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Stress Detection in IT Professionals using Real Time Videos

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ABSTRACT-

Stress has become an increasingly serious problem in the current society, threatening mankind's well-beings. With the ubiquitous deployment of video cameras insurroundings, detecting stress based on the contact-free camera sensors becomes a cost-effective and mass-reaching way without interference of artificial traits andfactors. The project entitled with Stress Detection in IT professionals using realtime videos is to detect stress in the IT professionals using vivid Deep learning anImage processing techniques .We hereby propose an upgraded version of the oldstress detection systems which excluded the live detection but this system comprises of live detection and detecting mental stress levels in his/her while they areat their work place. Our proposed system mainly focuses on live stress detectionAPI using Deep learning approach based on video frames using CNN and thusmaking the working environment healthy and spontaneous for the employees andto get the best out of them during working hours. This proposed system trains thedataset using Convolutional Neural Networks, testing the model using live streamand the deploying model using Flask API. This model will find live stress valuesfrom the video feed from the web camera of the device. For every second the program identifies the face, eyebrows and lip movements and shape. As, it changesthe stress levels calculated and also finds whether its 'High stress' or 'Low stress'.

Introduction

Framework gets the capacity to consequently take in and improve from self-encounters without being unequivocally customized utilizing Machine learning and Deep realizing which is a utilization of man-made consciousness (AI). PC programs are created by Deep Learning that can get to information and use it to find out on their own. Express programming to play out the assignment dependent on expectations or choices assembles a numerical model dependent on "preparing information" by utilizing Deep Learning. The extraction of stowed away information, relationship of picture information and extra example which are vaguely apparent in picture is finished utilizing Image Mining. It's an interrelated field that includes, Image Processing,Video Processing, Data Mining, Deep Learning and Data sets. As indicated by moderate appraisals in clinical books, 50-80% of generally actual sicknesses are brought about by stress. Stress is accepted to be the chief reason in cardiovascular infections. Stress can put one at higher danger for diabetes, ulcers, asthma, headache cerebral pains, skin problems, epilepsy, and sexual brokenness. Every one of these infections, and host of others, is psychosomatic (i.e., either caused or misrepresented by psychological circumstances like pressure) in nature. Stress has three prong impacts: Subjective impacts of pressure incorporate sensations of responsibility, disgrace, tension, hostility or dissatisfaction. People likewise feel drained, tense, apprehensive, touchy, grouchy, or forlorn. Noticeable changes in an individual's conduct are addressed by social impacts of pressure: Effects of conduct pressure are seen, for example, expanded mishaps, utilization of medications or liquor, giggling outside any connection to the issue at hand, entirely sensitive state of mind, Diminishing mental capacity, carelessness or potentially touchiness to analysis are a portion of the impacts of Cognitive pressure.

These days as IT businesses are setting another look in the market by acquiring new advances and items the market. In this review, the feelings of anxiety in representatives are additionally seen to increase current standards high. However there are numerous associations that give psychological wellness related plans to their workers yet the issue is a long way from control. In this paper we attempt to go in the profundity of this issue by attempting to distinguish the pressure designs in the functioning representative in the organizations, we might want to apply picture handling and profound learning methods to investigate pressure designs and to limit the variables that emphatically decide the feelings of anxiety.

SCOPE

In corporate world representatives know nothing about pressure driving conditions while working. It is constantly noticed for the most part in It representatives ongoing pressure is regularly disregarded. Organizations use to give a review structure to the representatives to fill and afterward use to anticipate pressure dependent on that structure. It isn't just tedious yet required entire part of endeavors as structures where conveyed physically. Stress Detection System empowers workers with adapting up to their issues prompting pressure by deterrent pressure the executives arrangements which is worried about disposing of pressure and further developing representative wellbeing. Additionally, customary pressure identification depends on mental

polls or expert mental discussion. As the aftereffects of polls rely to a great extent upon the appropriate responses given by people, the pressure measure is very abstract. At the point when individuals decide to communicate their mental states with reservations, the outcome scale would be one-sided.

Objective

• Training the dataset using Convolutional Neural Networks

• Testing the model using live stream.

• Deploying the model using a Flask API

PROPOSED SYSTEM

To conquer the constraints of the poll overviews, the strategies for naturally recognizing pressure by detecting a person's proactive tasks through wearable gadgets, for example, cell phones with implanted sensors or in light of physiological signals, for example, pulse changeability HRV, electrocardiogram ECG, galvanic skin reaction GSR, circulatory strain, electromyogram, electroencephalogram EEG, and so on from committed sensors have been created. While these techniques can equitably detect individuals' pressure states, they normally request wearable types of gear and sensors, which could barely acknowledge without contact estimation. Presently, the universal sending of without contact camcorders in environmental factors, along with the fast advancement of information assortment and examination methods, offers us one more channel to distinguish one's pressure dependent on picture successions caught as live from an observing camcorder. In the proposed framework we have fostered a model utilizing CNN calculation for the acknowledgment of stress from looks. This technique depends on the utilization of 7 classes of feelings accordingly arranged one's feeling into focused and non-pushed. Likewise the pressure esteem is determined and shows it on a similar casing as the video is caught.

DATASET

For training the model I used Kaggle Fer-2013 which is an open source dataset that has a total of 33,887 grayscale images classified into classes of emotions like:

Fig :Images showing emotion sad

Fig: Images showing emotion happy

METHODOLOGY

Deep learning has been generally and effectively applied in many fields like PC vision, feeling examination, etc. Unique in relation to the current work which extricated the highlights through hand-created include designing techniques, in this work, we direct pressure identification through profound learning of elements' portrayals. In this methodology we present a framework by which without contact camcorders are utilized for pressure location in IT Professionals. There are a few late examinations revealing discoveries that facial signs and articulations can give experiences into the recognizable proof of pressure. Stress Detection System empowers representatives with adapting up to their issues prompting pressure by deterrent pressure the executives arrangements which is worried about wiping out pressure and further developing worker wellbeing. In our

work we have planned a framework which will catch video edges of the worker on consistently and afterward it is grouped dependent on lip and eyebrow developments and sent it utilizing Flask.

I developed a real time face stress detection model. The model is image processing based model were the model classifies face is stressed or not by predicting the emotions on face. The stress level is calculated with the help of eyebrows contraction and displacement from the mean position. The distance between the left and right eyebrow is being calculated and then the stress level is calculated using exponential function and normalized between 1 to 100. This project has three major parts:

• Training the data set using CNN
• Testing the model using live stream
• Deploying the model using Flask API

A. Training the Model

The dataset we used here is the Kaggle Fer-2013 open-source dataset that has a total of 33,887 grayscale images classified into 7 classes of emotions. The 7 emotions choose are: Happy, Angry, Sad, Disgust, Surprise, Fear and Neutral. Totrain this dataset we used five convolutional layers with a combination of activation layers. These layers were implemented using Sequential model and contained 7
blocks each with respective Activation, Normalization and Flattening Layers. The entire training process ran in 100 epochs with a batch size of 64 and a patience value of 10 for early stopping and checkpoint.

B. Testing the model

This model will find live stress values from the video feed from the web camera of the device and to implement this OpenCV is utilized. Using the VideoCapture feature of OpenCV, every frame of the live video feed is taken. To identify the facial features of the employee, the 68-landmark facial features file is used. For every second the program identifies the face, eyebrows and lip shape. The convex shape of the eyebrows and lip s calculated against a normalization formula to determine the stress levels. as the lip and eyebrow movement changes the stress levels also changes accordingly. The program calculates whether the cumulative value from the eyebrow and lip movement to find the total stress values and whether it is 'High stress' or 'Low Stress'. These calculated values are displaced on the same frame as the video is captured using the OpenCV Puttext feature. The task of our video based stress detection is to sense the affective state (stressed or unstressed) of a user based on his/her video data V = (frame1, frame2, · · · , framen), where frame1, frame2, · · · , framen is a sequence of image frames of the video.

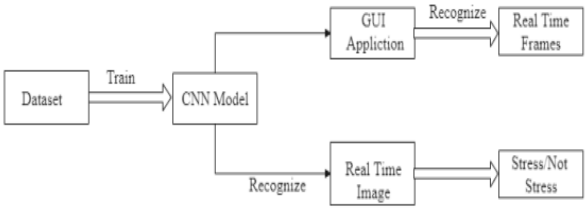
C. Deploying the model in Flask API

Here, we developed a basic API using Flask which will call the VideoCamera class from the test file (frame by frame calculations is done here) and display the video along with the stress levels. These are the ways we managed to make a live stress detection in IT professionals using python and Flask. The whole process is filled with so much of learning at each step. For training the model we used Kaggle Fer-2013 which is an open source dataset that has a total of 33,887 grayscale images classified into 7 classes of emotions. .

We trained the expression classification network on the modified FER2013. dataset. FER2013 is the dataset for facial expression recognition. It contains 7 labels (i.e., "angry", "disgust", "fear", "happy", "sad", "surprise", "neutral"). Here element-wise multiply to the attention distribution feature maps and the original post-pooling feature maps, mapping the attention distribution back to the postpooling feature maps.
$AD1\times1 = D1\times1 \times Att1\times1 + D1\times1$
$AD2\times2 = D2\times2 \times Att2\times2 + D2\times2$
$AD4\times4 = D4\times4 \times Att4\times4 + D4\times4$
and concatenated them together as
$R = concat(AD01\times1, AD02\times2, AD04\times4)\ R\ C(21HW)/16$

Initially, we need to operate the webcam on the computer which is going to record the real-time video. The faces will be detected in each frame of the webcam video and then the further processing will be done on those detected faces. In real-time also we have used OpenCV to operate webcam. Then after that, the image is processed by converting to grayscale. In the feature extraction stage, the faces detected are further processed for identification of eyebrows and mouth regions. Initially, the likely Y coordinates of the eyes were identified with the use of the horizontal projection. Then the areas

around the y coordinates were processed to identify the exact regions of the features. This will result in a lot of dots on the faces in the webcam video outlining the shape and all the "moveable parts". These dots are very important for the extraction of the features for the training and classification using the Machine learning algorithms. Then we implemented the ways to transform these nice dots overlaid on faces in the webcam video into features to feed the classifier. Features are small information that is used to describe the object or object state that we are trying to classify into different categories. The facial landmarks from the image material tell about the position of all the "moving parts" of the depicted face, the things we need to express an emotion. In Real-time the webcam captures the video and detected the faces and extracted the facial landmarks with green dots and then the vectors were calculated.



Architecture of cnn

The term 'Convolution" in CNN denotes the mathematical function of convolution which is a special kind of linear operation wherein two functions are multiplied to produce a third function which expresses how the shape of one function is modified by the other. In simple terms, two images which can be represented as matrices are multiplied to give an output that is used to extract features from the image.

A Convolutional Neural Network (CNN) is a deep learning algorithm that can recognize and classify features in images for computer vision. It is a multi-layer neural network designed to analyze visual inputs and perform tasks such as image classification, segmentation and object detection, which can be useful for autonomous vehicles. CNNs can also be used for deep learning applications in healthcare, such as medical imaging. There are two main parts to a CNN:

• A convolution tool that splits the various features of the image for analysis
• A fully connected layer that uses the output of the convolution layer to predict the best description for the image.

CNN architecture is inspired by the organization and functionality of the visual cortex and designed to mimic the connectivity pattern of neurons within the human brain. The neurons within a CNN are split into a three-dimensional structure, with each set of neurons analyzing a small region or feature of the image. In other words, each group of neurons specializes in identifying one part of the image. CNNs use the predictions from the layers to produce a final output that presents a vector of probability scores to represent the likelihood that a specific feature belongs to a certain class.

A CNN is composed of several kinds of layers:

• Convolutional layer - creates a feature map to predict the class probabilities for each feature by applying a filter that scans the whole image, few pixels at a time.
• Pooling layer (downsampling) - scales down the amount of information the convolutional layer generated for each feature and maintains the most essential information (the process of the convolutional and pooling layers usually repeats several times).
• Fully connected input layer — "flattens" the outputs generated by previous layers to turn them into a single vector that can be used as an input for the next layer.
• Fully connected layer — applies weights over the input generated by the feature analysis to predict an accurate label.
• Fully connected output layer - generates the final probabilities to determine a class for the image.

The architecture of a CNN is a key factor in determining its performance and efficiency. The way in which the layers are structured, which elements are used in each layer and how they are designed will often affect the speed and accuracy with which it can perform various tasks.

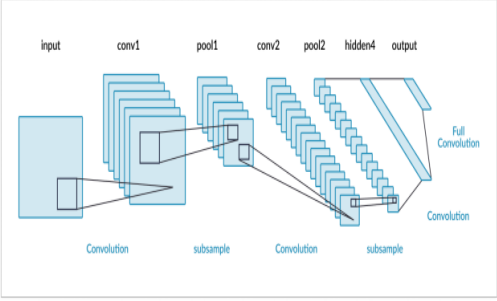


Figure 3.2: Architecture of CNN

LITERATURE REVIEW

Literature review is a searching similar system and identify the difference between researcher project with existing systems. This is help to get a deep idea of the project. It provides the combination of theoretical, methodological and current knowledge of findings according to subject. There are need to gather the information according to the project. This chapter describe the how difference the "Stress Detector" with other similar system.

[2] This paper presents a novel means to predict a driver's stress level by evaluating the movement pattern of the steering wheel. This is accomplished by using an inertial motion unit sensor, which is placed on a glove worn by the driver. The motion sensor selected for this paper was chosen because for its low cost and the fact that it is least affected by environmental factors as compared with a physiological signal. In this paper, skin conductance and driver self-reports served as a reference stress to predict the driver's stress level. Galvanic skin response, a well-known stress indicator, was captured along the driver's palm and the readings were transmitted to a mobile device via low energy Bluetooth for further processing. This demonstrates the opportunity for inclusion of motion sensors in wireless driver assistance systems for ambulatory monitoring of stress levels.

[3] This paper, they presented a video-based Two-leveled Stress Detection Network (TSDNet),which integrates face-level detector and action-level detector to understand facial expressions and action motions for stress identification. In particularly, designed a face-level multi-scale pooling attention mechanism and an action-level frame attention mechanism. The former employed the multi-scaled average pooling with different kernel sizes to grasp stress-related facial features, and the latter focused on key body movement frames related to stressed states.

[5] Stress Detection System is designed to predict stress in the employees by monitoring captured images of authenticated users which makes the system secure. The image capturing is done automatically when the authenticate user is logged in based on some time interval. The captured images are used to detect the stress of the user based on some standard conversion and image processing mechanisms. Then the system will analyze the stress levels by using Machine Learning algorithms which generates the results that are more efficient

[6] . In this paper, they have applied four classification algorithms (Random Forest, Na¨ıve Bayes, Support Vector Machine, and K-Nearest Neighbour) on the dataset of 206 students of JIIT Noida using sensitivity, specificity, and accuracy parameters. Due to small datasets, they have applied 10-fold cross validation also. Analyzing and finding methods like PSS with more accurate results and less cost can help improve the mental health of individuals and make our people mentally sound.

[7] In this paper, they presented the fully automatic recognition of facial emotions using the computer vision and machine learning algorithms which classify these eight different emotions.They tried many algorithms for the classification but the best which came out of the results was the support vectors machines with the accuracy of around 94.1%. Their results imply that user independent, fully automatic real-time coding of facial expressions in the continuous video stream is an achievable goal with present power of the computer, at least for applications in which frontal views can be assumed using the webcam. This machine learning based system for the emotion recognition can be extended to the deep learning system using the Convolutional Neural networks which will have many layers and the chances of getting much higher accuracy is there around 99.5%.

[9] In this paper, framework leverages a cascaded architecture with three stages of carefully designed deep convolutional networks to predict face and landmark location in a coarse-to-fine manner. This method achieves superior accuracy over the state-of-the-art techniques on the challenging face detection dataset and benchmark and WIDER FACE benchmarks for face detection, and annotated facial landmarks in the wild benchmark for face alignment, while keeps real-time performance

RESULT

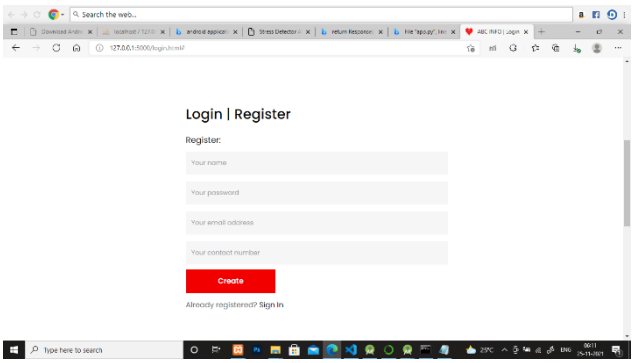


Fig A.1: Registration Page

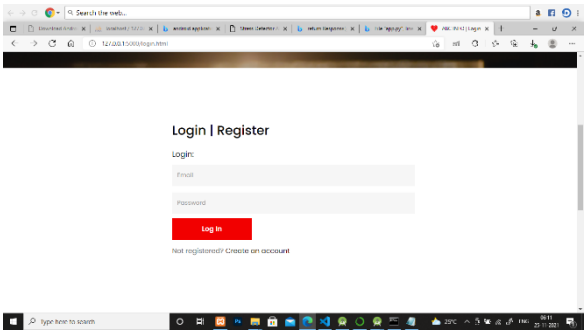


Fig A.2: Login Page

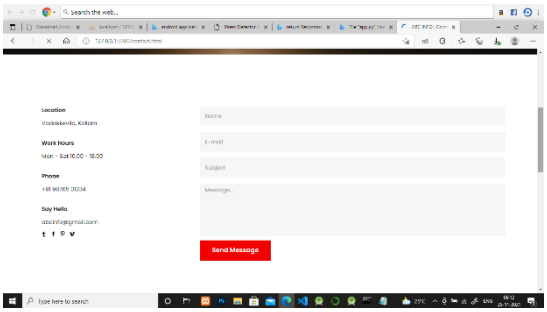


Fig A.3: Contact Page

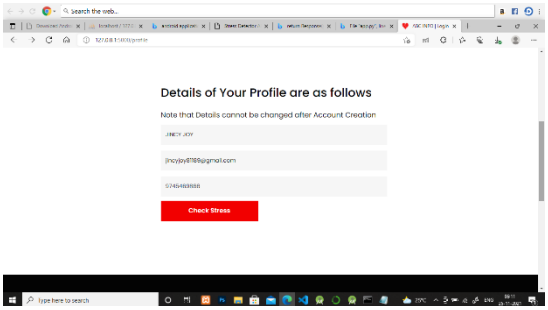


Fig A.4: Profile

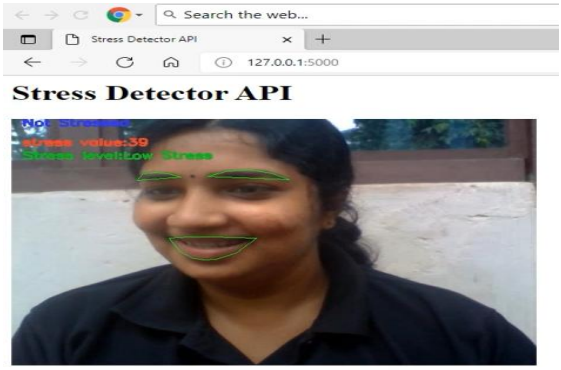


Fig A.5: Not Stressed

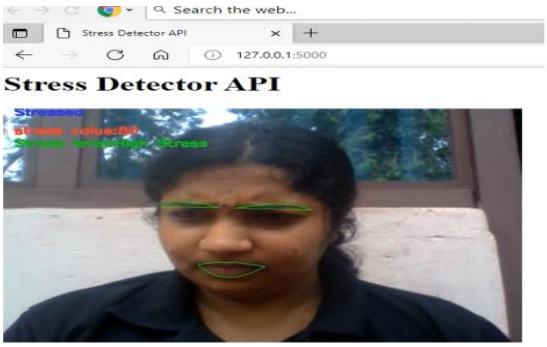


Fig A.6: Stressed

CONCLUSION

In this proposed system we tried to present a video based stress detection in ITProfessionals through deep learning technique. This is a real time face stress detection model. The model is image processing model which is having two parts:Emotion recognition and stress level calculation. The emotion recognition modelwill return the emotion predicted real time. The stress level is calculated withthe help of eyebrows contraction and displacement from the mean position. Themodel trained with an accuracy of 67.5% with minimal overfitting. Here, we developed a basic API using Flask which will call the VideoCamera class and displaythe video along with the stress levels.

This project can be extended in which it will detect as many emotions of different people in one frame in the real-time videos and thereby can identify stress. Our future work will be concentrated on, adding the audio stream into the framework to explore the audio-video methods for stress detection along with providing some remedies to overcome the stressed situation. Also, we are planning to add more algorithms other than CNN and thereby can compare which one gives the best result by checking its accuracy.

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