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EVALUATE THE HEIGHT WEIGHT AND BMI FROM FACE

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Abstract

Body height, weight, and body mass index (BMI) are important because they can be used for healthcare. A person's weight in proportion to their height is gauged by their BMI. Because it is frequently used to evaluate health issues. Our chances of living a longer, healthier life is said to be increased by having a healthy body mass index (BMI). The BMI range may be identified and classified using picture analysis, which can help to manage their BMI, and lead healthier lives. Being overweight has been linked to obesity, diabetes, and cardiovascular disease. Using the methods Linear Regression, Ridge Linear Regression, Random Forest Regressor, and Kernel Ridge Regression. We test the feasibility of estimating height, weight, and BMI from single-shot face photos. In order to estimate height, weight, and BMI, we will evaluate these regression models and select the one with the highest test score.

1.INTRODUCTION

The body mass index or BMI processes the ratio between height and weight. The body mass index is the most basic tool which we use to define overweight and obesity. BMI is commonly regarded as a vital indicator of health. A normal BMI is between 18 and 25 and obesity starts at 30. With the gradual increase of body mass index, we notice a higher probability of cardiovascular diseases such as high blood pressure, diabetes, etc. A number in higher ranges leaves an individual at an exponential risk in health that the person has in addition to their BMI being raised, a waist circumference more than 40 inches. Therefore, classifies them into a

greater risk category, so imperatively puts them up a risk category.

Weight issues are directly linked to all chronic diseases. If things proceed the way they are now, it is believed that the next generation may not live as long this current generation. The diet of an average overweight individual is one of the causes of this situation which contains various high-calorie fast food items. Even though after individual eats these meals and gains energy, the energy lasts a very short period of time and causes hunger much sooner. The second reason is physical inactivity. The increased usage of the latest technology such as television, mobile phones, video games, etc. has significantly reduced the physical activity of the average person. The third reason is stress. We are much less likely to exercise with the high amounts of stress and low sleep levels in our busy lives.

Additionally, weight gain can be promoted, possibly due to hormonal and metabolic changes. One more reason may be due to the environment we live in and our transportation system, which is overly dependent on cars. In many regions, there is an insufficiency of any form of public transportation systems, sidewalks, community parks, playgrounds and bike paths for recreational activities. On the other end of the spectrum, adult malnutrition is more common and widespread than we are conscious of these days. Individuals obtaining a BMI value below 18 are considered underweight. An issue in absorbing nutrients from food or consuming an inadequate diet is the root cause of malnutrition. The reasons for this can be many, consisting of having a low income, a long-term health condition or reduced mobility, etc. This result in a low mood, feeling tired all the time, weak muscles, slow or impaired growth, etc. Another major concern is that people that are overweight can be undernourished if they consume a high-calorie diet but are low in other essential nutrients. It becomes really difficult for a common individual to measure their BMI values given that people have less time in their busy life and most people do not own a weighing machine and/or a measuring tape.

In order to involve more people to measure their BMI, we propose an exciting measuring process and therein spread more awareness. In this paper, we propose a novel method to calculate the BMI of an individual from their face by the use of Deep Learning models. The prediction of deep learning model is largely considered as a

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black box process. Some reasons to explain the results can be due to the changing of facial features at varied weight ranges.

Overweight individuals have widened mid and lower faces, widened nose and a reduced eye height relatively to underweight individuals, who have an angular face with a pointed chin and relatively narrower cheeks. In addition to calculating the BMI, the height and weight of an individual is also calculated in this paper. This can be helpful for gaining knowledge of the physical appearance of a person, which otherwise may not be possible

Determining the health of a person by predicting the BMI value which requires factors like height and weight of an individual which is a complicated process. To overcome this problem, a BMI prediction system using machine learning techniques will be implemented so that individual can easily monitor their BMI values by taking a snapshot of their face.

Despite using BMI as one of the best methods for population assessment of overweight and obesity, it is time consuming process. The conventional calculation of the BMI results in inaccuracies. This is detrimental in deciding the fitness of an individual. As a result, it has become imperative to have efficient solution to make the BMI process fast and error-free.

Face detection and feature extraction component using machine learning to detect useful faceoutline information.Recognition of Useful Facial Information, not only detect the face position but also obtain face outline information that is useful for BMI prediction. Features Extractions from recognized facial information then data will be normalized for extracting features of good quality for the BMI prediction.

2. LITERATURE SURVEY

1.“AI-based BMI Inference from Facial Images: An Application to Weight Monitoring”, 2020 19th IEEE International Conference on Machine Learning and Applications (ICMLA), February 2021

Authors: Hera Siddiqui, Ajita Rattan, Dakshina Ranjan Kisku

Self-diagnostic image-based methods for healthy weight monitoring is gaining increased interest following the alarming trend of obesity. Only a handful of academic studies exist that investigate AI-based methods for Body Mass Index (BMI) inference from facial images as a solution to healthy weight monitoring and management.

To promote further research and development in this area, we evaluate and compare the performance of five different deep learning based Convolutional Neural Network (CNN) architectures i.e., VGG19, ResNet50, DenseNet, Mobile Net, and light CNN for BMI inference from facial images. Experimental results on the three publicly available BMI annotated facial image datasets assembled from social media, namely, Visual BMI, VIP-Attributes, and Bollywood datasets, suggest the efficacy of the deep learning methods in BMI inference from face images with minimum Mean Absolute Error (MAE) of 1.04 obtained using ResNet50.

Disadvantages

Computation time is more. No accurate dataset.

2.“A computational approach to body mass index prediction from face images”, Image and Vision Computing, Volume 31, Issue 5, May 2013, PP 392- 400

Authors: LingyunWen, GuodongGuo

Human faces encode plenty of useful information. Recent studies in psychology and human perception have found that facial features have relations to human weight or body mass index (BMI). These studies focus on finding the correlations between facial features and the BMI. Motivated by the recent psychology studies, we develop a computational method to predict the BMI from face images automatically. We formulate the BMI prediction from facial features as a machine vision problem, and evaluate our approach on a large database with more than 14,500 face images. Apromising result has been obtained, which demonstrates the feasibility of developing a computational system for BMI prediction from face images at a large scale.

Disadvantages

Not optimal prediction.Redundancy with more Unnecessary data.

3. “Investigation on Body Mass Index Prediction from Face Images”, 2020 IEEE- EMBS Conference on Biomedical Engineering and Sciences (IECBES), March2021.

Authors: Chong Yen Fook, Cheechin Lim, Vikneswaran Vijean

Body mass index is a measurement of obesity based on measured height and weight ofa person and classified as underweight, normal, overweight and obese. This paperreviews the investigation and evaluation of the body mass index prediction

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from face images. Human faces contain a number of cues that are able to be a subject of a study. Hence, face image is used to predict BMI especially for rural folks, patients that are paralyzed or severely ill patient who unable to undergoes basic BMI measurement and for emergency medical service. In this framework, 3 stages will be implemented including image pre-processing such as face detection that uses the technique of Viola- Jones, iris detection, image enhancement and image resizing, face feature extraction that use facial metric and classification that consists of 3 types of machine learning approaches which are artificial neural network, Support Vector Machine and k-nearest neighbor to analyze the performance of the classification. From the results obtained, artificial neural network is the best classifier for BMI prediction system with the highest recognition rate of 95.50% by using the data separation of 10% of testing data and 90% of training data. In a conclusion, this system will help to advance the study of social aspect based on the body weight.

Disadvantages

High difference in ratio between testing and training data. Highest recognition rate of 95.

3. PROBLEM STATEMENT

BMI is related to cholesterol and body fat, and is an important predictor of diseases that can evolve as a result of higher body fat levels. Most people are unconcerned with their health due to a lack of physical exercise and a hectic lifestyle. The majority of earlier research on automated height, weight, and BMI measurement has made use of 3D whole body videos and 2D and full body 2D pictures. A person's weight in proportion to their height is gauged by their BMI. It serves more as a gauge for calculating total body fat. Because it is frequently used to evaluate health issues. We suggest a cost and time effective approach for estimating Height, Weight, and BMI from a human face in the real world, where people have less time in their busy lives and most people do not own a measuring tape or a weighing machine.

LIMITATIONS

This approach failed to identify the outline of the face and spatial features. Traditional method, the health of a person by predicting the BMI value which requires factors like height and weight of an individual is a complicated process. The traditional method of calculating BMI is inconvenient and

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requires physical measuring of a person and particular instruments.

4. PROPOSED SYSTEM

BMI is one of the most widely used characteristics when considering an individual's fitness. BMI is a metric that is used to distinguish people and label them as overweight, underweight, or fit, which is helpful in assessing their health status. For a higher body fat ratio, a higher calorie diet is more normal these days. Malnutrition, on the other hand, is more serious and pervasive than we would imagine these days. BMI is a method used to assess adult dietary status of both people and populations. In this proposed system, Kernal Ridge and Random Forest Regression Models were used. The Face recognition module in Python is used to detect a person's face from an image. The image is then forwarded to the Feature Extractor model for processing. The derived features of height, weight, and BMI will be used in the regression models we used for further processing. For the validation of our concept, we used the VIP attribute dataset. The VIP attribute dataset includes photographs of men and women's faces along with their weight, height, BMI, age, and gender. When used as a Feature Extractor, the Random Forest Regressor model worked well for the weight attribute. Kernel Ridge performed well when dealing with height, while the Random Forest regressor performed well when dealing with the BMI attribute.

Advantages:

Considered large number of facial features. Huge dataset about thousand subjects.The scope of the project is, it is user friendly for aged, severely ill patients and physically challenged people, The system is useful for society to overcome the traditional method and predict the BMI using facial images.

5. DESIGN

System design is transition from a user-oriented document to programmersor data base Personnel. The design is a solution, how to approach to the creation of a new system. This is composed of several steps. It provides the understanding and procedural details necessary for implementing the system recommended in the feasibility study. Designing goes through logical and physical stages of development, logical design reviews the present physical system, prepare input and output specification,

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details of implementation plan and prepare a logical design walkthrough.

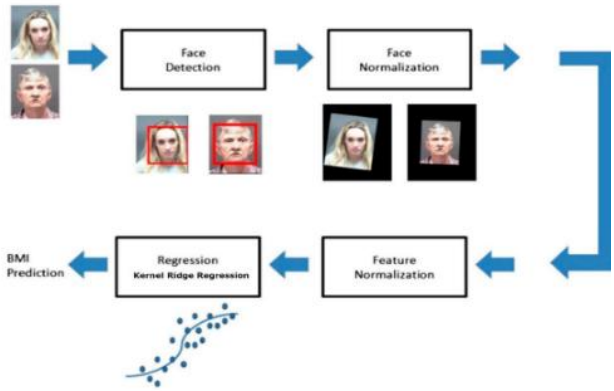

Fig 5.1 System Architecture

6. IMPLEMENTATIONS

6.1. Data preparation:

Human Facial Images and Their Height, Weight, BMI can be used as input for machine learning purposes. This data can come from large volumes of data are provided at the learning stage of the machine since as the number of data increases it aligns towards yielding desired results.

	UID	path	id	name	height	weig
0	Abhi	height_weight\Abhi1.jpeg	23	Abhi	1.72	59.0
1	Abhi	height_weight\Abhi2.jpeg	23	Abhi	1.72	59.0
2	Anishka	height_weight\Anishka1.jpeg	24	Anishka	1.62	42.0
3	Anishka	height_weight\Anishka2.jpeg	24	Anishka	1.62	42.0
4	Charan	height_weight\Charan1.jpeg	25	Charan	1.76	54.0
...	...	...	...	...	...	...
264	vikky	height_weight\vikky5.jpg	8	vicky kaushal	1.83	80.0
265	vikky	height_weight\vikky6.jpg	8	vicky kaushal	1.83	80.0
266	vikky	height_weight\vikky7.jpg	8	vicky kaushal	1.83	80.0
267	vikky	height_weight\vikky8.jpg	8	vicky kaushal	1.83	80.0
268	vikky	height_weight\vikky9.jpg	8	vicky kaushal	1.83	80.0

6.2. Face detection

Face recognition is the process of detecting or confirming the identity of individuals based on facial images. The following discusses Python-based methods for implementing face recognition, focusing on two approaches. First, using the face recognition library built into Python, and second, using the OpenCV computer vision library.

The model converts every image it gets into a numerical encoding. First, the face encodings method returns an encoding of the input image then, the compare faces method compares the encodings through a distance parameter to see if there is a match. Then, the encoding with the least distance gets selected since it's the closest match.

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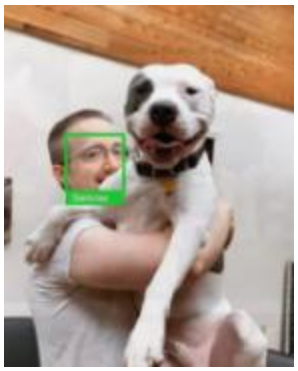

6.3. Model training

This stage is concerned with creating a model from the data given to it. At this stage, a part of the training data is used to find model parameters such as weights of in machine learning which helps to minimize the error for the given data set. The remaining data are then used to test the model. These two steps are generally repeated a number of times in order to improve the performance of the model. In order to estimate height, weight, and BMI, we will evaluate regression models and select the one with the highest test score.

6.4. Model evaluation

The input of this stage is the trained model produced by the model learning stage and the output is a verified model that provides sufficient information to allow users to determine whether the model is suitable for its intended application. Thus, this stage of the machine learning lifecycle is concerned with the fact that a model is working properly when treated with inputs that are unseen.

6.5. Deploy the machine learning model:

In this stage of the Machine learning lifecycle, we apply to integrate machine learning models into processes and applications. The ultimate aim of this stage is the proper functionality of the model after deployment. The models should be deployed in such a way that they can be used for inference for detection of height, weight and BMI.

7. OUTPUT SCREENS

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8. CONCLUSION

The System provides the BMI values using machine learning techniques. This system used data to assess any participants BMI-related facial traits, as well as visualization to guarantee that human judgements matched intuitions. This BMI values gives a understanding about the person's health based on the values person should take care of his health. This work developed a BMI prediction system using data mining approaches. Our technology ensures the use of front-facing photos using kernelized Ridge regression. This study employed data to determine the BMI-related face characteristics of any participants, and visualization to ensure that human judgments were consistent with intuitions and it also classifies the person into given categories such as under-weight (BMI value below 18), healthy (BMI value between 18.1 to 30), over- weight (BMI value between 30.1 to 40), obesity (BMI value above 40).

9. FUTURE ENHANCEMENT

In our future work, we would work on implementing new ideas to improve our model's performance. This paper was motivated by the need to create awareness for health amongst our society, which usually gets neglected in our busy lifestyle.

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