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"Stress Detection Using Emotions: A Survey"

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Abstract: Stress is an unpleasant emotional state that people experience in situations such as sitting in front of a computer for long periods of time.
Stress can be beneficial, but if it is continuous, it can be harmful to your health. As a result, it is critical to tell the person about his or her harmful lifestyle and even to warn him or her before an acute condition develops. Emotion can be seen in a variety of ways, including facial expressions and movements, voice, and written material. Emotion Detection in Text Documents is a content-based classification issue that incorporates concepts from Natural Language Processing and Machine Learning. The approaches utilized in emotion recognition based on textual data are discussed in this work.
Keywords: Emotion, Stress, Reddit, Detecting, Dataset.

I. INTRODUCTION

The difficulty of recognizing psychological stress, and more broadly, individuals in distress and in need of assistance, is a delicate one; as a result, the capacity to interpret the data in order to understand why is crucial. Psychological stress has risen considerably as global catastrophes, such as the COVID 19[11] epidemic and the ensuing economic collapse, have multiplied. Psychological stress has only recently been studied, but in this paper, we propose a new focus on studying the information our models use to make decisions and finding ways to add psychological elements, such as emotion, into them. Furthermore, models that make decisions about factors that affect stress based on psychology theory will be easier for humans to understand, and their errors will be more obvious.

Even if there were, it would be beneficial to incorporate external information without re-labelling new datasets or each new combination of useful tasks. For example, individuals who are stressed are likely to express emotions such as fear, sadness, or anger and unlikely to express emotions such as happiness.

We'll talk about the background of emotion detection in Section 2. Section 3 discusses the emotion detection procedure, section 4 discusses previously developed stress detection systems, section 5 discusses the issues in several studies, and section 6 lists the references.

II. BACKGROUND

A. *Emotion Detection*

The human experience and social interaction are centred on emotion expression and detection. We can communicate a wide range of subtle and complicated feelings with just a few words, and enabling robots to grasp affect and emotion has thus been a long-term objective. The bulk of extant datasets include annotations for minor variants of Ekman's six core emotion categories (joy, anger, fear, sorrow, disgust, and surprise) and/or affective dimensions (valence and arousal) that underpin the circumplex model of affect (Russell, 2003; Buechel and Hahn, 2017).[1]

By analysing the distribution of emotion reactions to a varied array of stimuli using computational techniques, recent breakthroughs in psychology have provided new conceptual and methodological approaches to capture the more complicated "semantic space" of emotion. We use these methods and findings to create a granular taxonomy for text-based emotion recognition and to investigate the dimensionality of language-based emotion space in this paper.

B. *Emotion Classification Models*

In our experiments, we also use the BERT model, which outperforms our biLSTM model. BERT (Devlinetal., 2019)[12], a transformer-based model with language model pretraining, has recently been shown to achieve state-of-the-art performance on several NLP tasks, including emotion prediction: all of the top-performing models in the EmotionX Challenge (Hsu and Ku, 2018) used a pre-trained BERT model. Automatic emotion classification models have been built using both feature-based and neural models. Handbuilt lexicons, such as the Valence Arousal Dominance Lexicon, are frequently used in feature-based models (Mohammad, 2018).

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SR. NO.	NAME OF AUTHORS	WORKING	DATASETS/MODELS USED	FINAL RESULT
1	Lei Zhang, Shuai Wang, Bing Liu	Applying deep learning to sentiment analysis.	Deep neural networks via Deep Learning	State-of-the-art results for various sentiment analysis tasks
2	Archana Shukla	Presents a tool which tells the quality of document or its usefulness based on annotations.	Collective sentiment of annotators and query knowledge base containing metadata, annotations and sentiments	Sentiment in range of [0.0-1.0]
3	Sumayh S. Aljameel *, Dina A. Alabbad, Norah A. Alzahrani, Shouq M. Alqarni, Fatimah A. Alamoudi, Lana M. Babili, Somiah K. Aljaafary and Fatima M. Alshamrani	To develop a model that predicts an individual's awareness of the precautionary procedures.	Bigram TF-IDF with the SVM classifier KNN and Naïve Bayes	85% 65%
4	Abdullah Alsaeedi, Mohammad Zubair Khan	Opinion investigation of Twitter data.	Stanford (STS), Sanders, OMD, and HCR datasets SemEval-2013 training General Corpus of the TASS	76.99, 81.06, 84.89, and 76.81 % 64.84% 62.98%
5	Xing Fang and Justin Zhan	Sentiment analysis or opinion mining	Naïve Bayesian Model Random Forest Model Support Vector Machine	>80% 77% 70%
6	Elsbeth Turcan and Smaranda Muresan and Kathleen McKeown	Explore the use of multi-task learning as well as emotion-based language model fine-tuning.	RNN BERT MultiAlt GEE MultiAlt Vent	68.86 ± 1.10 79.11 ± 1.32 81.07 ± 1.13 79.67 ± 2.03
7	Nisha Raichur, Nidhi Lonakadi, Priyanka Mural	Monitoring the emotional status of a person who is working in front of a computer for longer durations crucial for the safety of a person	19 collected datasets each of 18 images of individual	Standard deviation range is (2.672023 – 33.11495)
8	Russell Li and Zhandong Liu	Development two deep neural networks: a 1-dimensional (1D) convolutional neural network and a multilayer perceptron neural network.	WESAD, a multimodal dataset for wearable stress and afect detection	The deep convolutional neural network achieved 99.80% and 99.55% accuracy. The accuracy of the deep multilayer perceptron neural network was 99.65% and 98.38 percent, respectively.

Table 1

III. LITERATURE SURVEY OF PAPERS ON STRESS DETECTION SYSTEM

Deep learning has emerged as a powerful machine learning technique that learns multiple layers of representations or features of the data and produces state-of-the-art prediction results

Applying deep learning to sentiment analysis has become a popular research topic lately. With the advances of deep learning research and applications, we believe that there will be more exciting research of deep learning for sentiment analysis in the near future.[2]

Author presents a tool which tells the quality of document or its usefulness based on annotations. Annotation may include comments, notes, observation, highlights, underline, explanation, question or help etc. comments are used for evaluative purpose while others are used for summarization or for expansion also.

They've developed an augmented KMAD tool implemented using java server programming language to infer the collective sentiment of annotators and query knowledge base containing metadata, annotations and sentiments.[3]

This study aims to develop a model that predicts an individual's awareness of the precautionary procedures in five main regions in Saudi Arabia. In this study, a dataset of Arabic COVID-19 related tweets was collected, which fell in the period of the curfew. The dataset was processed, based on several machine learning predictive models: Support Vector Machine (SVM), K nearest neighbors (KNN), and Naïve Bayes (NB), along with the N-gram feature extraction technique.

Three machine learning techniques were chosen for training the model. The results show that bigram TF-IDF with the SVM classifier produced the highest accuracy of 85%, which outperformed KNN and Naïve Bayes. The proposed model was used to predict the awareness of individuals per region; the south region showed the highest level of awareness at 65%, while the middle was the lowest among the regions.[4]

Twitter is an enormously popular microblog on which clients may voice their opinions. Opinion investigation of Twitter data is a field that has been given much attention over the last decade and involves dissecting “tweets” (comments) and the content of these expressions. Machine learning algorithms, such as The Naive Bayes, Maximum Entropy, and SVM, achieved an accuracy of approximately 80% when n-gram and bigram model were utilized. Ensemble and hybrid-based Twitter sentiment analysis algorithms tended to perform better than supervised machine learning techniques, as they were able to achieve a classification accuracy of approximately 85%.[5]

Sentiment analysis or opinion mining is one of the major tasks of NLP (Natural Language Processing). Sentiment analysis has gained much attention in recent years. In this paper, we aim to tackle the problem of sentiment polarity categorization, which is one of the fundamental problems of sentiment analysis. A general process for sentiment polarity categorization is proposed with detailed process descriptions.

Sentiment analysis or opinion mining is a field of study that analyzes people’s sentiments, attitudes, or emotions towards certain entities. Sentiment polarity categorization is a key challenge in sentiment analysis that is addressed in this study. Online product reviews from Amazon.com are selected as data used for this study. A process for categorizing sentiment polarity has been developed, with thorough descriptions of each stage. Experiments on sentence-level categorization as well as review-level categorization were conducted.[6]

We explore the use of multi-task learning as well as emotion-based language model fine-tuning. With our emotion-infused models, we see comparable results to state-of-the-art BERT.

All three types of our models achieve comparable performance to a state-of-the art fine-tuning BERT baseline, and, more importantly, we show that they result in more explainable models. We also introduce a new framework for model interpretation using LIME and show that our emotion-enhanced multi-task models offer a new dimension of interpretability by using the predictions of auxiliary tasks to explain the primary task.[7]

Monitoring the emotional status of a person who is working in front of a computer for longer durations crucial for the safety of a person. In this work real-time non-intrusive videos are captured, which detects the emotional status of a person by analyzing the facial expression. We detect an individual emotion in each video frame and the decision on the stress level is made in sequential hours of the video captured

They developed a monitoring system for detecting emotion stress of a person working continuously in front of computer. To assess the detection performance, we conducted experiments on 19 collected data sets each consisting of 18 images of an individual, hence total of 19x18 images analyzed.[8]

Prior research has shown that analyzing physiological signals is a reliable predictor of stress. Such signals are collected from sensors that are attached to the human body. Researchers have attempted to detect stress by using traditional machine learning methods to analyze physiological signals. Results, ranging between 50 and 90% accuracy, have been mixed. When features are misidentified, accuracy suffers. We built two deep neural networks to overcome this shortcoming: a 1-dimensional (1D) convolutional neural network and a multilayer perceptron neural network.

For binary and 3-class classification, the deep convolutional neural network attained accuracy rates of 99.80 percent and 99.55 percent, respectively. For binary and 3-class classification, the deep multilayer perceptron neural network attained accuracy rates of 99.65% and 98.38 percent, respectively. The networks outperformed previous approaches that evaluated physiological data for binary stress detection and 3-class emotion categorization by a wide margin..[9]

IV. CHALLENGES

From the various papers that we have seen and surveyed; we can come across the various challenges that have been faced by them.

The neural networks must be trained and tested several times in order to obtain correct findings in future studies for a diverse population. This would improve precision. The data set was compiled from 15 human participants, and it is possible that this number does not reflect the entire human population. Individual human experiences may cause this to change.

The analysis of the sources of tension and relaxation reflected in language would be a future task. To address this issue, we will develop a framework that identifies two things: feelings and the causes of emotions.

V. CONCLUSION

Emotion detection is an important area of study in the human-computer interaction. Researchers have done a substantial amount of work to recognize emotion from face and audio data, but recognizing emotions using transfer learning techniques is still a new and hot study topic.

The networks' performance exhibited a significant improvement over past methods that analyzed physiological signals for both binary stress detection and 3-class emotion classification. [10]

So, in the future, we can utilize the above-mentioned validated models to assess people's stress levels and possibly establish a stress-free atmosphere.

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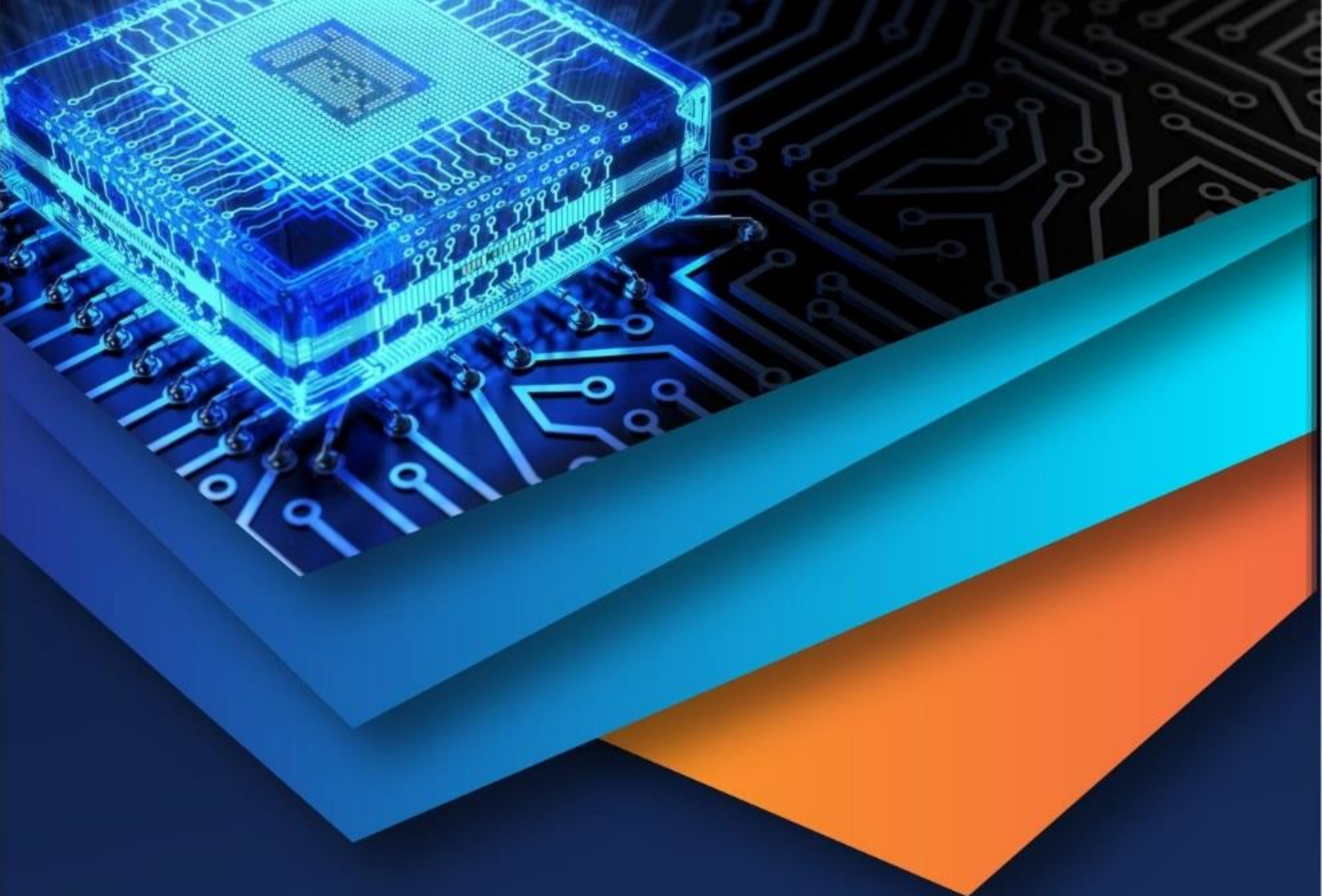

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