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A Survey on Physiological Emotion Recognition

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Abstract: ***Every human has disparate emotions in their daily life, and these emotions are not fully apprehended. In this paper, we are dis- cussing various types of emotion recognition methods. We have two kinds of signals, such as physiological and non-physiological signals. We mostly use physiological signals like electrocardiograms, galvanic skin respiration, temperature, electroencephalograms, electromyograms, and so on. One of the main drawbacks of these papers is that they cannot predict human absolute emotions.***

I. INTRODUCTION

Emotions are the most powerful strand of humanity. When we are regulating our minds and bodies, it as- sists us in coping with making resolution, interacting with mortals, and finding our way through entity. We feel fervour to help us pay regard and pivot our attention. The major premise of emotion can be sorted into three main types, such as Physiological , neurological and Cognitive. The reactions within the soma are responsible for emotions and this activity within the brain is used to emotional takes.

II. DIFFERENT ASPECTS OF FACE RECOGNITION

For understanding more about face recognition, we used different papers such as:

A. Emotion Recognition Based on Physiological Signals Using Convolution Neural Networks

This paper it says about how the Human Computer Interaction having more importance in emo- tion recognition. Here they divided emotion into two signals as physiological signal and non-physiological signal. In physiological signals it can be expresses the emotions but in physiological signals cannot express their feelings it should be develop as artificial. So everyone used physiological signals by expressing emotions[1].
Here the different sentiment classification models done by Ekman's , Plutchik , Russel models and they classifies the emotion as:

1) Ekman's Model

Dr Ekman's, comes up with six universal facial ex- pressions of emotions adorn in figure 1. He took emotions such as Happy, Sad, Surprise, Fear, Anger and Disgust. Emotional occur in response to some kind of impulse such as corporeal event, social interaction, remembering or imaging an event talking, thinking or physically reenacting a gone by ardor of experience.



Figure 1: Ekman's Model

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2) Plutchik's Model

Robert Plutchik, scientist comes up with a wheel of emotions , that to adorn figure 2 with 8 basic emotions as Joy, Sad, Fear, Disgust, Surprise, Anticipation, Anger and Trust , he shows visually the esprit of emotions. So in emotions all are thinking in different ways. For example sad and joy are two emotions if i get some- thing special then , concern about it and if i lose something special then also care about it. So we should understand that emotions have two sides which we have think to take positive or negative.

3) Russel's Model

Russel says about multidimensional scaling analysis divulge two bipolar dimensions: Valence and Activation adorn in figure 3. Emotions can be described using an unpleasantness or amity valence and a high arousal or low arousal activation.

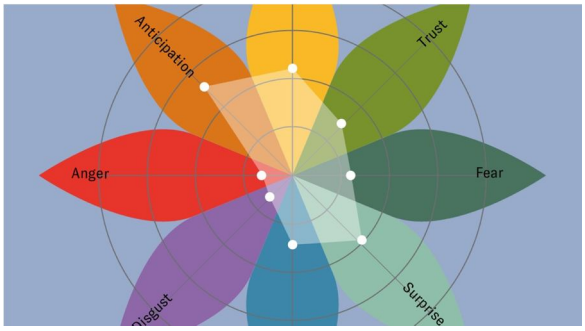


Figure 2: Plutchik Model

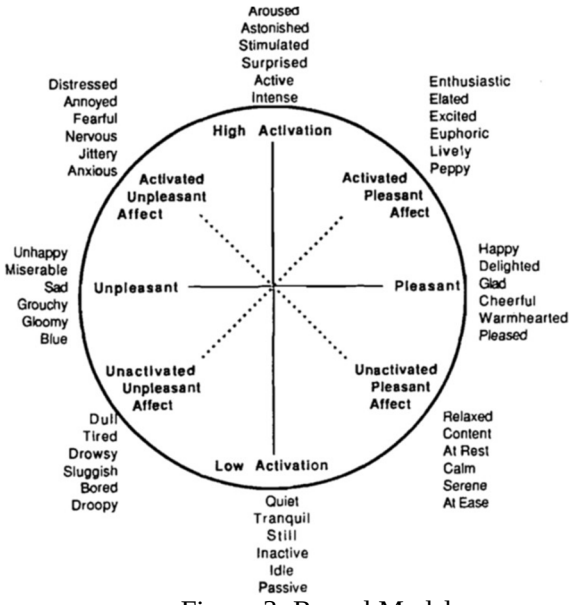


Figure 3: Russel Model

DEAP database which used for audios, videos, EEG and peripheral signals. MAHNOB -HCI data set used for large multi modal database. By using this data sets, the experiments are emotion recognition and latent affective tagging. More than that DREAMER AND SEED is used in it.

B. Using Deep Convolutional Neural Network for Emotion Detection on a Physiological Signals Dataset (AMIGOS)

This paper, says about non identical models to mea- sure Heart rate mutability, BVP, Skin temperature, ECG and Electrodermal pursuit. The peripheral nervous system and central nervous system. In affective states it classified as arousal and valence focuses. Here in this case valence focus on pleasurable/unpleasant aspects and for arousal focus on activation/deactivation of an emotion adorn in figure 4[2].

Here by using DCNN with comparison with ma- chine learning algorithms which can be used as a framework for emotion detection, data set used in AMIGOS.

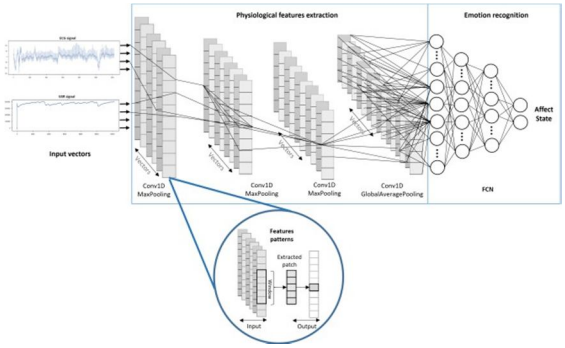


Figure 4: Emotion recognition process based in deep learning

C. Emotion Recognition based on EEG using LSTM Recurrent Neural Network

DL method proposed to recognize emotion from raw EEG signals .LSTM used for EEG features, dense layer into low/high arousal, valence and liking. DEAP data set is used to verify and proposed that introduce high average precision in comparison. By using these methods voice and facial expressions are not depend- able. The two signals which used for physiological changes are Central Nervous System and Peripheral Nervous System [3].

In CNS which consist of brain and spinal cord and in EEG is measure of these electrical changes. Dif- ferent methods are used here Fisher's Linear Discriminant for feature selection , Naive Bayes ,for classification with three different methods binary classification problems which are low/high arousal, L/H valence and L/H liking and Support Vector Ma- chine classify features into L/H arousal and valence classes. This proposed model is adorn in figure 5.

D. Behavioral and Physiological Signals-Based Deep Multimodal Approach for Mobile Emotion Recognition

The development of wearable devices and mobiles are increasing , so for accessing the affective data is more easy than other methods. Here they used two research methods: First it analysis the behavioural signals of face, speech and gestures, second analysis physiological data such as EEG ,ECG,EMG,GSR,HR,CNS,ANS for comparing the emotional classes and intimate links[4].

Here they worked on both physiological and behavioral signals from sensors. The emotion have two different view points such as the discrete and the continuous multi dimensional emotion model this is il- lustrated in figure 6. The design a replicable emotion analysis on mobile devices includes the induction intensity and col- lection of multi modal responses. It have some limitations such as amount of data collected is less and only narrow set of emotions.

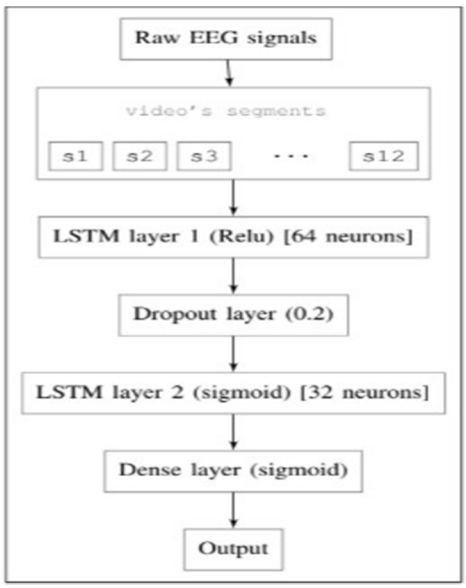


Figure 5: Proposed Model

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E. Emotion Recognition Using Fused Physiological Signals

The artificial intelligence is used for human intelligence, the impacts. The application field use such as medical, defence and retail. Here in some applications which include pain recognition, customer feedback and educational video games illustrated in figure 7[5] The method proposed by which increases effect of high valence signals and decreases effects of short variance signals. BP4D and DEAP are the data sets it used as large scale, multi modal emotion data set. They took 8 physiological signals that include BP, respiration ,heart rate and electrodermal , they took to quarry emotions.

III. COMPARISON OF DIFFERENT SCHEMES FOR EMOTIONS

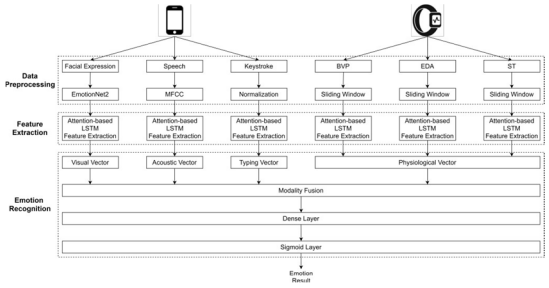


Figure 6: Behavioral Model

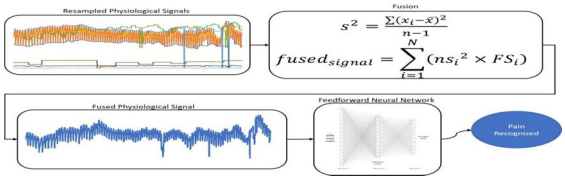


Figure 7: Fusion of 8 physiological pain signals

Works	Problem Statement	Published and Year	Algorithm Used
Ref[1]	CNN is are better than spectral power	ICMLC, 2020	SVM
Ref[2]	Small physiological data sets	IEEE ACCESS,2018	MLA DLA
Ref[3]	Binary classification problems	IJACSA 2017	SFFSA SLA
Ref[4]	Mobile recognition mobile system	IEEE Transactions 2015	LRA fea SVM
Ref[5]	Fusing physiological signals	ACII 2019	SVM NBA RFA

From the comparison it is clear that all methods having capability to handle multiple algorithms. SVM algorithm mainly used in every areas and it give the best result .From this we can understand the areas which emotions are arisen and some of them don't have emotions. In every techniques there will be need of accurate, well-founded features are in this mechanisms.

IV. CONCLUSION

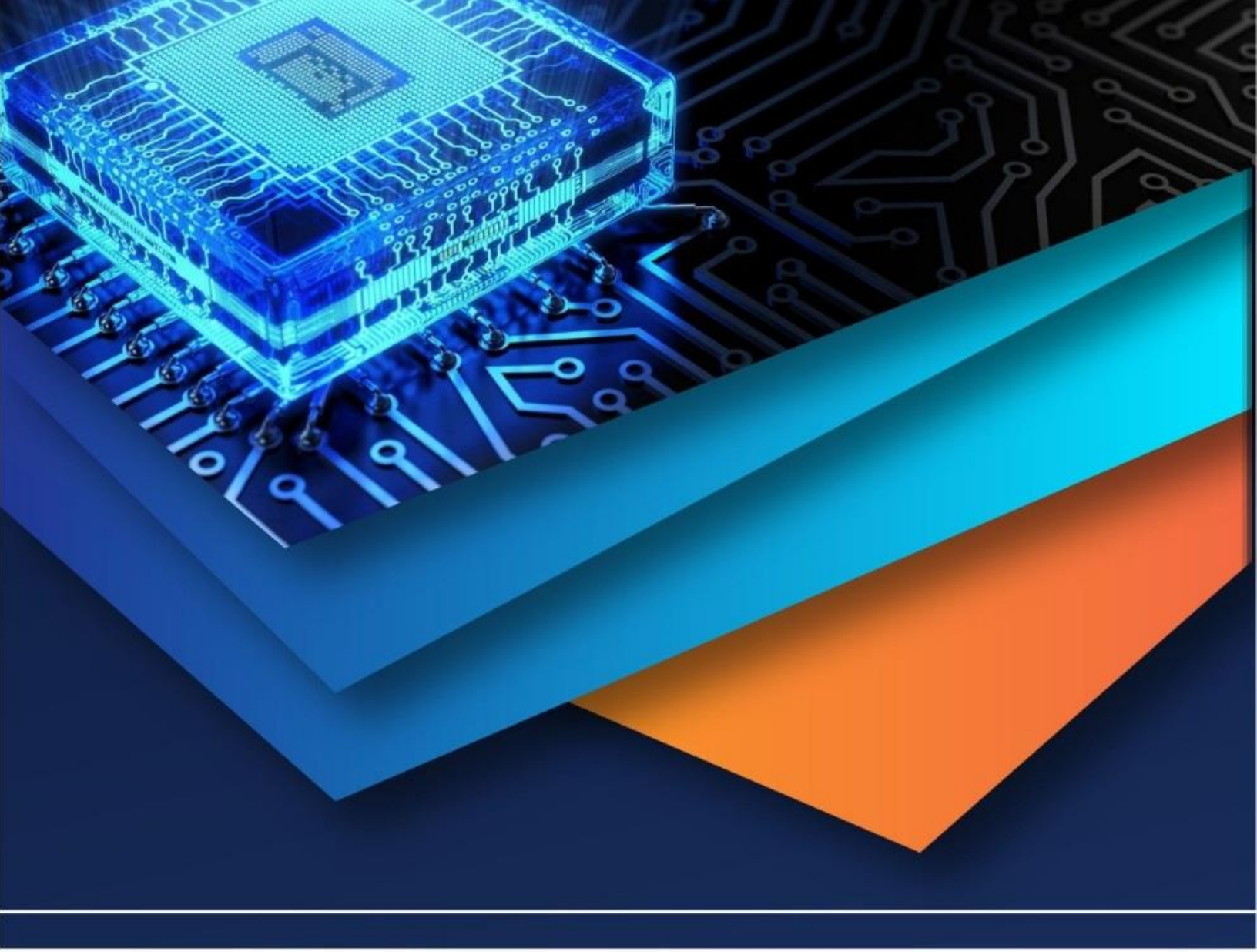
Emotions are classified into two types as primary and secondary emotions. Primary emotions which consist of Sad, Happy, Fear, Disgust etc..., and in Secondary emotions which consist of Envy, Pride, Jealous etc... Here we go through different issues such as gestures, speech ,mental state all are varying. A well founded detector is not equipped for correct emotion detection .Here by using Hybrid particle swarm optimization and Support vector machine algorithm checking for its efficient tool.

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