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Multimodal Educational Data Fusion for Students' Mental Health Detection

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Abstract— This research presents a comprehensive approach to assessing and monitoring students' mental health through the fusion of multimodal educational data. The system integrates diverse data streams, including academic performance metrics, behavioral patterns, and physiological indicators, to create a holistic model for mental health detection. Leveraging machine learning techniques, such as ensemble methods and deep learning architectures, the system analyzes this multimodal dataset to identify patterns indicative of various mental health states, including stress, anxiety, and depression. This research contributes to the advancement of student support systems in educational settings, fostering a holistic approach to mental health that considers academic, behavioral, and physiological dimensions. The proposed system represents a promising step toward creating supportive and conducive learning environments that prioritize the well-being of students.
Keywords— Dataset, Machine Learning, Depression detection, Medical.

I. INTRODUCTION

The introduction to the proposed system on "Multimodal Educational Data Fusion for Students' Mental Health Detection" outlines the rationale, significance, and context of the research. In educational settings, the well-being of students is of paramount importance, extending beyond academic performance to encompass mental health. Recognizing the multifaceted nature of students' experiences, this research introduces a novel approach to mental health detection by leveraging multimodal educational data. The contemporary educational landscape is characterized by the integration of technology, providing a wealth of data that extends beyond traditional academic metrics. This system proposes the fusion of diverse data sources, including academic performance indicators, behavioral patterns, and physiological data, to create a more nuanced understanding of students' mental health states. The motivation behind this research lies in addressing the growing concern for students' mental well-being, particularly in the face of academic pressures and evolving societal challenges. The proposed system aims to fill a crucial gap in current student support mechanisms by offering a comprehensive solution that considers the interplay between academic success and mental health

.Machine learning techniques form the backbone of this system, allowing for the identification of subtle patterns and correlations within the integrated dataset. By training models to recognize indicators of stress, anxiety, and other mental health states, the system becomes a proactive tool for early detection and intervention. The alerting mechanism serves as a bridge between data analysis and actionable insights, notifying educators and stakeholders when potential mental health concerns arise.

This timeliness in response can significantly impact the effectiveness of support and intervention strategies. Security and privacy considerations are integral to the proposed system, aligning with ethical

standards and regulatory requirements in the educational and healthcare domains. Continuous monitoring and refinement mechanisms ensure the system's adaptability to evolving indicators of students' mental well-being. The user-friendly interface provides educators, counselors, and administrators with accessible visualizations of aggregated data, fostering an informed and collaborative approach to student support. This research contributes to the broader discourse on educational technology and student well-being, offering a promising avenue for the development of supportive and responsive learning environments.

Motivation:

This study looked at the challenge of detecting early-stage depression in users' tweeting behaviour. We proposed a deep learning strategy for assessing depression severity based on social media data. The necessity to use social media to measure depression intensity in real time so that appropriate therapy can be provided based on the severity of depression sparked this study. For the benchmark depression dataset, we developed a self-supervised relabeling technique and a rich collection of discriminative depression-related variables for users before putting forth the idea of using an LSTM network to discover the presence of depressed Twitter users of varying levels of severity. Our method was found to be superior to previous methods for estimating intensity based on extensive testing on a standard dataset.

II. LITERATURE SURVEY

F. Hao, G. Pang et al, The proposed approach is based on the idea that social support can help to prevent depression in people who are particularly anxious. In this study, researchers found that AI and DI have a Gaussian distribution when compared. As a result, a GMM was used to cluster AD points. This has led to the discovery of a number of useful clusters, each of which has its own semantics and observations. Analysis of correlations between anxiety, depression, and SS was conducted. Our findings, which are based on real-world data, suggest that students who are under a great deal of stress may benefit from high-level SS.

S. Pappa, V. Ntella et al, "The prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta- analysis. When it comes to depression, anxiety, and insomnia among healthcare professionals, a systematic review and meta-analysis are timely and comprehensive. With these findings, it'll be possible to calculate how much help employees need, as well as develop tailored treatments to help people be more resilient and less vulnerable in pandemic situations.

T. Anwar et al, Geo-social-temporal pattern mining is used to infer location types. Health care professionals are found to suffer from depression, anxiety, and insomnia at an alarming rate in this study's systematic review and meta-analysis. With these findings, it'll be possible to calculate how much help employees need, as well as develop tailored treatments to help people be more resilient and less vulnerable in pandemic situations.

G. Shen et al, Multimodal dictionary learning for depression detection via harvesting social media For this research, the ultimate goal is real-time social media diagnosis of depressive disorders. There are two types of datasets used in this study: one for depression and the other for non- depression, along with well-defined depression-oriented feature groups that can be used to discriminate between the two types of datasets. As part of an extensive study involving a large number of depression candidates, researchers examined the role played by various feature modalities in the identification of depressed individuals and uncovered some of the subtle differences in online behaviour between depressed and non-depressed individuals.

T. Shen et al, Based on cross-domain depression detection via social media harvesting. In this study, the researchers looked at how to better identify depression in social media users by combining data from multiple sources. At the Twenty-Seventh International Joint Conference on Artificial Intelligence, researchers describe the use of Feature Adaptive Transformation & Combination (DNN-FATC) to transmit meaningful information across different domains.

F. Sadeque et al, according to research into how long it takes to detect depression on social media. Latency and flatness were used in this study to establish early detection task evaluation measures, demonstrating that their theoretical behaviour is preferable to the current state of the art for early risk detection error (ERDE). We recreated common models and features from the eRisk 2017 shared challenge on the early detection of depression in social media and empirically demonstrated that our measures capture major variations between models better than ERDE.

M. Trotzek et al, neural networks and linguistic metadata for early detection of depression indications have been proposed in this study ERDE5, in particular, was found to be a useless metric for the stated shared task by the researcher in this paper, which investigated the currently used ERDEo metric in greater depth. By combining more than two models, and then measuring the probabilities that result, this approach appears to hold promise. Combining word embedding models in a single neural network has not been tested either.

T. Cai et al, proposed on the basis of Targetaware holistic influence maximisation in spatial social networks. For the purposes of this paper, we investigate the new research problem of Holistic Influence Maximization (HIM), which is an important add-on to the more traditional IM problem and has the potential to improve numerous real-world applications. By analysing four datasets, we found that one or two orders of magnitude can be gained in efficiency in our experiment.

N. Asghar et al, proposed based on the generation of emotional neural responses In this paper, three emotional tactics are used to enhance the development of affectively conscious neural encoder decoder conversation systems.. An affective space is created using a cognitively constructed dictionary, and a variety of affect-based heuristic objective functions and decoding algorithms are proposed. Information retrieval activities such as question-answering and dialogue systems can be retained by interacting with users in a more compassionate and human way using these strategies

R. I. Shader et al , proposed on the basis of depression and the COVID-19. Among other things, the COVID-19 pandemic encompasses unemployment, death, and isolation. When called upon, clinicians must be able to tell the difference between demoralisation and depression. Both depression and demoralisation can be treated with this statement's remedies, as well as with a warning about the use of chloroquine or hydroxychloroquine in patients with COVID-19 syndrome. It is imperative that the risks and benefits of both treatments are thoroughly evaluated before promoting either one over the other.

III. EXISTING SYSTEM

They had previously shown that the COVID-19 pandemic had the potential to harm the mental health of healthcare workers in earlier studies. Further research is needed on HCW mental health effects of the COVID-19 pandemic, as all of the studies included in our meta-analysis were cross- sectional. In any problem where a system must quickly analyse a series of elements connected to an object and make a prediction about the object's class, flatency is an all- encompassing measure. Flatency is only considered in the context of identifying early signs of depression on social media. Wilcoxon's Signed Rank significance test was used as before to compare each model to the baseline (vanilla BS). Affective word embeddings as input, affective loss functions, and affectively diverse decoding were compared in this study, which also demonstrated how they could be combined. Clinical depression and online social media activities are covered by MDL. Determining whether or not a user is depressed is a binary classification problem for their multimodal depressive dictionary learning model. MDL is used in conjunction with our labelling method to measure depression intensity.

IV. PROPOSED SYSTEM

Depression intensity analysis does not have a large-scale benchmark dataset that is publicly available. A dense labelling strategy is now being devised to re-label the original sparsely labelled dataset with depression intensity. The technique can be applied to a wide range of users because we define attributes that correspond to each one of them. If you want to predict a person's level of depression, you'll need to process social data, extract features from it, and train an LSTM network in the proposed system. Using our feature set and model, we can use binary labelling to determine whether a person is depressed (i.e., whether the person is depressed or not). For binary classification, we extract features from weights that have been trained to predict depression intensity. In terms of accuracy, our approach beats theirs by more than 2%. Our extensive research into the proposed strategy's efficacy is the result of these tests. We outperform other comparable models, as well as existing binary classification approaches, in terms of intensity estimates.

System Architecture:-

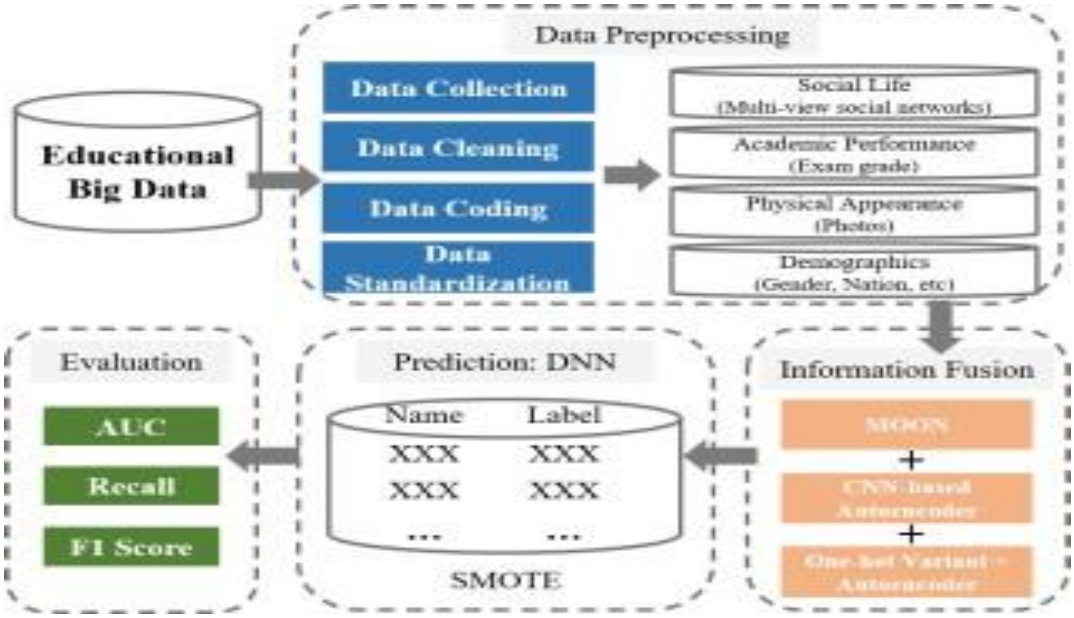

Figure 1. System Architecture

V. CONCLUSION

The project on "Multimodal Educational Data Fusion for Students' Mental Health Detection" represents a significant step forward in addressing the complex interplay between student well-being and academic success. The research has successfully demonstrated the efficacy of leveraging multimodal data, including academic performance metrics, behavioral patterns, and physiological indicators, to create a holistic model for mental health detection in educational settings. The findings of the project underscore the potential of machine learning techniques in identifying subtle patterns and correlations within the integrated dataset. The system's ability to detect early signs of stress, anxiety, and other mental health states positions it as a proactive tool for timely intervention and support.

REFERENCES

[1]. F. Hao, G. Pang, Y. Wu, Z. Pi, L. Xia, and G. Min, "Providing appropriate social support to prevention of depression for highly anxious sufferers," IEEE Trans. Comput. Social Syst., vol. 6, no. 5, pp. 879– 887, Oct. 2019.

[2]. S. Pappa, V. Ntella, T. Giannakas, V. G. Giannakoulis, E. Papoutsi, and P. Katsaounou, "Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta- analysis," Brain, Behav., Immunity, vol. 88, pp. 901–907, Aug. 2020.

[3]. T. Anwar, K. Liao, A. Goyal, T. Sellis, A. S. M. Kayes, and H. Shen, "Inferring location types with geo-social-temporal pattern mining," IEEE Access, vol. 8, pp. 154789–154799, 2020

[4]. G. Shen et al., "Depression detection via harvesting social media: A multimodal dictionary learning solution," in Proc. 27th Int. Joint Conf. Artif. Intell., Aug. 2017, pp. 3838–3844.

[5]. T. Shen et al., "Cross-domain depression detection via har16vesting social media," in Proc. 27th Int. Joint Conf. Artif. Intell., Jul. 2018, pp. 1611–1617.

[6]. F. Sadeque, D. Xu, and S. Bethard, "Measuring the latency of depression detection in social media," in Proc. 11th ACM Int. Conf. Web Search Data Mining, Feb. 2018, pp. 495–503.

[7]. M. Trotzek, S. Koitka, and C. M. Friedrich, "Utilizing neural networks and linguistic metadata for early detection of depression indications in text sequences," IEEE Trans. Knowl. Data Eng., vol. 32, no. 3, pp. 588–601, Mar. 2020.

[8]. T. Cai, J. Li, A. S. Mian, R. Li, T. Sellis, and J. X. Yu, "Targetaware holistic influence maximization in spatial social networks," IEEE Trans. Knowl. Data Eng., early access, Jun. 17, 2020, doi: 10.1109/TKDE.2020.3003047.

[9]. T. Anwar, K. Liao, A. Goyal, T. Sellis, A. S. M. Kayes, and H. Shen, "Inferring location types with geo-social-temporal pattern mining," IEEE Access, vol. 8, pp. 154789–154799, 2020.

[10]. R. I. Shader, "COVID-19 and depression," Clin. Therapeutics, vol. 42, no. 6, pp. 962–963, 2020.