Body Fitness Prediction

Using Machine Learning

Developed by--Madhukar Revuri, Jyoshna kondaparthi, Eshwar Rangu,Kumaraswamy samudrala.

Smart Bridge-Remote Summer Internship Program

1.Introduction

Fitness is a program for collecting and analyzing gym weight training results. It means you need to keep a training log, usually a small notebook or paper with you when you go to the gym and record your training results there. When you return from the gym you enter the information into Fitness which you can then use to analyze the results and form new training programs based on your results in the gym. The premise of Fitness is training to failure, eg. you select some exercise resistance and do as many repetitions as you can. You then record the number of repetitions and the resistance (weight) used in the log fitness is a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities. Physical fitness is generally achieved through proper nutrition, moderate-vigorous physical exercise, and sufficient rest.Before the industrial revolution, fitness was defined as the capacity to carry out the day's activities without undue fatigue. However, with automation and changes in

lifestyles physical fitness is now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases, and to meet emergency situations.Before the industrial revolution, *fitness* was defined as the capacity to carry out the day’s activities without undue fatigue. However, with automation and changes in lifestyles physical fitness now considered a measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic diseases and to meet emergency situations.

For Fitness to work, you need to follow a fixed exercise program. The most basic type of fixed exercise program would consist of selecting exercises to train your whole body. You would then keep on repeating this exercise program, resting some number of days in between. In practice it is usual to split the exercise program over many days (eg. Day 1, Day 2, Day 3), training different body parts on different days. When you have done the last training day workout, you rest some number of days and and the program then repeats.

You need to design this exercise program yourself and enter the details into Fitness. You then need to perform the program once, entering the initial data (exercises, repetitions and weights used) into the log. Before you have done this, Fitness cannot do anything useful.

1.1Overview

Fitness is defined as the quality or state of being fit and healthy Around 1950, perhaps consistent with industrial revolution and the treatise of World War 2, the term "fitness" increased in western vernacular by a factor of ten.The modern definition of fitness describes either a person or machine's ability to perform a specific function or a holistic definition of human adaptability to cope with various situations. This has led to an interrelation of human fitness and attractiveness that has mobilized global fitness and fitness equipment industries. Regarding specific function, fitness is attributed to persons who possess significant aerobic or anaerobic ability, i.e. endurance or strength. A well-rounded fitness program improves a person in all aspects of fitness compared to practising only one, such as only cardio/respiratory endurance or only weight training.

A comprehensive fitness program tailored to an individual typically focuses on one or more specific skills,and on age-or health-related needs such as bone health.Many sources also cite mental,social and emotional health as an important part of overall fitness. This is often presented in textbooks as a triangle made up of three points, which represent physical, emotional, and mental fitness. Physical fitness can also prevent or treat many chronic health conditions brought on by unhealthy lifestyle or aging. Working out can also help some people sleep better and possibly alleviate some mood disorders in certain individuals.

Developing research has demonstrated that many of the benefits of exercise are mediated through the role of skeletal muscle as an endocrine organ. That is,

contracting muscles release multiple substances known as myokines, which promote the growth of new tissue, tissue repair, and various anti-inflammatory functions, which in turn reduce the risk of developing various inflammatory diseases.

1.2 Purpose

Exercise is essential for improving overall health, maintaining fitness, and helping to prevent the development of obesity,hypertension, and cardiovascular disease. Surveys conducted by the Centers for Disease Control and Prevention (CDC) indicate that 61.5 percent of children aged nine to 13 years do not participate in any organized physical activity (for example, sports, dance classes) and 22.6 percent are not physically active during their free time. According to the American Obesity Association, approximately 30 percent of children and adolescents aged six to 19 years are overweight and 15 percent are obese.

A sedentary lifestyle and excess caloric consumption are the primary causes of this increase in overweight and obesity; regular exercise is considered an important factor in controlling weight. Overweight and obese children and adolescents are at higher risk of developing several medical conditions, including the following:

- asthama
- diabetes

- hypertension
- orthopedic complications, such as hip and knee pain and limited range of motion
- cardiovascular disease
- high cholesterol
- sleep apnea
- psychosocial disorders, such as depression, negative body image, and eating disorders

Clinical studies have shown that regular exercise has numerous benefits, including the following:

- preventing weight gain and maintaining healthy weight
- reducing blood pressure and cholesterol
- improving coordination
- improvin self-esteem and self-confidence
- decreasing the risk of developing diabetes, cardiovascular disease, and certain types of cancer
- increased life expectancy

2.Literature Survey

When it comes to estimating body fitness prediction using the machine learning,we estimated body fitness using classical machine learning namely,linear

regression, decision tree and random forest,knn,naive bayas, with the highest accuracy 80% with linear regression.Machine learning is the process of analyzing data from different perspectives and extracting knowledge from it .It is the core of Knowledge discover process.The Body fitness prediction is particularly well suited to logistic regression algorithm.The regression,the independent variables are so we'll trained to predict the dependent variable.And the model is evaluated.

2.1 Existing problem

1.Tight Schedules and Expensive Gym Memberships. Join the
2.Gym is the little things that you do each day that add up to being healthy and fit.
3.False Information about Exercises & Nutrition Guide.
4.Lack of professional training.
5.Attitudes of urban settlers towards physical fitness.
6.Lack of equipment and facility.
7.Inadequate fitness club/center and high cost of fitness center.
8.Government attitude towards recreational centre.
9.Modernisation.
10.Fear of injury.

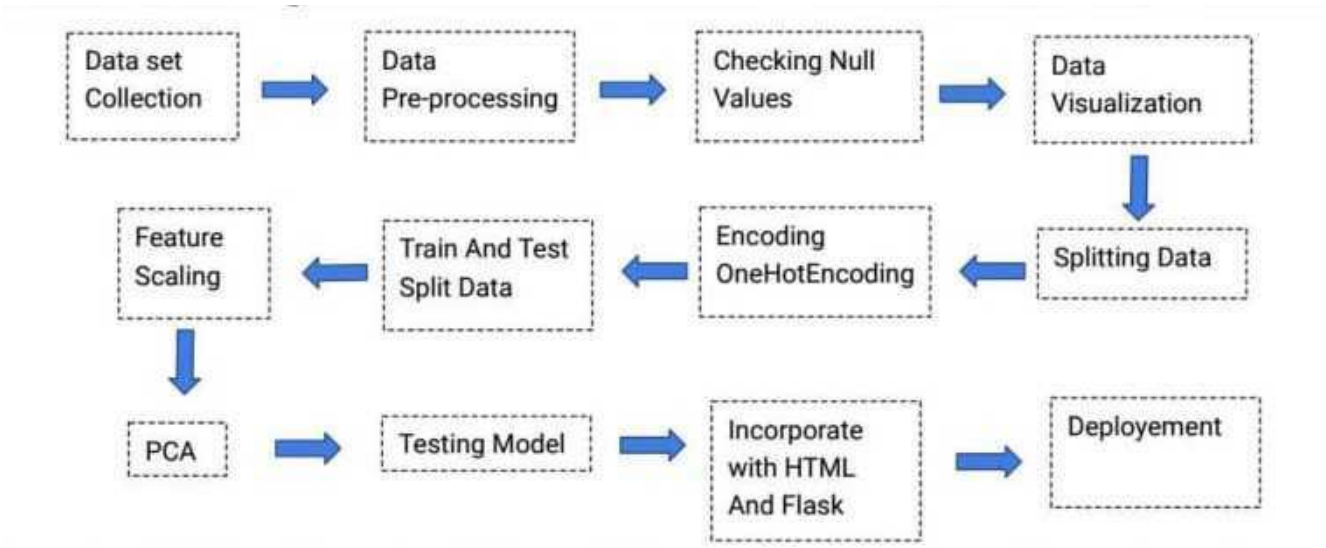
2.2 Proposed Solution

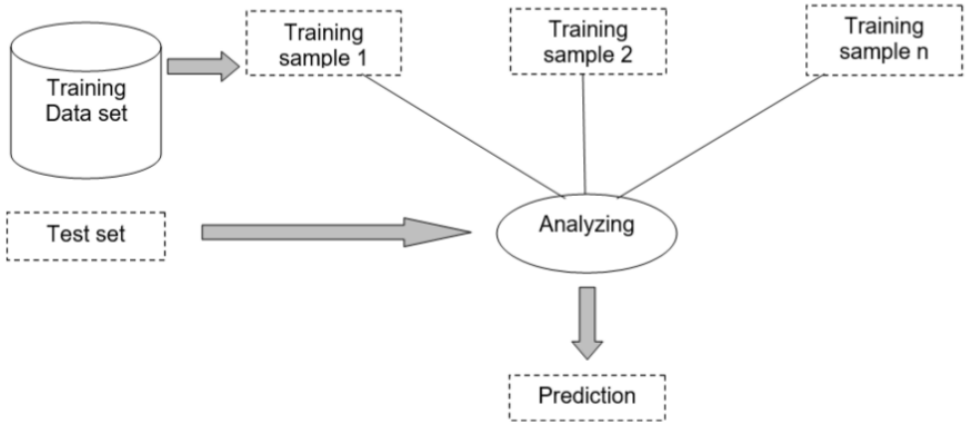
Machine learning (linear regression)The previous model have less accuracy and the predictions are not at accurate where as this model is constrained with the lit of advantages and with higher accuracy than any other model already proposed. In this model we used machine learning algorithm named linear regression which give an accuracy 80% of the predicted problem and there is an user friendly user interface to check the weight for the body.Linear regression is one of the simplest and most common supervised machine learning algorithm that data scientists use for predictive modelling.we will use the linear regression to build a model that predicts the weight of the body,And also we have created an UI using flask for the fitness prediction and this UI will allow the users to predict their weight of the body very easily and the user interface is user friendly not at least one complication in using the interface,and it can be used just by entering some necessary details into the UI in real-time it will give the predicted value like weight of the body.

3.Theoretical analysis:

While selecting the algorithm that gives an accurate prediction we gone through few algorithms which gives the results and from them we selected only one algorithm for the prediction problem that is logistic regression,it assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature that's how the prediction work great with the logistic regression algorithm.

3.1 Block diagram:





3.2 Software designing

1.Jupyter notebook environment.

2.Spyder lde.

3.Machine learning alogrithms.

4.Python(pandas,numpy,matplotlib,seaborn,sklearn)

We developed this body fitness prediction by using the python language which is a interpreted an high-level programing language and using the machine learning algorithm,for coding we used the jupyter notebook environment of anaconda distribution and the Spyder,it is an integrated scientific programing in the python language. For creating an user interface for the prediction we used the flask. It is a micro web frame work written in the python. It is classified as a micro frame work because it does not require any particular tools or the libraries. It has no data base abstraction layer, from validation,or any other components where pre-existing third-party libraries which provide common functions, and a scripting

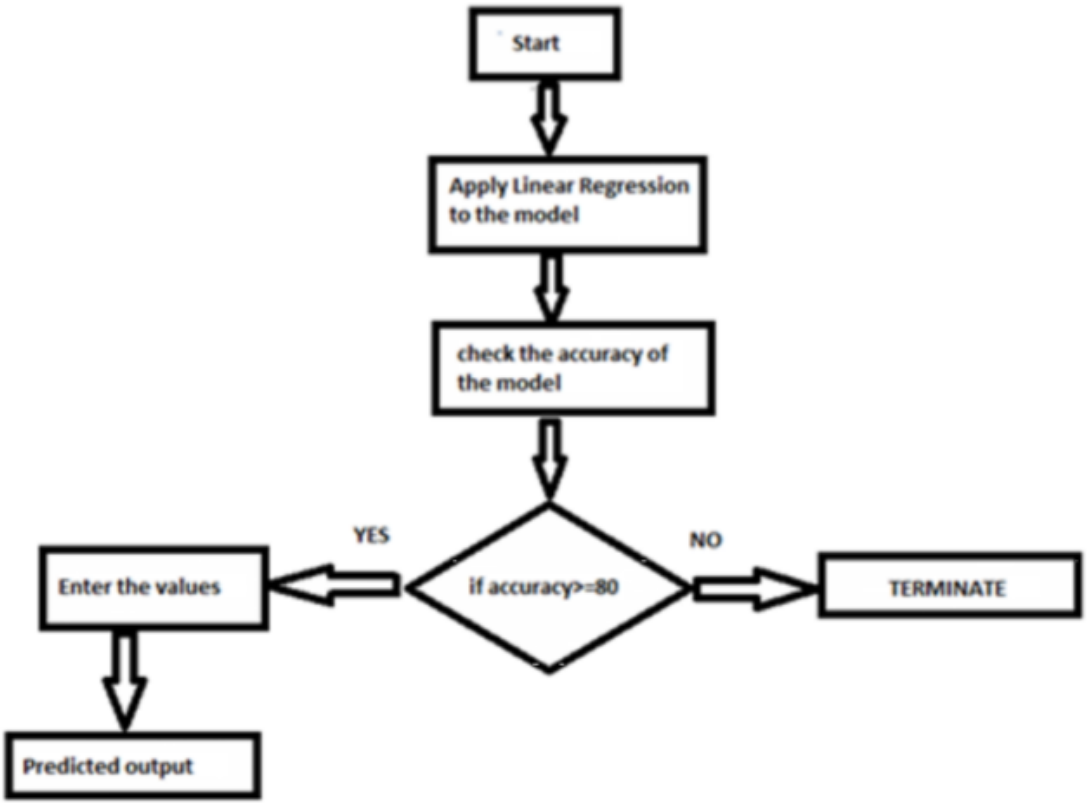
language to create a web page is HTML by creating the templates to use in the functions of the flask and HTML.

4.Experimental investigation

In this paper, the data set we used is derived from www.kaggle.com It contains 1992 original data of weight with 5attributes. After that ,the missing values are filled in by means of mode interpolation,and the duplicate or meaning less attributes are deleted, finally we have retained the data. Those attributes were shown below in the screenshot of the data set we used.

	A	B	C	D	E	F	G	H
1	step_count	mood	calories_bur	hours_of_sl	bool_of_acti	weight_kg		
2	5464	200	181	5	0	66		
3	6041	100	197	8	0	66		
4	25	100	0	5	0	66		
5	5461	100	174	4	0	66		
6	6915	200	223	5	500	66		
7	4545	100	149	6	0	66		
8	4340	100	140	6	0	66		
9	1230	100	38	7	0	66		
10	61	100	1	5	0	66		
11	1258	100	40	6	0	65		
12	3148	100	101	8	0	65		
13	4687	100	152	5	0	65		
14	4732	300	150	6	500	65		
15	3519	100	113	7	0	65		
16	1580	100	49	5	0	65		
17	2822	100	86	6	0	65		
18	181	100	6	8	0	65		
19	3158	200	99	5	0	65		
20	4383	200	143	4	0	64		
21	3881	200	125	5	0	64		
22	4037	200	129	6	0	64		
23	202	200	6	8	0	64		
24	292	200	9	5	0	64		
25	330	300	10	6	0	64		
26	2209	200	72	5	0	64		
27	4550	300	150	8	500	64		
28	4435	300	141	5	0	64		
29	4779	300	156	4	0	64		
30	1831	300	57	5	0	64		
31	2255	300	72	4	0	64		
32	539	300	17	5	500	64		
33	5464	300	181	4	0	64		
34	6041	200	197	3	0	64		
35	4068	300	131	2	0	64		
36	4683	300	154	9	0	64		
37	4033	300	137	5	0	64		
38	6314	300	193	6	500	64		
39	614	300	19	4	500	64		
40	3149	300	101	5	500	64		
41	4005	300	139	8	500	64		
42	4880	300	164	4	500	64		

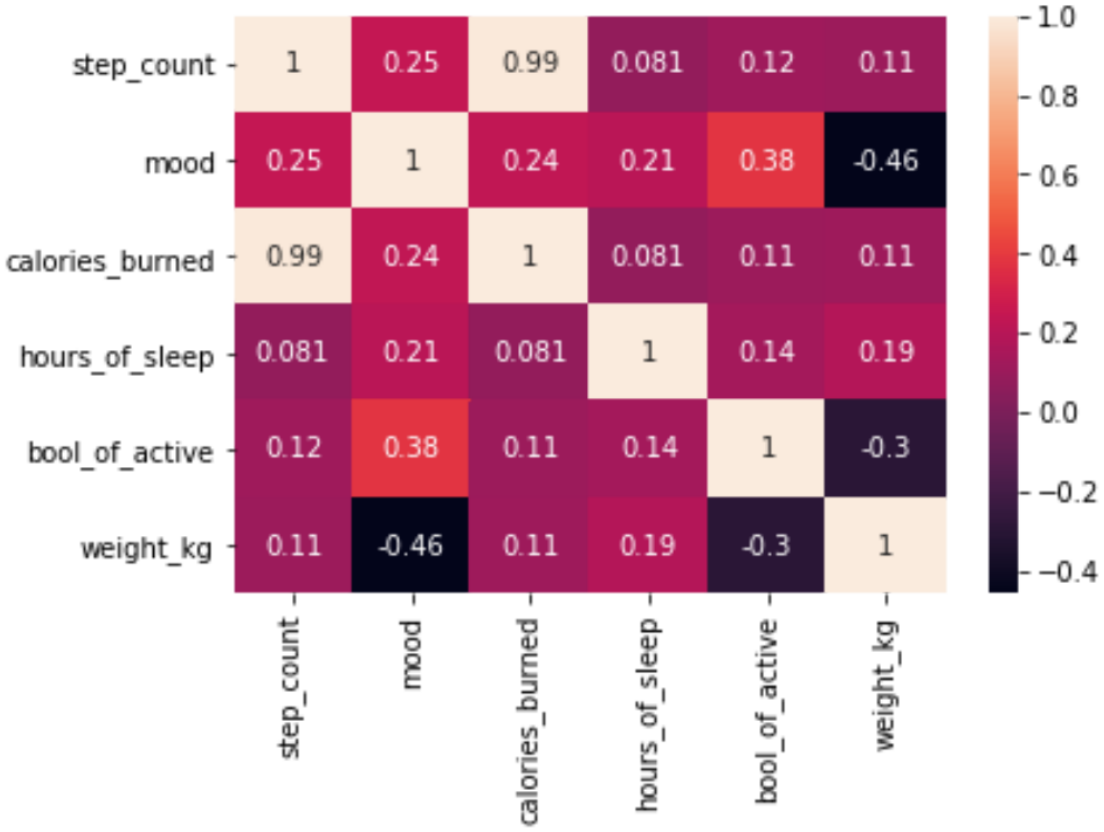
5.Flow Chart

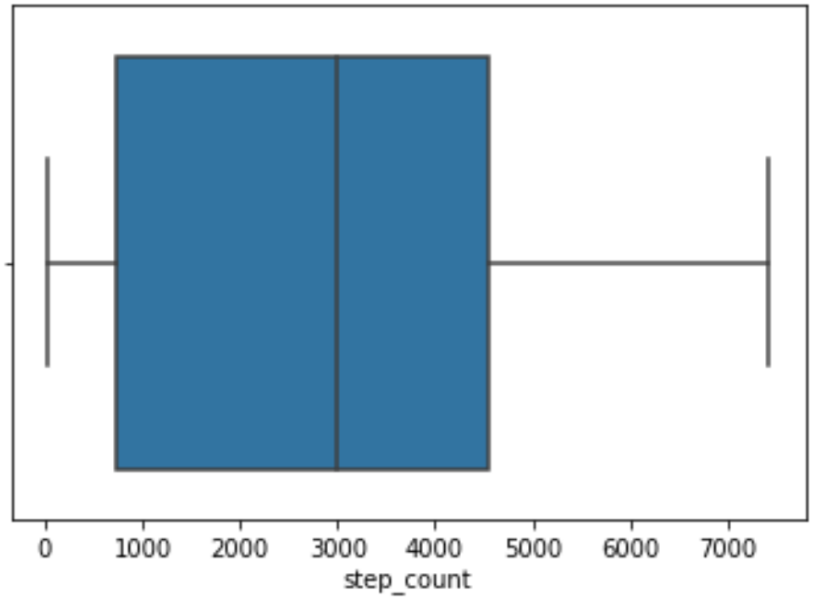


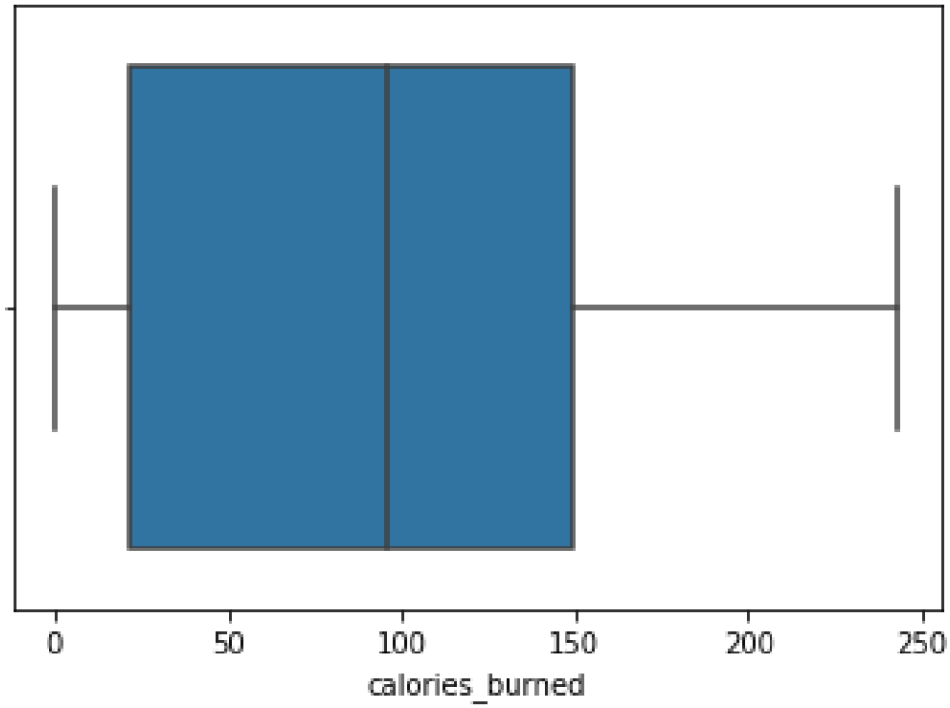
6.Result

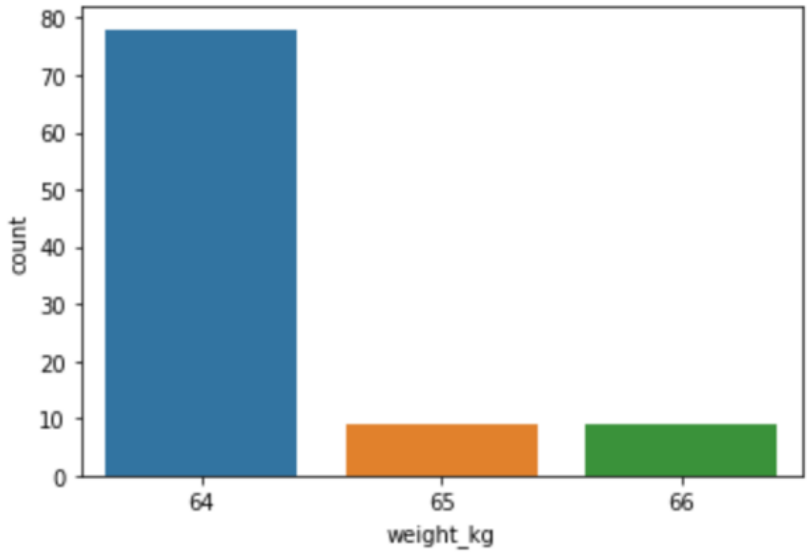
In this paper,the linear regression algorithm is used to predict the weight, and compared with another two machine learning methods namely the decision tree,the radom forest. The obtained results are displayed in the table below. The results show ,that the linear regression have better than random forest and decision tree. The linear regression is best with an accuracy of 80% higher than

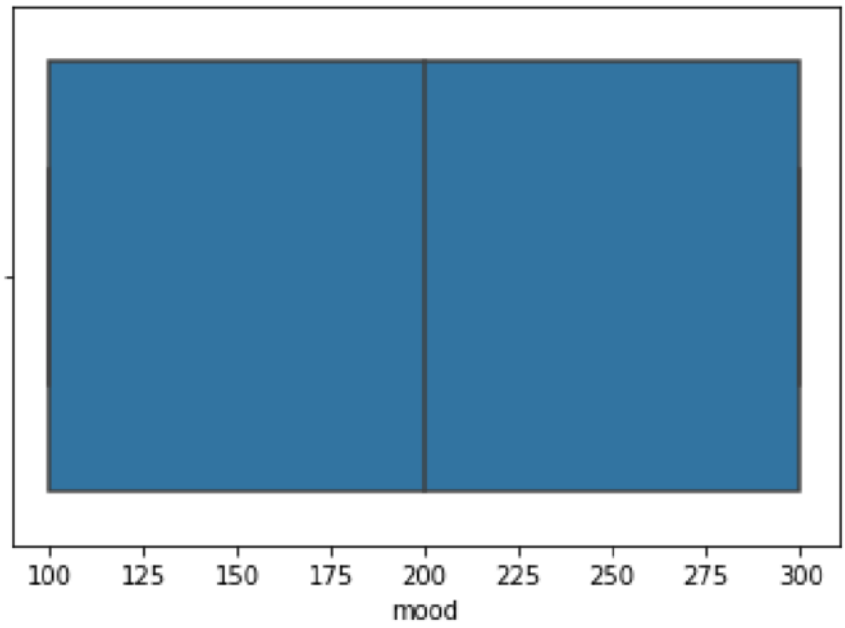
random forest.The given are the heatmap of the dataset which represents the correlation between the attributes and the boxplot of each attribute.




0
1000
2000
3000
4000
5000
6000
7000
step_count


0
50
100
150
200
250
calories_burned


80
70
60
50
40
30
20
10
0
count
64
65
66
weight_kg


100
125
150
175
200
225
250
275
300
mood

Algorithm used	Accuracy
Logistic regression	80%
Random forest	55%
Decision tree	65%

7.Advantages

1.Regular physical activity can improve your muscle strength and boost your endurance. Exercise delivers oxygen and nutrients to your tissues and helps your cardiovascular system work more efficiently. And when your heart and lung health improve,you have more energy to tackle chores.

2. Help you control your weight.

3. Reduce your risk of heart diseases.

4.Help your body manage blood sugar and insulin levels.

5.Help you quit smoking.

6. Improve your mental health and mood.

7.Help keep your thinking, learning, and judgment skills sharp as you age.

8.It Can Make You Feel Happier.

9.It Can Help With Weight Loss.

10. It Is Good for Your Muscles and Bones.

11.It can increase your energy levels.

12. It Can Reduce Your Risk of Chronic Disease.

13. It Can Help Skin Health.

14. It Can Help Your Brain Health and Memory.

15. It Can Help With Relaxation and Sleep Quality.

8.Disadvantages

1.Overuse Injuries. To understand some of the problems you might in encounter on your quest for physical fitness, it's important to understand one basic truth: Exercise damages your body.
2.Overtraining syndrome.
3.Changes in the Appetite.
4.Disappointment.
5.Social impact.
6.Scheduled crunch.

9.Applications

1.This model is mostly used by people who are interested in fitness and who are trying to get good body based on their workouts, exercises,gyms.
2.fitness is generally achieved through proper nutrition, moderate-vigorous physical exercise, and sufficient rest.
3.fitness is a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities.

10.conclusion

In this paper,the machine learning algorithm is adpoted to build A UI model for predicting weight and the results are compared with other algorithms of random forest, decision tree,linear regression and support vector machine. The experiment show the logistic regression performs outstanding than other algorithms in the prediction of weight. There is no definite guide of which algorithm to use given any situation. What may work on some data sets not necessarily work on others.

11. Futurescope

In future the logistic regression can be applied on other datasets for finding weights to further Investigation it's accuracy. A rigorous analysis of other machine learning algorithms other than these can also done in future investigation the power machine learning algorithms for body fitness prediction.

12. Bibliography

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2004: An empirical investigation of the relationships among service quality,customer satisfaction and psychological commitment in a health club, European Sport Management 4(1), 36-52.

13.Appendix

HTML

```
<html>
<head>
<style>
 body{

background-image:url("https://th.bing.com/th/id/OIP.qBQoluXYtl7gUR59NR5XTQHaER?w=329&h=189&c=7&o=5&dpr=1.25&pid=1.7.jpg");
 background-repeat:no-repeat;
```

```
 background-attacchment:fixed;
 background-size:cover;
 }
 .header{
     width:800px;
     background-color:rgb(0,0,0,6);
     margin:auto;
     color:#FFFFFF;
     padding:10px 0px 10px 0px;
     text-align:center;
     border-radius:15px 15px 0px 0px;
     }
.MAIN button
{
height:30px;
width:200px;
margin-left:60px;
background-color:rgb;
}
.MAIN{
    background-color:rgb(0,0,0,0.5);
    width:800px;
    margin:auto;
    text-allign:center;
   }
   form{
   padding:100px;
   }
</style>
</head>
<body>
<form action="/predict" method="post">
<p>step_count</p>
```

```
<p><input type="number" name="step_count"/></p>
<p>mood</p>
<p><input type="number" name="mood"/></p>
<p>calories_burned</p>
<p><input type="number" name="calories_burned"/></p>
<p>hours_of_sleep</p>
<p><input type="number" name="hours_of_sleep"/></p>
<p>bool_of_active</p>
<p><input type="number" name="bool_of_active"/></p>
<p><input type="submit" value="click"/></p>
<h2><font color=red>Body fitness:{{y}}kg</font></h2>
</form>
</body>
</html>
```

App.py

```
from flask import Flask,render_template,request
import pickle
model=pickle.load(open('weight.pkl','rb'))
app=Flask(__name__)
@app.route('/')
def hello_world():
    return render_template("index.html")
@app.route('/predict',methods=["POST"])
def func2():
    step_count=request.form['step_count']
    mood=request.form['mood']
    calories_burned=request.form['calories_burned']
    hours_of_sleep=request.form['hours_of_sleep']
    bool_of_active=request.form['bool_of_active']

data=[[int(step_count),int(mood),int(calories_burned),int(hours_of_sleep),int(bool_of_act
ive)]]
    pred=model.predict(data)
```

```
    print(pred)
    return render_template("index.html",y=str(pred))
if __name__=='__main__':
    app.run(debug= True)#wsgi local server url
```

OUTPUT

step_count

mood

calories_burned

hours_of_sleep

bool_of_active

click

Body fitness:kg