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STUDENT NAME: **PRITI RAI JAIN**

SUPERVISOR NAME: **PROF S.M.K. QUADRI**

TOPIC: **Artificial Intelligence based Framework for Effective Assessment and Detection of Mental Disorders**

DEPARTMENT: **Department of Computer Science, Faculty of Natural Sciences**

FINDINGS

This study addresses the critical and rising challenge of mental health related issues in the digital era, with particular focus on the increasing emotional stress experienced in contemporary society and severe shortage of mental health professionals in the world in general and India in particular.

Recognizing the psychological impact of the COVID-19 pandemic, especially in academic environments, two nationwide online surveys were conducted in 2020 and 2021 to evaluate the emotional well-being of students and teachers engaged in online learning. The anonymized survey data were published in the public domain via the Mendeley Data Repository under the titles "Covid-19 Go Away 2020" and "Covid-19 Go Away 2021." Subsequent analysis using statistical and machine learning techniques demonstrated that online education played a stabilizing role in preserving emotional connection and mitigating mental health deterioration during the pandemic but at the same time the students and teachers both were of the opinion that online classes can supplement learning but they cannot in any way be a substitute for the face-to-face student-teacher interaction of a traditional physical classroom.

To address the problem of limited access to professional mental health assessment and the scarcity of annotated training data, the study proposes two novel deep learning models for facial emotion recognition, aimed at supporting early detection of mental health issues. The first model, EM-UDA (Emotion Recognition using Unsupervised Domain Adaptation), is based on



a convolutional neural network (CNN) architecture that leverages domain adaptation to classify facial expressions as either positive or negative. Three experimental frameworks were developed to evaluate the model: Framework-1 (a supervised deep CNN, used as a benchmark), Framework-2 (the proposed EM-UDA model using unsupervised domain adaptation), and Framework-3 (a baseline transfer learning approach). The EM-UDA model achieved superior performance compared to other unsupervised methods and basic transfer learning, indicating its effectiveness in scenarios with limited labelled data and significant domain variation.

The second contribution is the PM-ViT model, which utilizes a pre-trained visual transformer backbone to classify facial emotions into positive and negative categories and further stratify negative emotions into mild, moderate, or severe classes. This hierarchical classification provides additional insight into the emotional intensity and potential psychological risk of individuals. Experimental results confirm that PM-ViT outperforms existing state-of-the-art models in terms of classification accuracy, even with minimal labelled training data, by capitalizing on the strengths of fine-tuned transformer architectures.

By integrating advanced deep learning techniques with publicly accessible emotion data, this research contributes to the development of scalable, cost-effective, and privacy-aware tools for preliminary mental health screening. These models are intended not as diagnostic systems but as supportive instruments to aid early detection, particularly in settings where access to clinical professionals is limited. The study also highlights the translational potential of facial emotion recognition in mental health monitoring systems, which could be extended to detect early indicators of stress, anxiety, fear, and emotional distress in real-time. The findings and methodologies presented in this work offer valuable insights for both academic research and practical implementation in digital mental health solutions.

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