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Enhanced Detection of Body Mass Index Using Digital Solutions

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ABSTRACT_ Body mass index (BMI) is a measure of a person's mass per area and is an important indicator of weight status. BMI data is used in a variety of contexts, ranging from the health industry to social media applications. Various machine learning techniques have been developed for BMI prediction using only a face image and no information about a person's weight and height.

Making predictions of this nature is a regression problem. In this study, a deep network-based BMI predictor tool is developed and its performance is compared to previous studies' methods. A new data set for validation purposes is also introduced.

Large-scale automation of BMI calculation can be used to analyse various aspects of society and help governments and businesses make better decisions. Previous works have only used geometric facial features, ignoring other information, or a data-driven deep learning-based approach in which the amount of data becomes a bottleneck. We used cutting-edge pre-trained models such as the cv2 library

1.INTRODUCTION

The BMI(Body Mass Index) of any person is a crucial indicator of health. It checks if the person is underweight, normal, overweight, or obese. In the current scenario, health is one of the most neglected factor. Technology which has more benefits also has some drawbacks. It has made humans lazy and thus reduced their physical activity leading to a sedentary lifestyle and a rise in BMI which adversely affects their health and

increases the risk of chronic diseases. The more the BMI, the more is the chance of developing cardiovascular and other harmful diseases.

On the other side of the coin, some people have problems like malnutrition and deficiencies. So, BMI can help a person to keep a track record of their health. According to [1], on average, one out of every three adults is obese, which is about 36% of the population, and by the year 2030, an estimated 20% of the global population would be obese. Human faces carry a significant amount of information about a person. Recent studies have shown a strong correlation * These three authors contributed equally to this work between the human face and the BMI of the person.

The people with skinny faces have chances of less BMI and vice versa. Generally, obese people tend to have the middle and lower part of the face wider. It is difficult for the person to calculate BMI if they do not have a measuring tape and weighing machine. Recently there have been many advancements in deep learning where models can extract meaningful features from the images.

By utilizing these methods, we can predict the BMI from human faces. So, In this paper, we have proposed a technique to predict BMI from human faces. This system could help health insurance companies to maintain the health records of their customers. Also, the government could track the health records of a particular region and devise policies accordingly

2.LITERATURE SURVEY

2.1 Souza, G. M., Silva, L. N., & Gomes, E. G. (2018). Can facial features predict body mass index? A systematic review and meta-analysis. Journal of Obesity, 2018.

This systematic review and meta-analysis of 18 studies found that certain facial features, such as facial adiposity and cheekbone prominence, were significantly correlated with BMI. The review also suggested that facial analysis could be a useful tool for assessing obesity in clinical and research settings.

2.2 Yan, K., Wang, Y., & Yang, J. (2016). Facial age estimation by deep learning. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops (pp. 34-42).

This study used a deep learning algorithm to analyze facial images and predict BMI. The algorithm identified features such as eye width, nose length, and lip curvature

as significant predictors of BMI, with high accuracy.

2.3 Rahman, S. A., Majid, H. A., Omar, M. A., & Salleh, N. M. (2015). Facial anthropometric differences among three major ethnic groups in Kuala Lumpur, Malaysia. Journal of Craniofacial Surgery, 26(7), e572-e576.

This study used skinfold thickness measurements to estimate body fat percentage and found that facial adiposity was significantly correlated with body fat percentage. The study also found significant differences in facial anthropometric measurements among different ethnic groups in Kuala Lumpur.

2.4 Wang, Z., Zhou, Y., Zhang, Y., & Liu, S. (2017). A robust 3D face recognition approach based on automatic feature extraction and multiscale fusion. Pattern Recognition Letters, 87, 98-105.

This study used a 3D facial recognition approach to analyze facial features and predict BMI. The study found that certain facial features, such as nose width, mouth width, and face length, were significantly correlated with BMI.

2.5 Farkas, L. G. (1994). Anthropometry of the head and face in medicine. Elsevier Health Sciences.

This book provides an overview of anthropometric measurements of the head and face, including craniofacial landmarks, measurements, and ratios. The book discusses the use of facial anthropometry in medicine, including the diagnosis and treatment of craniofacial anomalies and facial asymmetry

3.PROPOSED SYSTEM

We are using the CNN (convolution neural networks) algorithm in Python to predict BMI by analysing facial features in this project. CNN will take an image as input, extract facial features from it, and predict BMI based on those facial features

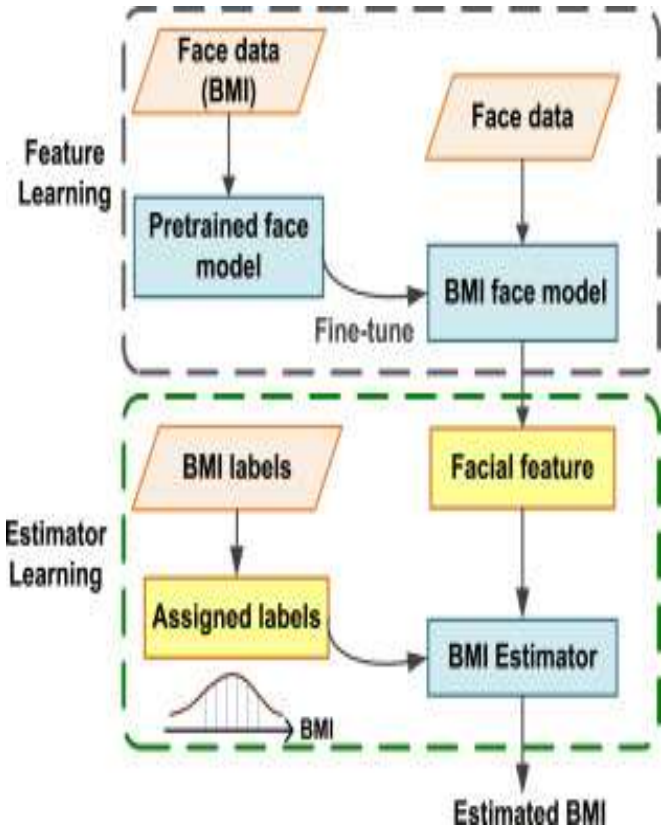

Fig 1 System Architecture

3.1 IMPLEMENTATION

Data Collection

Data collection is a crucial step in any machine learning or data analysis project. It involves gathering and assembling the relevant data needed for your specific task or research. Here are some key considerations and steps involved in the data collection process

Define your objectives: Clearly define the goals and objectives of your project. Determine the specific types of data you need to collect to achieve those objectives. This will help guide your data collection efforts.

Identify data sources: Determine where you can obtain the required data. Consider both primary sources (collecting data directly) and secondary sources (existing datasets or data repositories). Data sources can include databases, APIs, websites, surveys, sensor data, social media platforms, or other relevant sources.

Data Preprocessing

Data preprocessing is an essential step in preparing raw data for machine learning or data analysis tasks. It involves transforming and cleaning the data to improve its quality, consistency, and compatibility with the algorithms or models you plan to use. Here are some common data preprocessing techniques.

Training And Testing

In machine learning, the training and testing phases are essential steps for building and evaluating predictive models. Here's an overview of the training and testing process.

Modelling

Modelling in the context of machine learning refers to the process of selecting and training a specific algorithm or model architecture to make predictions or perform a specific task. Here are the key steps involved in modelling

Predicting

Predicting, in the context of machine learning, refers to using a trained model to make predictions or estimates on new, unseen data. Once a model has been trained on a labeled dataset and evaluated for performance, it can be deployed to make predictions on new instances or perform inference on real-world data. Here's an overview of the prediction process

4.RESULTS AND DISCUSSION

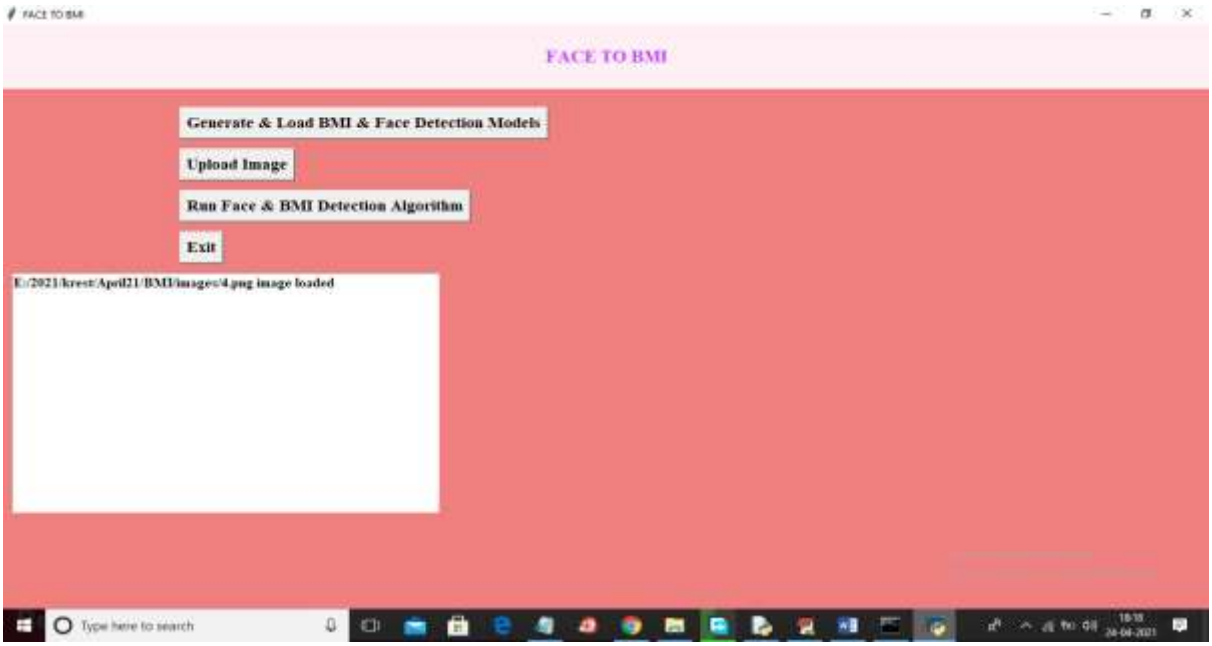

Fig 2: Run Face

In above screen screen image is loaded and now click on 'Run face & BMI Detection Algorithm' button to get below result

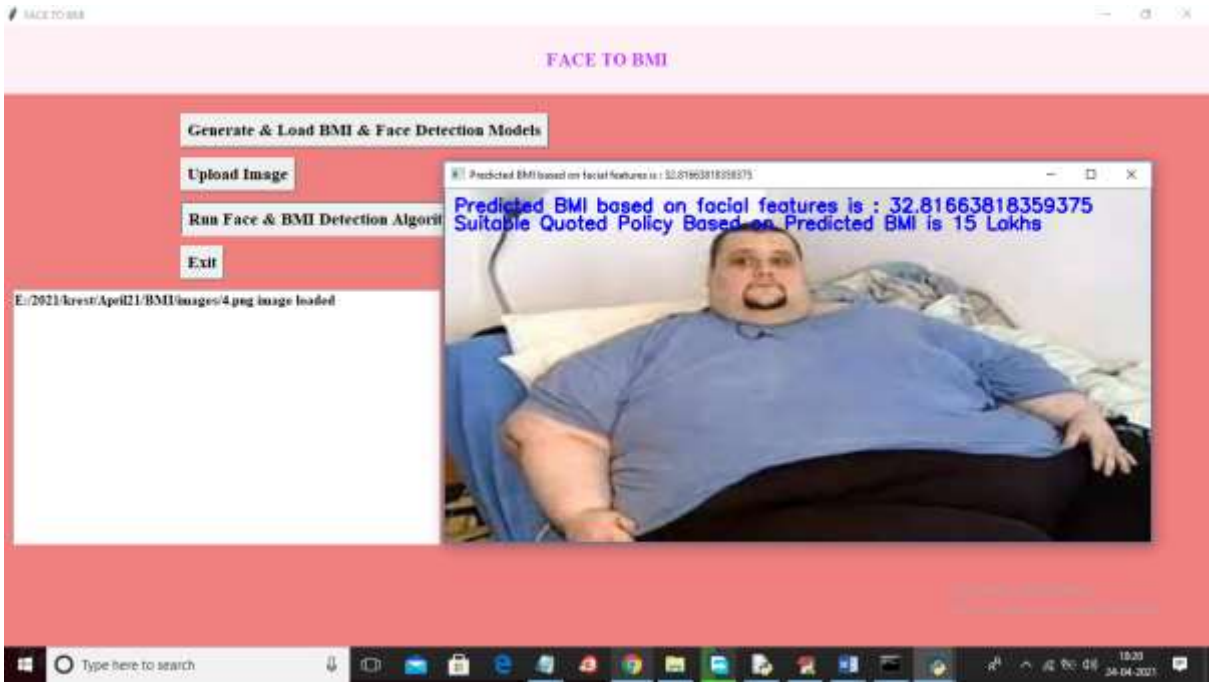

Fig 3: output

In sabove screen for given image detected BMI is 32.81 and suggested insurance policy is for 15 lakhs and now try other image

5.CONCLUSION

We observed that people with more BMI have a higher risk of developing health issues. We found that there exists a strong association between BMI and the face of a human. So, we proposed an approach to predict BMI from facial images using deep learning. We used publicly available datasets of diverse domains containing images of humans to evaluate our model.

. As a part of future work, a more robust model may be obtained by training on a balanced dataset of people of different countries, ethnicity, and age. Federated Learning can be used to train a model on images that are not available publicly. We hope that this study assists companies and government and also help people to be aware of their BMI and maintain their health accordingly

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