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Face Emotions based Stress Index Measurement using Machine Learning

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Abstract

This system is designed & developed for detection of the stress index of a person on the basis of emotion recognition and analysis of a face. It's a simple application which use the front camera of the smartphone or computer and does not have requirement of any other external hardware. It has been developed with the major focus on students & young generation and somewhat less on the adults because of the fact that the young generation is more prone to over-use of the smart devices. The methodology used is efficient and simple as this application running in background takes pictures of the user at various intervals as defined by the timing graph. Such images are converted into compatible images and stored in the database whose URL would be fetched in return after a successful operation.

A timing graph is a resultant of a function over time which determines the initiation of the consecutive photo captures of the user in a series. It gets increased over time as the condition of stress is likely to happen as the duration of usage & content increases.

Major 7 emotions with which the face can express are Happy, Sad, Angry, Disgust, Neutral, Fear, Surprise whose analysis is found by Microsoft azure emotion API.

These Expressions could be formulated in a probabilistic manner & with priority weightage mentioned in the weight table (table no. 1) assignment to each emotion fetched. The returned emotion set of the seven major emotion face expression.

Introduction

The computation of stress was a big hurdle to compute as there were no fixed parameters for the measurement other than high resolution resonance imaging. This method was not easy and was expensive, also long exposure can be harmful. The detection of stress needs to be detected by a more suitable way, so researchers tried to obtain another way which does not harm and could make the process faster also. The main challenge was to make the process of computation faster as the older method was very tedious and time taking. Regarding the perceived problems, researchers tried to find many ways to calculate stress of a person, which were touch dependent and would calculate stress either by blood sample or by touching the fingers of the person. Both the methods were providing next to accurate results but with this method the user would be hindered while working for the detection of stress. These methods were not continuous as the MRI method but were not harmful indeed. Contrary to this, these methods could be not performed for a longer period of time as neither every time a blood drop could not be collected nor the user would be touching the device for stress detection.

Now, there was in need of a system where the user can freely work without any hindrance and in the mean while it can continuously measure the stress index so that if the stress index of the user increases due to any reason, the system can inform to the respective mechanism to take any action. As in today's time the majority of the people are using smart phones and desktop on the regular basis. Another method was to deploy a stress detection system at the back of the mobile device which can detect the stress, but in that another problem of accurate finger placing aroused. After some researches, smart watches were made with stress detection systems but professionally people were not wearing those types of watches and they were expensive too.

Our method is simple, easy and fast. It simply captures the image of the user and on the basis of facial recognition the system detects the stress of the person and pings when the stress is above the threshold level.

The main objectives of this work are:

To study existing methods used for stress detection of a person.

To design a system by which stress can be calculated in a faster and more convenient way.

To evaluate performance of proposed system on experimental data.

Material and methods

The dissertation does not require any hardware other than a smart device with a front camera, it is only a software based application. It would be a legal application as it does not send any other user data (except the image) outside the smartphone. The libraries used are open source and platform independent. The technology used is based on face recognition for which predefined libraries are present. The similar types of work with these libraries have been done in the past for another objective so it is totally feasible for the affluent release of the application. This application could be used all over without the trespassing of any jurisprudence facts. The main hindrance is that it cannot work on multiple faces if present in the same frame. Another limitation is that if the camera is already engaged (like in zoom meetings) the stress cannot be fetched. Other important fact is that it could not be effectively work if the person is wearing mask or tinted glasses. Some of the additional Libraries would be needed which are necessary for the proper working of the application

& behaves as an update over which downloaded by the application itself. Machine learning processes are closely related to data mining and predictive modelling. Both need to search for patterns and calibrate program actions accordingly through data. The first thing about convolutional networks to know is that they don't perceive images like people does. Therefore, you will have to think differently about what an image means as a convolutional network feeds and processes it. In case of image the image processing associates with as a signal dispensation in which input is image, like video frame or photograph and output is an image or characteristics extracted from that image. Usually, Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. Digital Processing techniques help in manipulation of the digital images by using computers. As raw data from imaging sensors from satellite platform contains deficiencies. To get over such flaws and to get originality of information, it has to undergo various phases of processing. The three general phases that all types of data have to undergo while using digital technique are Pre- processing, enhancement and display, information extraction. The convolutional Neural Network & shifted somewhat towards the Deep Learning provided by Microsoft Azure which will be giving the data in JSON for our machine learning algorithm. The Machine learning algorithm used here is Naive Bayes which is based on Bayesian Network working on probability. The working model is mentioned in the figure no. 1.

Result and discussion

For the computation of stress index, a python application was developed which captures the images of the user by using the camera of the device. The method of stress index computation is harmless and has no additional cost. In the comparison of the latest mechanism for stress detection, it proved to be more consistent and hassle free. For the experimental process we have taken random Google images accordingly for the computation of stress index.

Images	Stress Index
<p>20.866263</p>
<p>57.754412</p>
<p>18.445712</p>
<p>28.021037</p>

Images	Stress Index
<p>33.000363</p>
<p>39.652611</p>
<p>67.994868</p>

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Tables and Figures

Emotion Label	Weightage Value
Angry	0.8
Sad	0.5
Disgust	-
Neutral	0.5
Fear	Pure
Surprise	Pure
Happy	-1

Table no .1 - Weight Table

Figure no .1 - Working Model