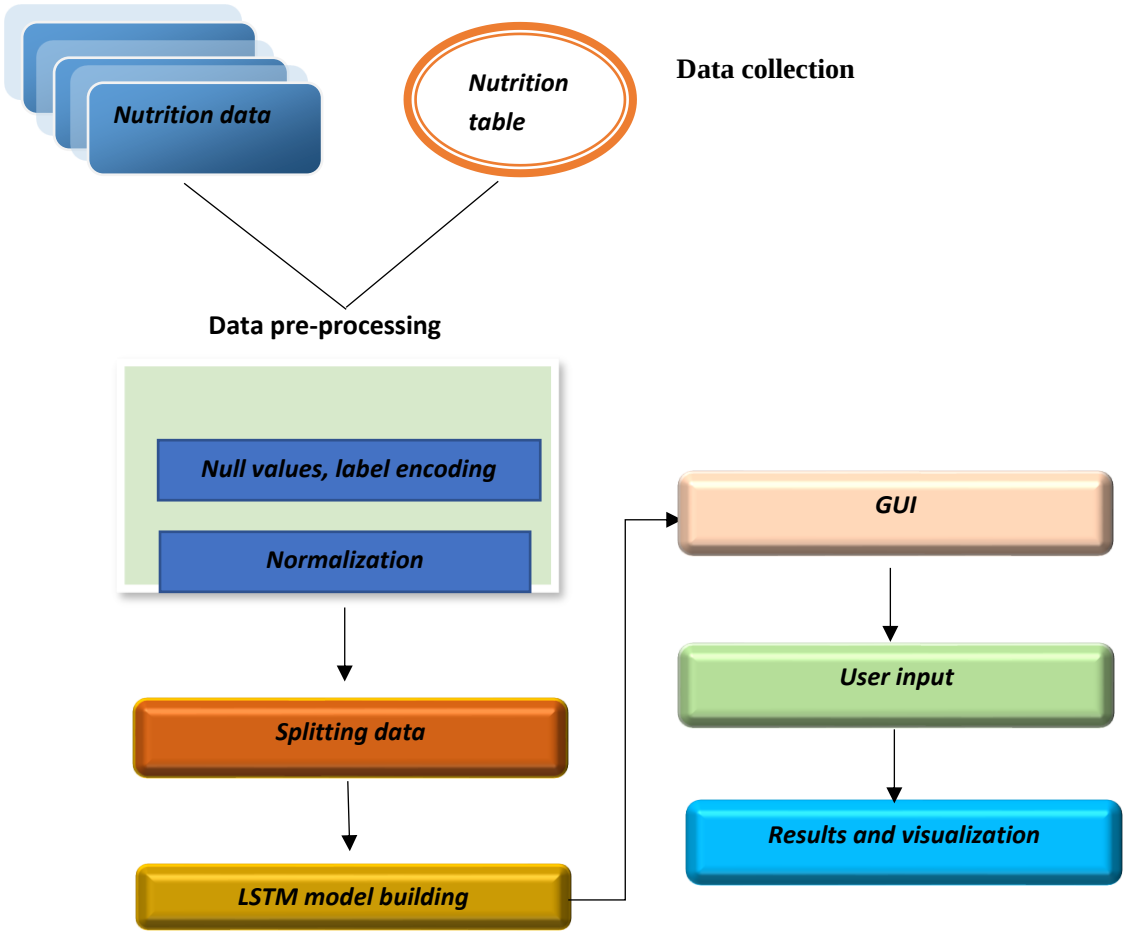
3.3 PROPOSED SYSTEM

The proposed model overcomes the limitations to previous systems and the advantage of proposed system is, it is mainly built for Indian women athletes and active youth. With the reference of a nutrition composition table is created and foods are mapped and suggested within the range of nutrients so that each player get proper nutritional food and help to maintain a proper diet. Each time when a user input is given, different meal would be suggested as per the age group. The main objective of the proposed system is to suggest a healthy nutrition model for Indian women athletes and active youth. It is built in a way which helps the players to have proper diet intake to meet the energy and other nutrition requirements for the training and during matches. The most significance of the proposed system is it is built in way of user friendly and in an interactive model which provides energy required for performance. The model is constructed using machine learning algorithm like LSTM with all pre-processing steps and a graphical user interface is created for suggesting the food to athletes and active youth. The food intake helps them improving strength, training and recovery. It is important for nutrition of amount and food they take throughout a day. Another important feature of this proposed model is the real time data is also collected using google form a certain age group of Indian female active youth, the meal recommendation is created according to the real time data. The model is built in a way that recommends a per day meal to the women athlete's and active youth according to their age. It is recommended that a proper diet plan along will help to enhance the performance of women players. The proposed model helps humans to take proper diet and improve performance.

SYSTEM DEVELOPMENT

4.SYSTEM DEVELOPMENT

4.1 METHODOLOGY DIAGRAM



4.2 MODULES:

- IMPORTING DATASET AND LIBRARIES
- DATA PRE-PROCESSING
- LSTM MODEL BUILDING
- GUI
- VISULAIZATION

4.3 MODULE DESCRIPTION

1] Importing dataset and essential libraries:

A library is a collection of related modules. It contains bundles of code that can be used repeatedly in different programs. It makes Python Programming simpler and convenient for the programmer. Here we have imported essential libraries like NumPy, pandas, Sklearn. pre-processing, Keras Sequential, Keras, Dense, LSTM. Importing modules is an important part of working with Python that allows you to call functions that are not part of your main program. The next step is to load the data for further processes. The module is focused on capturing the nutrition related data which is used to recommend food.

Import Pandas as pd

Pandas is one of the most important and useful open-source python's libraries. It is basically used for handling complex and large amount of data efficiently and easily. The pandas allow importing data from various file formats such JSON, SQL database, CSV and EXCEL files. In this project pandas is used to import the dataset in CSV file format.

Import NumPy as np

NumPy is a Python library used for working with arrays. It also has function for working in domain of linear algebra, matrices and numerical operations.

from sklearn.preprocessing import MinMaxScaler

Scikit-learn is probably the most useful library for machine learning in Python. The sklearn library contains a lot of efficient tools for machine learning and statistical modelling including classification, regression, clustering and dimensionality reduction. The sklearn. preprocessing package provides several common utility functions and transformer classes to change raw feature vectors into a representation that is more suitable for the downstream estimators. MinMaxScaler. Transform features by scaling each feature to a given range. This estimator scales and translates each feature individually such that it is in the given range on the training set

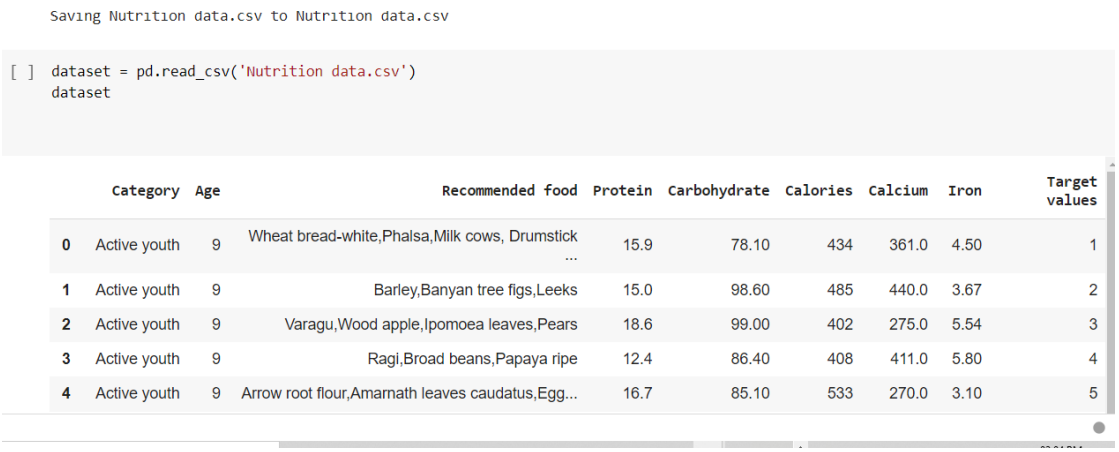
from keras.models import Sequential

A Sequential model is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor. A Sequential model is not appropriate when: Your model has multiple inputs or multiple outputs. Any layers has multiple inputs or multiple outputs.

from keras.layers import Dense, LSTM

Dense layer is the regular deeply connected neural network layer. It is most common and frequently used layer. Dense layer does the below operation on the input and return the output.

Without a proper data a suggestion model cannot be built, especially the data should have Indian foods which are in taken regularly and suite for suggestion model This nutrition data includes various types of Indian foods like millets, cereals, meat, fruits, nuts, vegetables, greens, milk products etc with their nutritional values like calories, iron, vitamin, protein, carbohydrate in each 100 grams of the food item. The nutrition table is the base reference table for the mapping of new dataset and the reference cannot be roughly made, proper reference should be gained with the help of resources available. This table has two categories like active youth and athletes of women of three age groups with the nutrition range needed for them per day. The range in the nutrition table is taken as the base and the food are mapped to breakfast, lunch and dinner. The nutrition range is divided into three so that the food are given for each meal.



Saving Nutrition data.csv to Nutrition data.csv

```
[ ] dataset = pd.read_csv('Nutrition data.csv')
    dataset
```

	Category	Age	Recommended food	Protein	Carbohydrate	Calories	Calcium	Iron	Target values
0	Active youth	9	Wheat bread-white,Phalsa,Milk cows, Drumstick ...	15.9	78.10	434	361.0	4.50	1
1	Active youth	9	Barley,Banyan tree figs,Leeks	15.0	98.60	485	440.0	3.67	2
2	Active youth	9	Varagu,Wood apple,Ipomoea leaves,Pears	18.6	99.00	402	275.0	5.54	3
3	Active youth	9	Ragi,Broad beans,Papaya ripe	12.4	86.40	408	411.0	5.80	4
4	Active youth	9	Arrow root flour,Amarnath leaves caudatus,Egg...	16.7	85.10	533	270.0	3.10	5

Figure 1 Dataset Preview

2] Pre-processing:

Data pre-processing is a process of preparing the raw data and making it suitable for a machine learning model. It is the first and crucial step while creating a machine learning model. A real-world data generally contains noises, missing values, and maybe in an unusable format which

cannot be directly used for machine learning models. Data pre-processing is required tasks for cleaning the data and making it suitable for a machine learning model which also increases the accuracy and efficiency of a machine learning model. The first step of pre-processing is to load the dataset. The mapped data is loaded. The next step of data pre-processing is to handle missing data in the datasets. If there are missing values the model will not be accurate and in efficient manner. As in our dataset there is no missing values, we don't need to handle it. It is checked whether it is present. Label encoding refers to converting the labels into a numeric form so as to convert them into the machine-readable form. Machine learning algorithms can then decide in a better way how those labels must be operated. In our dataset we have two labels Recommended food and Category. Each label is assigned to a unique integer based on alphabetical order. Normalization is the process of translating data into the range [0, 1] (or any other range) or simply transforming data onto the unit sphere. Normalization gives equal weights/importance to each variable so that no single variable steers model performance in one direction just because they are bigger numbers. As an example, clustering algorithms use distance measures to determine if an observation should belong to a certain cluster Normalization gives equal weights or importance to each variable so that no single variable affects model performance in one direction just because they are bigger numbers. Here we have used minmaxscaler for normalization. It Transform features by scaling each feature to a given range. This estimator scales and translates each feature individually in a way that it is in the given range on the training set, e.g., between zero and one. As we have a categorical variable as target variable, we have used minmaxscaler.

```
data.isnull().sum()
```

```
Category            0
Age                 0
Recommended food    0
Protein             0
Carbohydrate        0
Calories            0
Calcium             0
Iron                0
Target values       0
dtype: int64
```

Figure 2 Checking for null values

	Category	Age	Recommended food	Protein	Carbohydrate	Calories	Calcium	Iron	Target values
0	0	9	39	15.9	78.1	434	361.0	4.50	1
1	0	9	5	15.0	98.6	485	440.0	3.67	2
2	0	9	32	18.6	99.0	402	275.0	5.54	3
3	0	9	18	12.4	86.4	408	411.0	5.80	4
4	0	9	0	16.7	85.1	533	270.0	3.10	5

Figure 3 Data before normalization

	0	1	2	3	4	5	6	7	8
0	0.0	0.015747	0.068237	0.027820	0.136649	0.759358	0.631632	0.007874	0.001750
1	0.0	0.013585	0.007547	0.022642	0.148832	0.732084	0.664159	0.005540	0.003019
2	0.0	0.018053	0.064190	0.037311	0.198588	0.806389	0.551635	0.011113	0.006018
3	0.0	0.015357	0.030714	0.021158	0.147427	0.696183	0.701302	0.009897	0.006825
4	0.0	0.014905	0.000000	0.027656	0.140931	0.882681	0.447137	0.005134	0.008280

Figure 4 Data after normalization

3)LSTM Model building

Modelling building is done using LSTM algorithm. LSTM stands for Long short-term memory which is capable of learning long-short term dependencies for a sequence prediction. This algorithm is well suited for classification, processing, predictions. Train-test split procedure is used to estimate the performance of the algorithm when they used for model building. This procedure is dividing it two subsets train and test set. The training set is used to fit the model for predicting results. The test set is used to evaluate the fitted model. The data is divided in to two sections testing and training data with k-fold method in the ratio of 70% training and 30% testing. It has three layers input layer, output layer and hidden layers in the proposed system Sequential is declared for defining the model and the layers are added to it.,

it has five layers like LSTM layer and dense layers and the model is compiled and fitted using training data. The binary_crossentropy function has been used to compute the loss between the labels and the predicted labels. As the data has multi-class data which has two or more inputs this function has been computed. Model fitting is used to measure how the model generalizes data which is training. The model is fitted with the training data and the predictions are done.

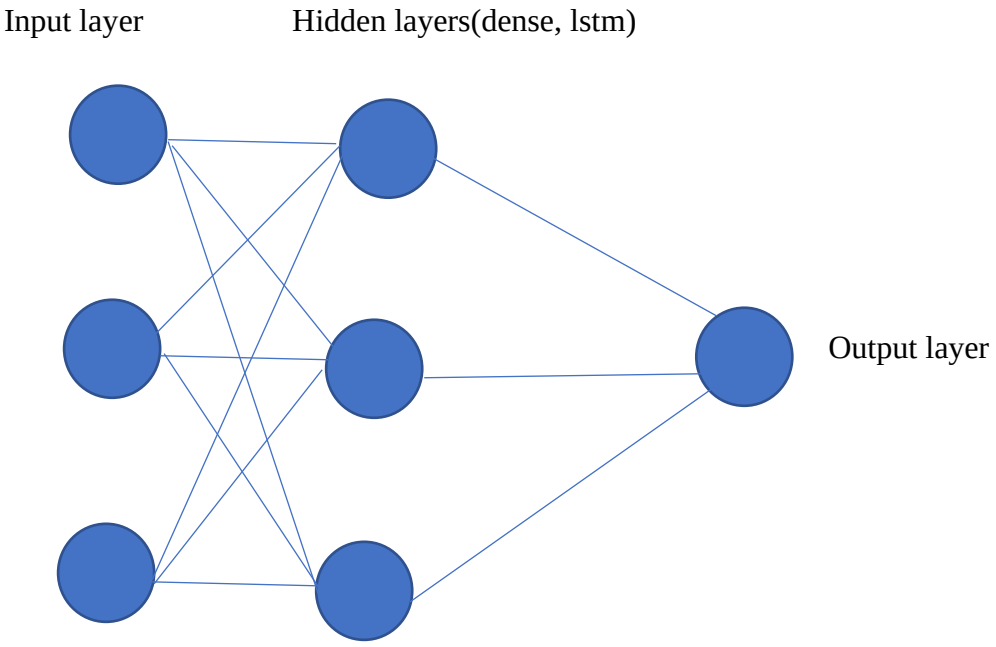


Figure 5 LSTM architecture

4)GUI

Graphical user interface is a graphics-based system interface which uses icon, menu etc to manage interaction with the system. In this model GUI is a tool to get the inputs from the user and suggest them a meal per day with nutrition values age wise for female active youth and women athletes. In python GUI, tkinter in commonly used to build the proposed model. Tkinter is the fastest and easiest toolkit to create GUI using python. The tkinter module is imported and a main window(container)is created with the main loop (). The pack () method, grid () method organises the widgets in a grid structure. In tkinter module there are vast number of widgets which can added to the application. In the window a home is created with button, textbox and label. For each widget there are many numbers of options like font, colour, width, height. The

widgets are places and formats are declared. While on clicking the button they are redirected to another pages, with the selection of the information the suggestion is displayed age wise.

5.VISUALIZATION

Visualization is a pictorial representation of the results which makes it easier to understand, observe the results. The plots show each nutrition value which gives a clear information and nutrition contents in the foods suggested. The need of visualization is to present the results in effective and easy understandable manner. With sigma plot the final results are acquired in a data format then the data are added to the notebook. Sigma plots gives us enormous plots and the outputs are visualized. This will show the graphical representation of each meal and the amount of nutrients value in each food and overall nutrients needed per day.

CONCLUSION AND FUTURE ENHANCEMENT

5.CONCLUSION AND FUTURE ENHANCEMENT

A healthy nutrition suggestion model for women players is developed to provide a proper meal to the women players and active youth. The existing system has limitation which does not have any suggestion for Indian women players. Nutrition is a much needed for women players to perform well and having a healthy life. The nutrition model suggests the players meal per day age wise for women athletes and active youth. A rule-based suggestion model consisting of a GUI and visualization are created. The foods are suggested for each age group women and active youth with the nutrition value. With the GUI the results of the model displayed in a user interface. A visualization is represented to get a clear level of nutrients available in the recommended food. Thus, with this system a player will be fit and able to match the training and match period. The model is created for women athletes and women active youth. Real time data for three age groups like 9-18, 18-40,40-50 data can be collected suggestion can be displayed.

SCOPE FOR FUTURE ENHANCEMENT

- It can develop as a website with tracking system and user can suggest foods to their preferences.
- It can be developed for health sectors like for diabetics' patients etc.
- The model can be developed it can be enhanced for all sports like swimming, volleyball, hockey etc for all genders.

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WEBSITE LINK

- https://www.w3schools.com/python/python_intro.asp#:~:text=Python%20has%20a%20simple%20syntax,prototyping%20can%20be%20very%20quick.
- https://www.section.io/engineering-education/introduction-to-jupyter-notebooks/#:~:text=Jupyter%20notebook%20is%20an%20open,they%20can%20edit%20and%20share.

APPENDIX

7.APPENDIX

7.1 DATASET

Dataset description

Indian foods composition table includes the food items with their nutrition value of each 100 grams. As we are building a model for our country wise the Indian foods data is used. The data has the major food consumption in India. It contains 447 food items which we take normally like rice, ragi, carrot, meat, milk, pears, apple, horse gram, prawn, egg, cauliflower, spinach and so on. The dataset has 2,682 data and 6 attributes [10]. All features in the dataset are taken building. The dataset link is given below. This dataset is mapped to another dataset as combinations of three meals per day. This data is numeric type of protein, carbohydrate, calcium, iron, calories contents in per 100 grams of food with strings like rice, wheat bread etc.

The mapped data has 54 rows and 8 attributes. The derived data also has the same numeric and string data type. For further the rows can be increased. The data is derived to a breakfast, lunch, dinner based on the table 1 and the food items are divided. The mapped data is further used for model building and suggestion meal. A real time data is collected using google forms. It is collected from the active youth of age 18-30. The data has the basic details of age, height and weight. It has 34 rows and 5 attributes. The nutrition composition table data which is used to map is taken from the following link **https://www.eeb.cornell.edu.**

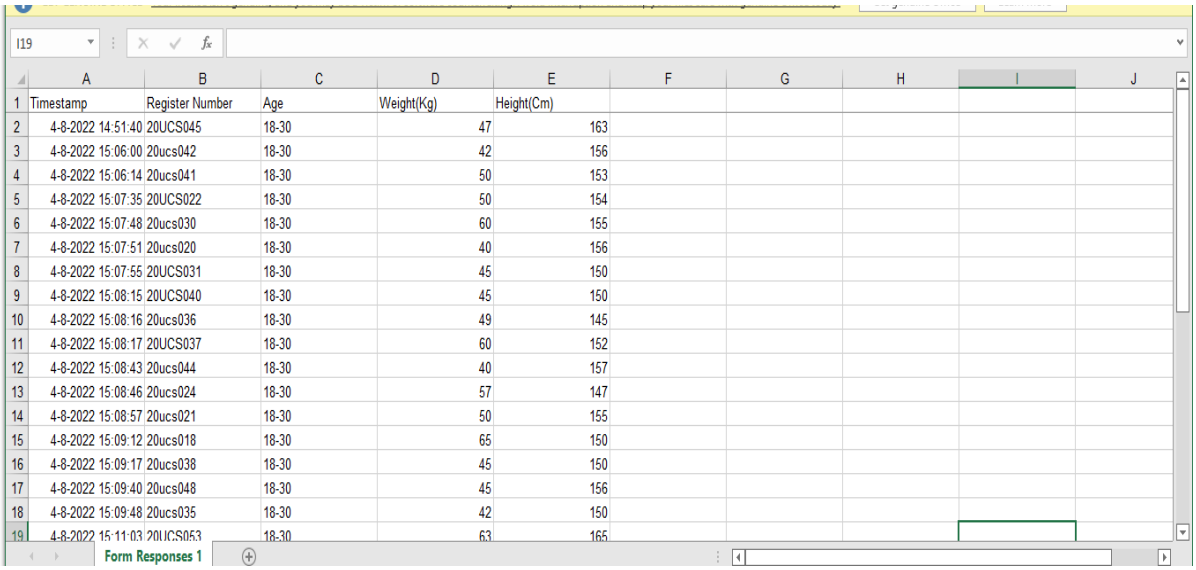
Raw data of Indian foods with nutrition composition.

Food Name	Protein	Carbohydı	ENERgy(K	Calcium	Iron
Bajra(Pennisetum typhoideum)	11.6	67.5	361	42	8
Barley (Hordeum vulgare)	11.5	69.6	336	26	1.67
Italian millet	12.3	60.9	331	31	2.8
Jowar(Sorghum vulgare)	10.4	72.6	349	25	4.1
Maize dry(Zea mays)	11.1	66.2	342	10	2.3
Maize,tender,local(Zea mays)	4.7	24.6	125	9	1.1
Panivaragu	12.5	70.4	341	14	0.8
Ragi(Eleusine coracana)	7.3	72	328	344	3.9
Rice,parboiled,handpounded	8.5	77.4	349	10	2.8
Rice,parboiled,milled(oryza sativa)	6.4	79	346	9	1
Rice,parboiled,handpounded	7.5	76.7	346	10	3.2
Rice, raw, milled (Oryza sativa)	6.8	78.2	345	10	0.7
Rice,bran	13.5	48.4	393	67	35
Rice flakes(Oryza sativa)	6.6	77.3	346	20	20
Rice puffed(Oryza sativa)	7.5	73.6	325	23	6.6
Samai (Panicum miliare)	7.7	67	341	17	9.3
Sanwa millet	6.2	65.5	307	20	5
Varagu (Paspalum scrobiculatum)	8.3	65.9	309	27	0.5
Wheat, bulgur (Triticum aestivum)	4.2	77.2	356	37	1.9

Mapped data according to age and nutritive composition table

Category	Age	Recommended food	Protein	Carbohydı	Calories	Calcium	Iron	Target values
Active youth	9-13	Wheat bread-white,Phalsa,Milk cows, Drumstick flowers	15.9	78.1	434	361	4.5	1
Active youth	9-13	Barley,Banyan tree figs,Leeks	15	98.6	485	440	3.67	2
Active youth	9-13	Varagu,Wood apple,Ipomoea leaves,Pears	18.6	99	402	275	5.54	3
Active youth	9-13	Ragi,Broad beans,Papaya ripe	12.4	86.4	408	411	5.8	4
Active youth	9-13	Arrow root flour,Amarnath leaves caudatus,Egg hen	16.7	85.1	533	270	3.1	5
Active youth	9-13	Maize dry,Amarnath species(Koyakeerai),Parsnip	15.2	94.7	480	352	5.3	6
Active youth	9-13	Wheat flour refined,Milk buffalos,Brinjal	16.7	82.9	489	261	3.88	7
Active youth	9-13	Wheat semolina,Amarnath viridis,Bitter gourd small	17.7	89.2	446	374	4.25	8
Active youth	9-13	Wheat vermicelli,Ari fish	24.6	81.8	441	402	4.07	9
Active youth	14-18	Barley,Milk buffalos,Avocado pear,Beetroot	19.2	84.2	711	364.3	4.76	10
Active youth	14-18	Wheat bread-white,Coconut milk,Banyan tree figs,Pink beans	16	79.6	791	444	4.2	11
Active youth	14-18	Wheat-vermicelli,Carrot,Egg hen,Mulberry	24	99.2	622	232	6.82	12
Active youth	14-18	Varagu,Curd cows milk,Yam oridinary,Parupu keerai,Broad beans	19.7	105	555	372	10.9	13
Active youth	14-18	Rice raw milled,Egg duck,Bengal gram leaves	23.8	93.1	623	420	7	14
Active youth	14-18	Rice parboiled milled, Field beans tender,Avocado pear,Drumstick flowe	15.5	93.6	659	280	4.35	15
Active youth	14-18	Wheat flour refined,Channa buffalos milk	24.4	81.8	679	528	4.9	16
Active youth	14-18	Arrow root flour,Channa cows milk,Ambada	19.2	88.8	647	251	5.1	17
Active youth	14-18	Wheat bread brown,Milk cows,Parsnip,Mahua	14.7	99.3	531	283	3.13	18

Real time data of Active youth of age 18-30



	A	B	C	D	E
1	Timestamp	Register Number	Age	Weight(Kg)	Height(Cm)
2	4-8-2022 14:51:40	20UCS045	18-30	47	163
3	4-8-2022 15:06:00	20ucs042	18-30	42	156
4	4-8-2022 15:06:14	20ucs041	18-30	50	153
5	4-8-2022 15:07:35	20UCS022	18-30	50	154
6	4-8-2022 15:07:48	20ucs030	18-30	60	155
7	4-8-2022 15:07:51	20ucs020	18-30	40	156
8	4-8-2022 15:07:55	20UCS031	18-30	45	150
9	4-8-2022 15:08:15	20UCS040	18-30	45	150
10	4-8-2022 15:08:16	20ucs036	18-30	49	145
11	4-8-2022 15:08:17	20UCS037	18-30	60	152
12	4-8-2022 15:08:43	20ucs044	18-30	40	157
13	4-8-2022 15:08:46	20ucs024	18-30	57	147
14	4-8-2022 15:08:57	20ucs021	18-30	50	155
15	4-8-2022 15:09:12	20ucs018	18-30	65	150
16	4-8-2022 15:09:17	20ucs038	18-30	45	150
17	4-8-2022 15:09:40	20ucs048	18-30	45	156
18	4-8-2022 15:09:48	20ucs035	18-30	42	150
19	4-8-2022 15:11:03	20UCS053	18-30	63	165

Form Responses 1

The above figure shows the real-time data collected through google forms from the female active youth. The food is suggested for the users.

7.2 NUTRITION COMPOSITION TABLE

The nutrition composition table is taken from various references which is used to map the new data for model building and suggestion of foods to players.

Table 1. Nutrition Composition Table

S. No		Age	Protein	Carbohydrate	Energy	Calcium	Iron
1	Active youth	9-13	34-120	225-325	1200-2200	800-1300	11-45
2		14-18	46-85	225-325	1800-2000	800-1300	14-45
3		>18	46-144	225-325	1600-2400	800-1300	14-45
1	Young Athletes	9-13	105-135	313-343	1800-2200	1000-1300	18-45
2		14-18	105-160	325-390	2000-2400	1000-1300	15-45
3		>18	120-300	325-580	2400-3000	1000-1300	18-45

7.3 PSEUDOCODE

```
import numpy as np
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from keras.models import Sequential
from keras.layers import Dense, LSTM
dataset = pd.read_csv('Nutrition data.csv')
dataset
from sklearn import preprocessing
label_encoder = preprocessing.LabelEncoder()
dataset['Recommended food']= label_encoder.fit_transform(dataset['Recommended food'])
dataset['Recommended food'].unique()
dataset.isnull().sum()
from sklearn import preprocessing
import pandas as pd
d = preprocessing.normalize(data)
df_min_max_scaled= pd.DataFrame(d)
df_min_max_scaled.head()
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size=0.3)
model = Sequential()
model.add(LSTM(50, return_sequences=True, input_shape= (X_train.shape[1], 1)))
model.add(LSTM(50, return_sequences= True))
model.add(LSTM(50, return_sequences= False))
model.add(Dense(25))
model.add(Dense(1))
model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
model.fit(X_train, y_train, epochs=3, batch_size=64)
print(model.summary())
```

7.4 SCREENSHOT

Importing Essential libraries

Here we have imported the essential libraries which are needed for model building.

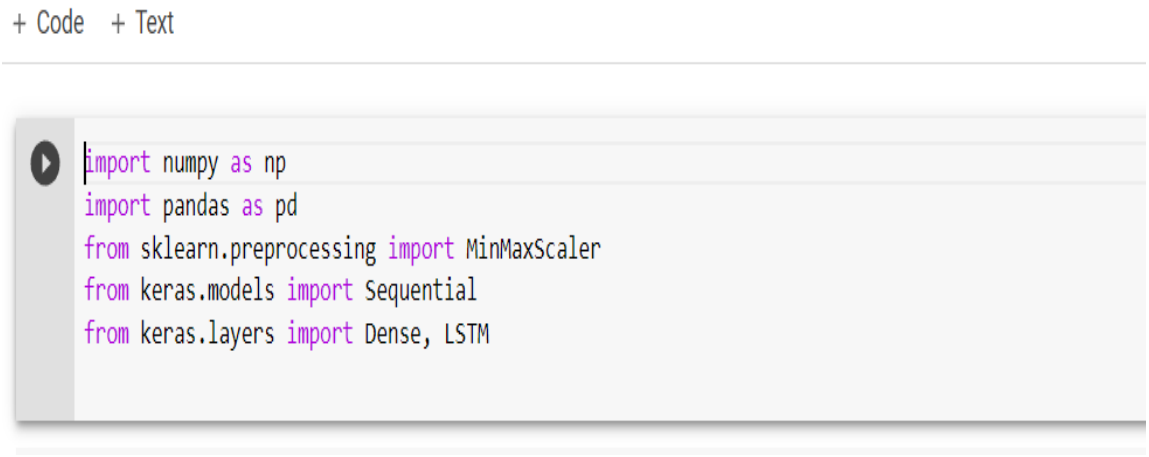


Figure 6. Importing libraries like numy, pandas, keras , and minmaxscaler

Importing dataset

The nutrition dataset is loaded and further used for model building.

Figure 7. Importing dataset

Retrieving the Nutrition data

The dataset is viewed and it has category, age, recommended food, carbohydrates, calories, energy, iron.

```
dataset = pd.read_csv('Nutrition data.csv')
dataset
```

	Category	Age	Recommended food	Protein	Carbohydrate	Calories	Calcium	Iron	Target values
0	Active youth	9	Wheat bread-white,Phalsa,Milk cows, Drumstick ...	15.9	78.10	434	361.0	4.50	1
1	Active youth	9	Barley,Banyan tree figs,Leeks	15.0	98.60	485	440.0	3.67	2
2	Active youth	9	Varagu,Wood apple,Ipomoea leaves,Pears	18.6	99.00	402	275.0	5.54	3
3	Active youth	9	Ragi,Broad beans,Papaya ripe	12.4	86.40	408	411.0	5.80	4
4	Active youth	9	Arrow root flour,Amarnath leaves caudatus,Egg...	16.7	85.10	533	270.0	3.10	5
5	Active youth	9	Maize dry,Amarnath species(Koyakeerai),Parsnip	15.2	94.70	480	352.0	5.30	6

Figure 8. View of Nutrition data

Data Pre-processing

In data pre-processing the null values and checked, Label encoding, and normalization of the data is done.

```
[11] dataset.isnull().sum()

Category            0
Age                 0
Recommended food    0
Protein             0
Carbohydrate        0
Calories            0
Calcium             0
Iron                0
Target values       0
dtype: int64
```

Figure 9. Checking for missing values

```
[ ] from sklearn import preprocessing

    # label_encoder object knows how to understand word labels.
    label_encoder = preprocessing.LabelEncoder()

    # Encode labels in column 'species'.
    dataset['Recommended food']= label_encoder.fit_transform(dataset['Recommended food'])

    dataset['Recommended food'].unique()
```

```
array([39,  5, 32, 18,  0, 12, 42, 47, 50,  7, 38, 53, 31, 24, 21, 41,  1,
       34, 17,  2, 48, 23, 27, 16, 40, 33, 51, 15, 19, 14, 20, 28, 30, 35,
       13, 29, 52, 46,  4, 26, 22,  9, 36, 43,  6, 37,  8, 45, 11, 25,  3,
       44, 49, 10])
```

Figure 10. Label encoding

```
[ ] from sklearn import preprocessing
    import pandas as pd
    d = preprocessing.normalize(data)
    df_min_max_scaled= pd.DataFrame(d)
    df_min_max_scaled.head()
```

	0	1	2	3	4	5	6	7	8
0	0.0	0.015747	0.068237	0.027820	0.136649	0.759358	0.631632	0.007874	0.001750
1	0.0	0.013585	0.007547	0.022642	0.148832	0.732084	0.664159	0.005540	0.003019
2	0.0	0.018053	0.064190	0.037311	0.198588	0.806389	0.551635	0.011113	0.006018
3	0.0	0.015357	0.030714	0.021158	0.147427	0.696183	0.701302	0.009897	0.006825
4	0.0	0.014905	0.000000	0.027656	0.140931	0.882681	0.447137	0.005134	0.008280

Figure 11. Normalization of data

LSTM Model building.

In this module the data is splited into training set and testing set using k-fold method in which data is splitted into 30% of training and 70% of testing and the model is build.

```
[ ] from sklearn.model_selection import train_test_split

[ ] X_train, X_test, y_train, y_test = train_test_split(X,y,test_size=0.3)

[ ] X_train, y_train = np.array(X_train), np.array(y_train)
    X_train = np.reshape(X_train, (X_train.shape[0], X_train.shape[1], 1))

[ ] X_test, y_test= np.array(X_test), np.array(y_test)
    X_test = np.reshape(X_test, (X_test.shape[0], X_test.shape[1], 1))

[ ] X_train.shape
```

Figure 12. Splitting data to train and test data

```
[ ] print(X_train)

    [[[1.       ]
      [1.       ]
      [0.1509434 ]
      [1.       ]
      [0.04643428]
      [1.       ]
      [0.16447368]]

     [[0.       ]
      [0.5      ]
      [0.58490566]
      [0.13321168]
      [0.0289745 ]
      [0.27079646]
      [0.46052632]]

     [[1.       ]
      [0.       ]
```

Figure 13. Train data

```
[ ] model = Sequential()
    model.add(LSTM(50, return_sequences=True, input_shape= (X_train.shape[1], 1)))
    model.add(LSTM(50, return_sequences= True))
    model.add(LSTM(50, return_sequences= False))
    model.add(Dense(25))
    model.add(Dense(1))
```

```
[ ] model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
```

Figure 14. LSTM model building

```
[ ] model.fit(X_train, y_train, epochs=3, batch_size=64)
    # Final evaluation of the model
    print(model.summary())
```

```
Epoch 1/3
1/1 [==============================] - 6s 6s/step - loss: 7.6220 - accuracy: 0.0000e+00
Epoch 2/3
1/1 [==============================] - 0s 27ms/step - loss: 7.6220 - accuracy: 0.0000e+00
Epoch 3/3
1/1 [==============================] - 0s 21ms/step - loss: 7.6220 - accuracy: 0.0000e+00
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm_3 (LSTM)               (None, 7, 50)             10400

 lstm_4 (LSTM)               (None, 7, 50)             20200

 lstm_5 (LSTM)               (None, 50)                20200
```

Figure 15. Model fitting

GUI

A home page is created with input attributes and after selection the suggestion is displayed

Figure 16. Home page

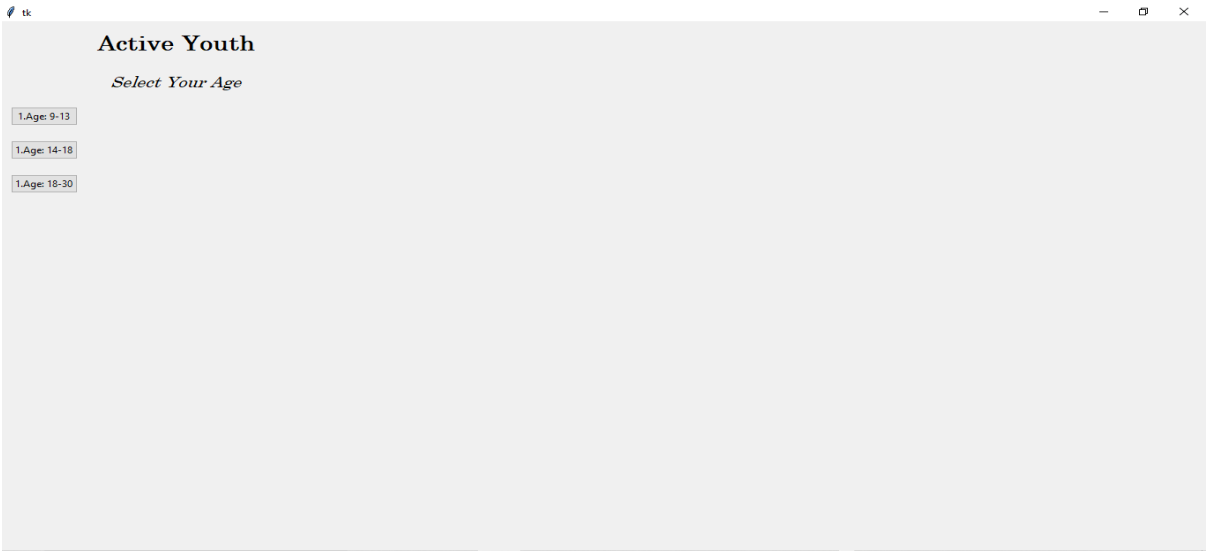


Figure 17. Selection of Age for Active Youth

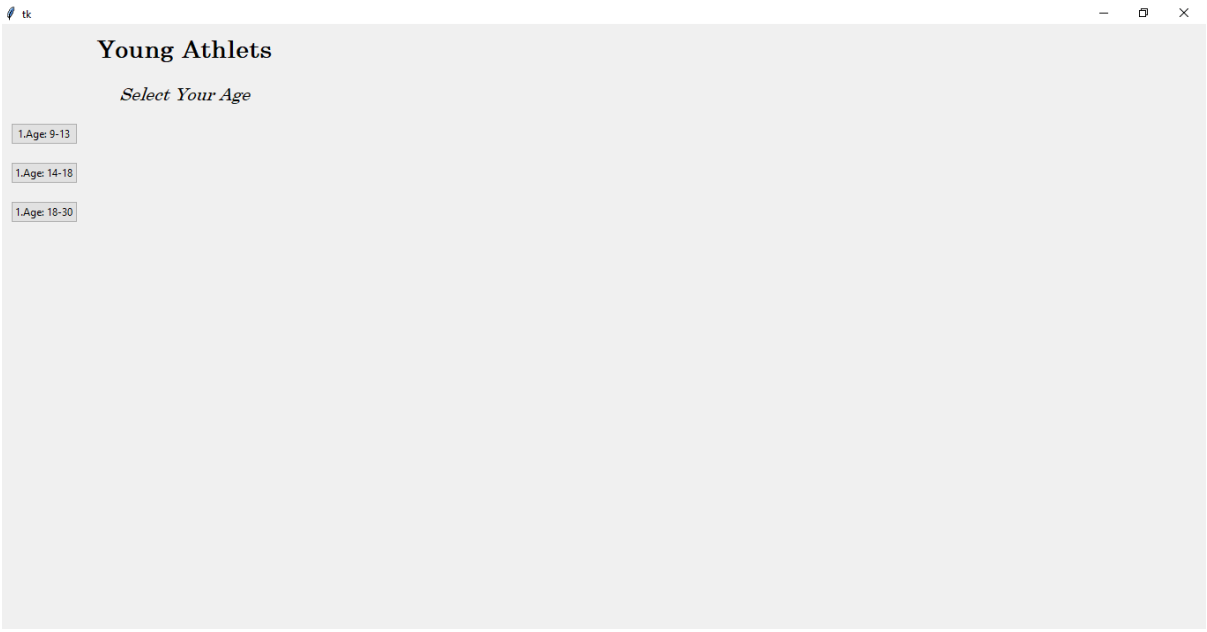


Figure 18. Selection of Age for Women Athletes

Figure 19. Food suggestion for Active Youth (9-13)

```
-----------------
A HEALTHY NUTRITION SUGGESTION MODEL
---------------
Suggested Food intake per day for Active Youth(14-18)
---------------
BREAKFAST
Barley,Milk buffalos,Avocado pear,Beetroot Protein-19.2, Carbs-84.2, Calories-711, Calcium-364.3, Iron-4.76
LUNCH
Rice raw milled,Egg duck,Bengal gram leaves    Protein-23.8, Carbs-93.1, Calories-623, Calcium-420, Iron-7
DINNER
Wheat bread brown,Milk cows,Parsnip,Mahua Protein-14.7, Carbs-99.3, Calories-531, Calcium-283, Iron-3.13
HAVE A NICE DAY
-----------------
```

Figure 20. Food suggestion for Active Youth (14-18)

```
-----------------
A HEALTHY NUTRITION SUGGESTION MODEL
---------------
Suggested Food intake per day for Active Youth 18-30
---------------
BREAKFAST
Wheat semolina,Milk buffalos,Pomegranate,Carrot        Protein-16.7, Carbs-106.1, Calories-588, Calcium-261, Iron-5.68
LUNCH
Panivaragu,Passion fruit,Butter milk,Cluster beans,Spinach Protein-19.4, Carbs-97, Calories-596, Calcium-257, Iron-4.34
DINNER
Wheat bulgur,Egg duck,Parsely  Protein-21.3, Carbs-91.5, Calories-618, Calcium-477, Iron-6.3
HAVE A NICE DAY
```

Figure 21. Food suggestion for Active Youth (Above 18)

```
-----------------
A HEALTHY NUTRITION SUGGESTION MODEL
---------------
Suggested Food intake per day for Young Athlets(9-13)
---------------
BREAKFAST
Milk buffalos ,Passion fruit,Jowar,Parsnip  Protein-16.9, Carbs-113.2, Calories-612, Calcium-295, Iron-6.8
LUNCH
Varagu,Cluster beans,Red gram dal,Curd Protein-36.9, Carbs-116.5, Calories-890, Calcium-379, Iron-5.2
DINNER
Tapioca,Horse mackerel,Water chestnut dry  Protein-35.3, Carbs-107,Calories-586, Calcium-477, Iron-5.3
HAVE A NICE DAY
-----------------
```

Figure 22. Food suggestion for Women Athletes (9-13)

```
-----------------
A HEALTHY NUTRITION SUGGESTION MODEL
---------------
Suggested Food intake per day for Young Athlets(14-18)
---------------
BREAKFAST
Wheat germ,Sweet potato,Phalsa,Milk buffalo,Plaintain stem  Protein-36.6, Carbs-111, Calories-674, Calcium-435, Iron-10.71
LUNCH
Rice parboiled milled,Sarputi,Horse gram whole  Protein-44.8, Carbs-118.5, Calories-768, Calciuum-416, Iron-9.21
DINNER
Wheat bread white,Channa cows milk,Moth bean  Protein-49.7, Carbs-109.6, Calories-840, Calciuum-421, Iron-10.6
HAVE A NICE DAY
-----------------
```

Figure 23. Food suggestion for Women Athletes (14-18)

Figure 24. Food suggestion for Women Athletes (Above 18)

7.5 RESULTS, DISCUSSIONS AND VISUALIZATION

Table 2. LSTM layers with parameters

S.no	Layer (type)	Output shape	Param #
1	lstm_3 (LSTM)	(None, 7, 50)	10400
2	lstm_4 (LSTM)	(None,7, 50)	20200
3	lstm_5 (LSTM)	(None, 50)	20200
4	dense_2 (Dense)	(None, 25)	1275
5	dense_3 (Dense)	(None, 1)	26

Table 2 represents the layers which are build in the model. It has five layers in which three LSTM layers and two dense layers with their output shape and parameters on each layer. From this we can conclude that every parameter in the LSTM model are trainable parameters and thus the model is fitted.

Table 3. Food suggestion for active youth (9-13)

S. No	Suggested food	Protein	Carbohydrates	Calories	Calcium	Iron
1	Wheat bread, Phalsa, Milk cows, Drumstick flowers	15.9	78.1	434	361	4.5
2	Maize dry, Amarnath species, Parsnip	15.2	94.7	480	352	5.3
3	Wheat flour refined, Milk buffalos, Brinjal	16.7	82.9	489	261	3.88
		47.8	**255.7**	**1403**	**974**	**13.68**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. A person with proper nutrition can improve well-being, improve the ability to recover from illness and fight against diseases. Table 3 represents the breakfast, lunch, dinner required per day is suggested with protein-47.8, carbohydrates-255.7, calories-1403, calcium-974 and iron 13.68 to active youth of age 9-13. The suggested food helps the person to have a healthy and balanced diet. With this food one can attain the nutrition level and can be fit and active. A female active youth should have protein-34-120, carbohydrate-225-325, calories – 1200-2200, calcium-800-1300 and iron- 11-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet with proper exercise can lead their life healthy.

Table 4. Food suggestion for active youth (14-18)

S. No	Suggested food	Protein	Carbohydrates	Calories	Calcium	Iron
1	Barley, Milk, Avacado pear, Beetroot	19.2	84.2	711	364.3	4.76
2	Rice raw milled, Egg duck, Bengal gram leaves	23.8	93.1	623	428	7
3	Wheat bread brown, Milk cows, Parsnip, Mahua	14.7	99.3	531	283	3.13
		57.7	**276.6**	**1865**	**1075.3**	**14.89**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. A person with proper nutrition can improve well-being, improve the ability to recover from illness and fight against diseases. Table 4 represents the breakfast, lunch, dinner required per day is suggested which is required per day is suggested for the active youth to intake the food. The suggested food is composed with protein-57.7, carbohydrates-276.6, calories-1865, calcium-1075.3 and iron 14.89 to active youth of age 9-13. A female active youth should have protein-45-85, carbohydrate-225-325, calories – 1800-2000, calcium-800-1300 and iron- 14-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet can be stay healthy and fit.

Table 5. Food suggestion for active youth (Above 18)

S. No	**Suggested food**	**Protein**	**Carbohydrates**	**Calories**	**Calcium**	**Iron**
1	Wheat semolina, Milk buffalos, Pomegranate, carrot	16.7	106.1	588	261	5.68
2	Panivaragu, Passion fruit, Butter milk, Cluster beans, Spinach	19.4	97	596	257	4.34
3	Wheat bulgur, Egg duck, Parsely	21.3	91.5	618	477	6.3
		57.4	**294.6**	**1802**	**995**	**16.32**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. Table 5 represents the breakfast, lunch, dinner required per day is suggested with protein-57.4, carbohydrates-294.6, calories-1802, calcium-995 and iron 16.32 to active youth of age above 18. A female active youth should have protein-46-144, carbohydrate-225-325, calories – 1600-2400, calcium-800-1300 and iron- 14-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet can be stay healthy and fit.

Table 6. Food suggestion for Women Athletes (9-13)

S. No	Suggested food	Protein	Carbohydrates	Calories	Calcium	Iron
1	Milk buffalos, Passion fruit, Jowar, Parsnip	16.9	113.2	612	295	6.8
2	Varagu, Cluster beans, Red gram dal, Curd	36.9	116.5	890	379	5.2
3	Tapioca, Horse mackerel, Water chestnut dry	35.3	107	586	477	5.3
		89.1	**336.7**	**1788**	**1151**	**17.3**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. Table 6 represents the breakfast, lunch, dinner required per day is suggested with protein-89.1 carbohydrates-336.7, calories-1788, calcium-1151 and iron 17.3 to women athlete of age 9-13. A female active youth should have protein-105-135, carbohydrate-313-343, calories – 1800-2200, calcium-1000-1300 and iron- 18-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet can be stay healthy and fit and a women athlete can perform precisely in matches.

Table 7. Food suggestion for Women Athletes (14-18)

S. No	Suggested food	Protein	Carbohydrates	Calories	Calcium	Iron
1	Wheat germ, sweet potato, Phalsa, Milk buffalo, Plantain stem	36.6	111	674	435	18.71
2	Rice parboiled milled, Sarputi, Horse gram whole	44.8	118.5	768	416	9.21
3	Wheat bread white, Channa cow's milk, Moth bean	49.7	109.6	840	421	10.6
		131.1	**339.1**	**2282**	**1272**	**38.52**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. Table 7 represents the breakfast, lunch, dinner required per day is suggested with protein-131.1, carbohydrates-399.1, calories-2282, calcium-1272 and iron 38.52 to women athlete of age 14-18. A female active youth should have protein-105-160 carbohydrate-325-390, calories – 2000-2400, calcium-1000-1300 and iron- 15-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet can be stay healthy and fit and a women athlete can perform precisely in matches.

Table 8. Food suggestion for Women Athletes (Above 18)

S. No	Suggested food	Protein	Carbohydrates	Calories	Calcium	Iron
1	Wheat flour whole, Rajma, Egg duck	48.5	130.8	868	378	12.5
2	Barja, Black gram dal, Broad beans, Curd cow's milk	43.6	127.3	816	395	13.4
3	Wheat semolina, Water chestnut dry, Jew fish (Pallikora), Cauliflower	46.4	147.7	808	333	10.3
		138.5	**405.8**	**2492**	**1106**	**36.2**

Nutrition is important for body as it gives energy, so each person should be fit and healthy. Nutrition are much needed to sports persons, especially women athletes and active youth in order to perform in matches. Table 8 represents the breakfast, lunch, dinner required per day is suggested with protein-138.5, carbohydrates-405.8, calories-2492, calcium-1106 and iron 36.2 to women athletes of age above 18. A female active youth should have protein-120-300, carbohydrate-325-580, calories – 2400-3000, calcium-1000-1300 and iron- 18-45. The food suggested from the nutrition suggestion model falls under this nutrition composition. A female taking this diet can be stay healthy and fit and a women athlete can perform precisely in matches.

VISUALIZATION

PLOTS WITH EXCEL:

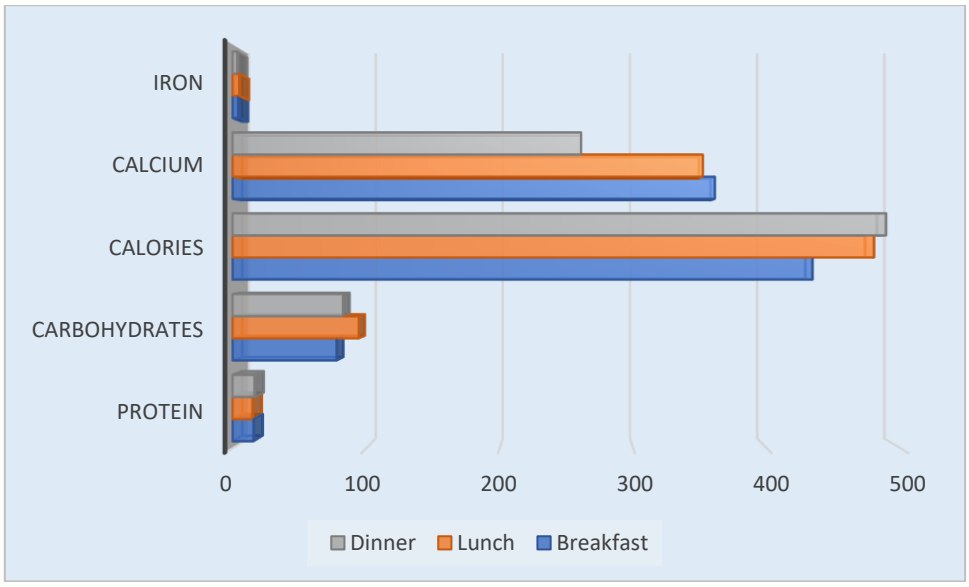


Figure 25. Nutrition value of food suggested to active youth (9-13)

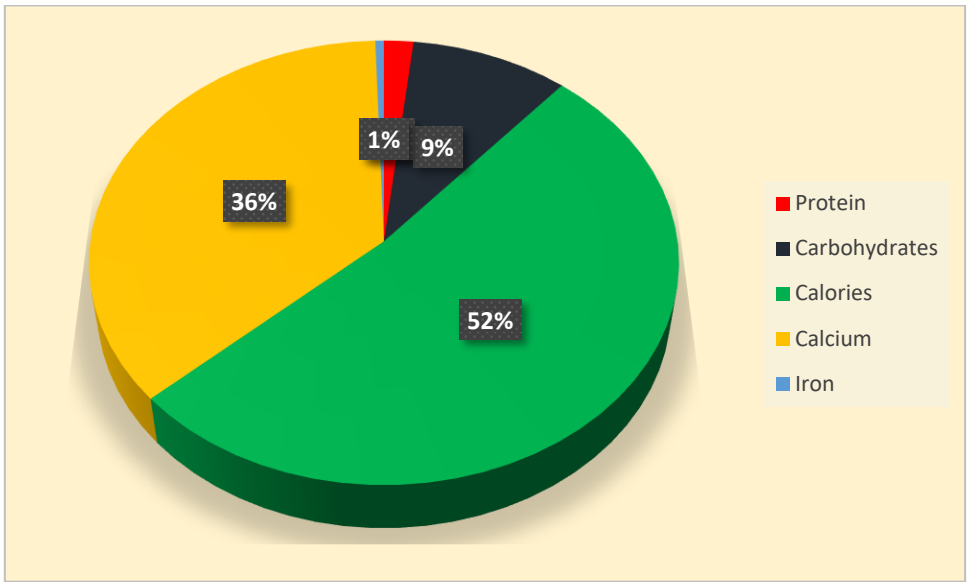


Figure 26. Nutrition values of per day suggested food for active youth (9-13)

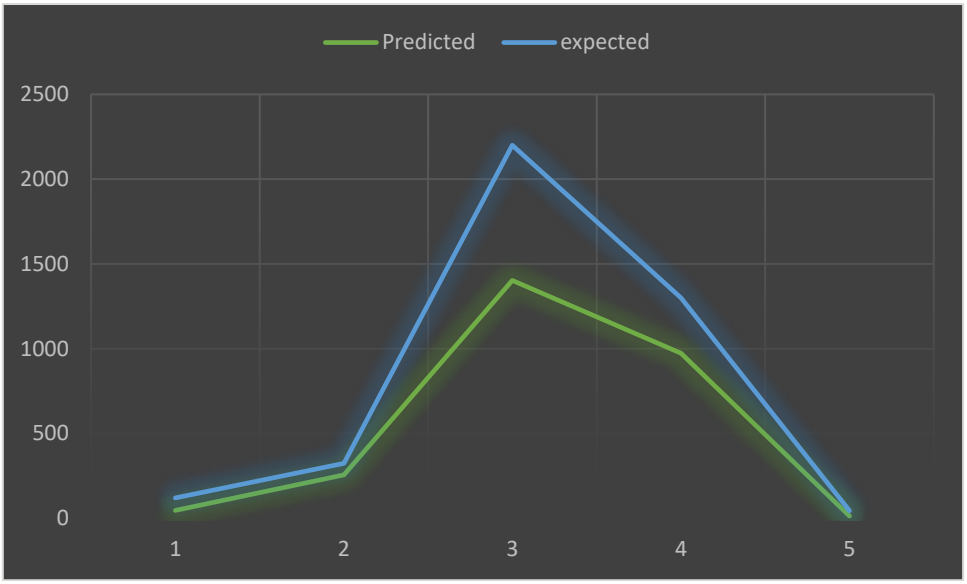


Figure 27. Expected and predicted output of Active youth

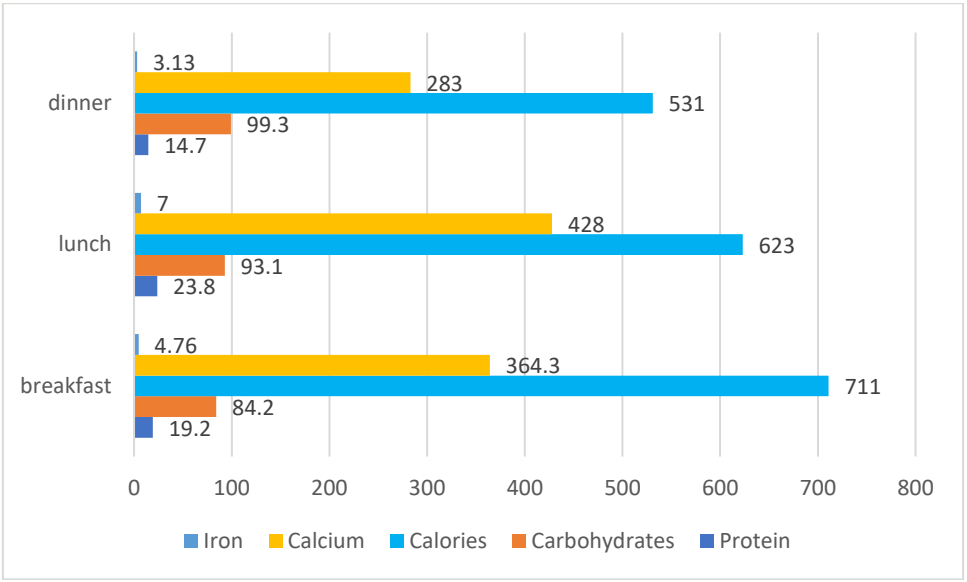


Figure 28. Nutrition value of food suggested to active youth (14-18)

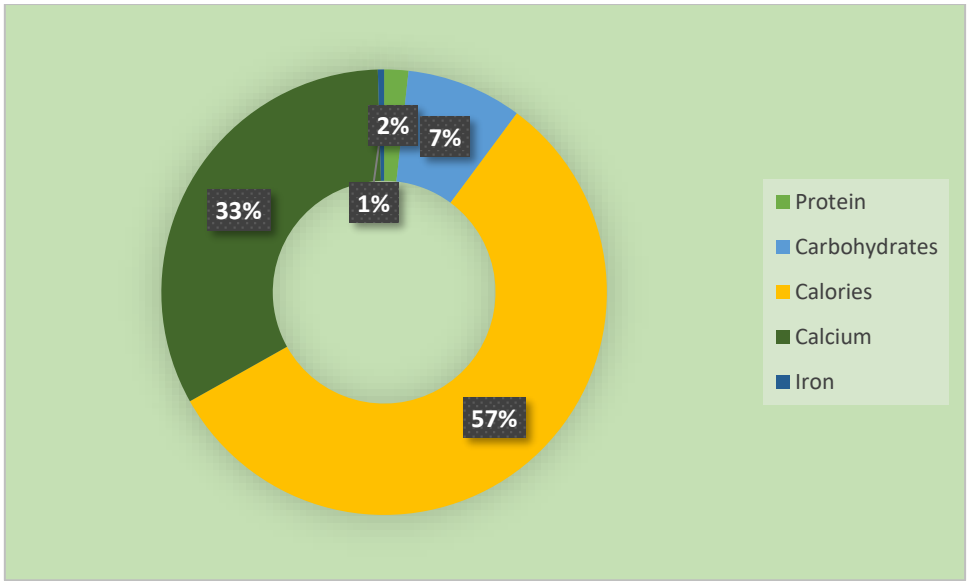


Figure 29. Nutrition values of per day suggested food for active youth (14-18)

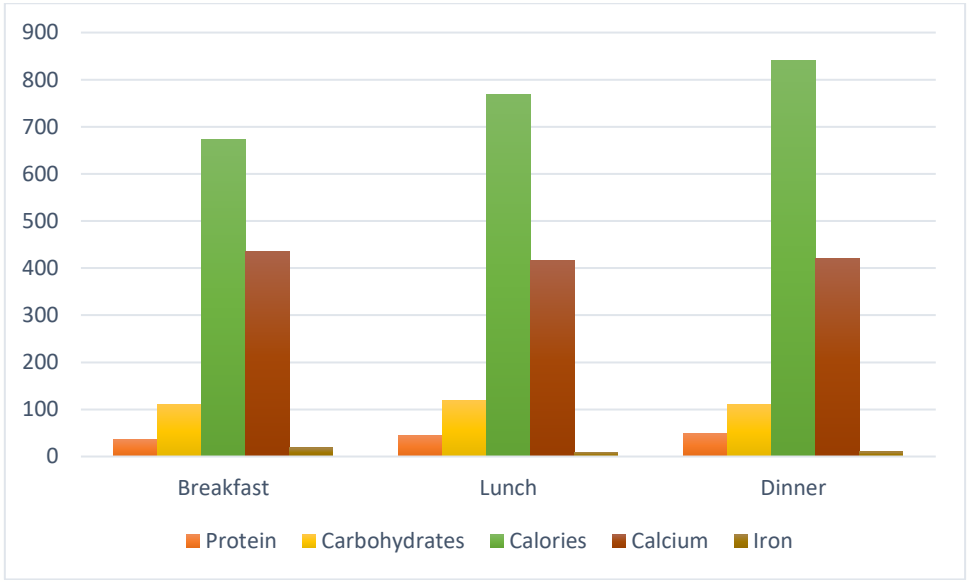


Figure 30. Nutrition value of food suggested to women athletes (14-18)

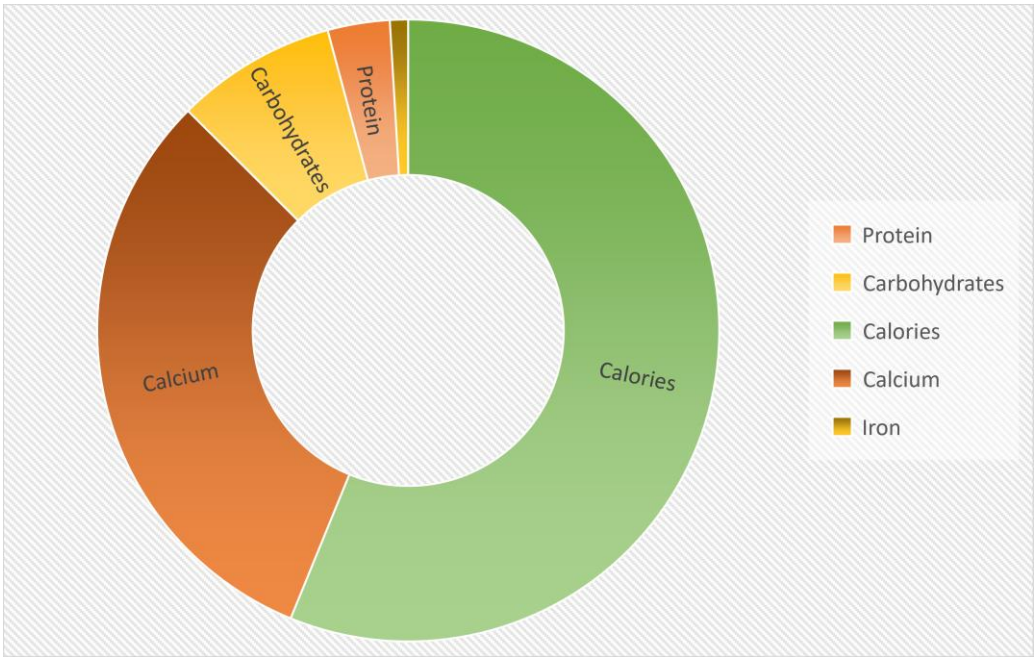


Figure 31. Nutrition values of per day suggested food for women athletes (14-18)

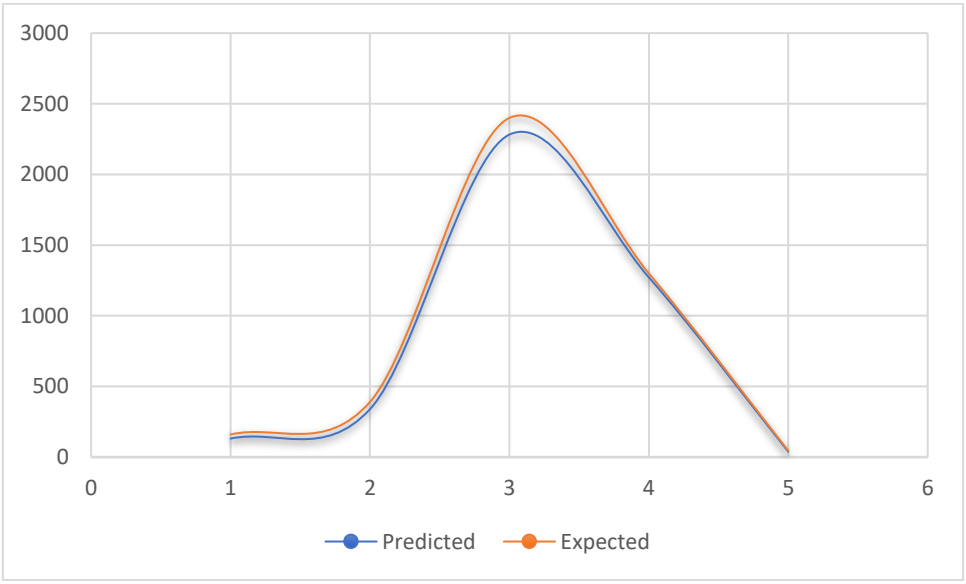


Figure 32. Predicted and expected output of women athletes(14-18)

PLOTS WITH SIGMA PLOT

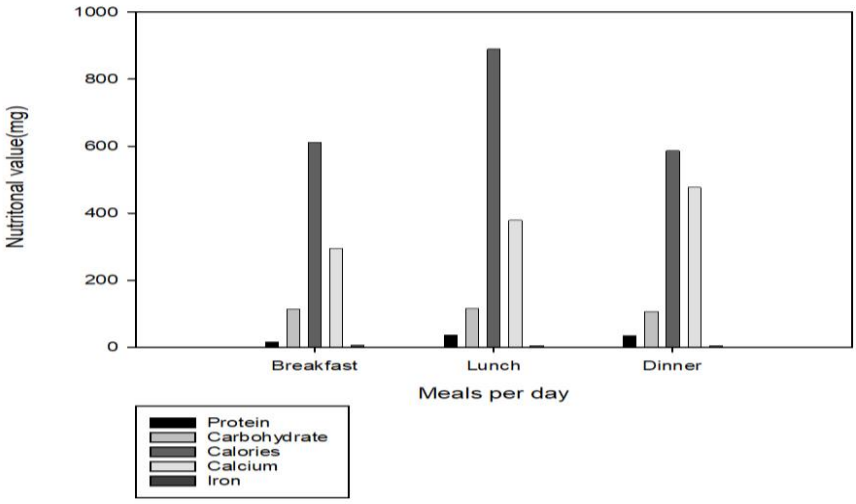


Figure 33. Nutrition value of food suggested to women athletes (9-13)

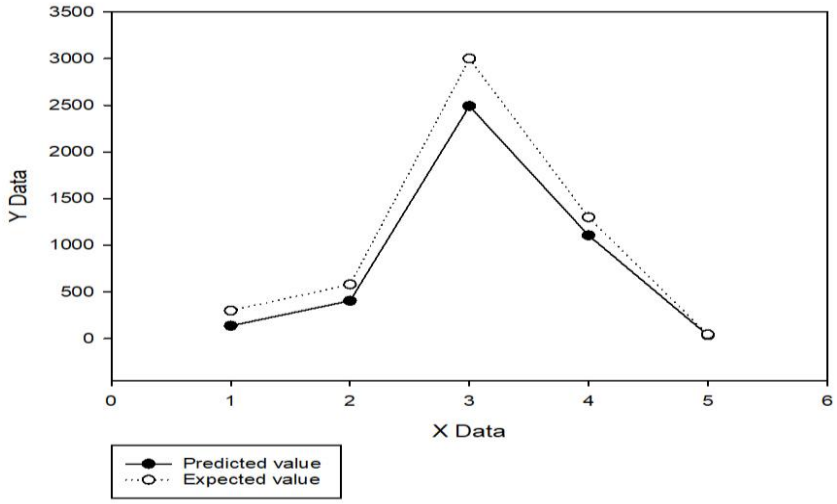


Figure 34. Predicted and expected output of women athletes(>18)