

Stress Classification using Deep Learning with 1D Convolutional Neural Networks

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ABSTRACT

Stress has been a major problem impacting people in various ways, and it gets serious every day. Identifying whether someone is suffering from stress is crucial before it becomes a severe illness. Artificial Intelligence (AI) interprets external data, learns from such data, and uses the learning to achieve specific goals and tasks. Deep Learning (DL) has created an impact in the field of Artificial Intelligence as it can perform tasks with high accuracy. Therefore, the primary purpose of this paper is to evaluate the performance of 1D Convolutional Neural Networks (1D CNNs) for stress classification. A Psychophysiological stress (PS) dataset is utilized in this paper. The PS dataset consists of twelve features obtained from the expert. The 1D CNNs are trained and tested using 10-fold cross-validation using the PS dataset. The algorithm performance is evaluated based on accuracy and loss matrices. The 1D CNNs outputs 99.7% in stress classification, which outperforms the Backpropagation (BP), only 65.57% in stress classification. Therefore, the findings yield a promising outcome that the 1D CNNs effectively classify stress compared to BP. Further explanation is provided in this paper to prove the efficiency of 1D CNN for the classification of stress.

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I. Introduction

The new COVID-19 has contributed to psychological disorders among people, leading to a higher risk of suicide. Stress endurance varies between individuals; some people can handle it, and others cannot [1]. Some research has been conducted to analyze COVID19 impact on an individual's stress [2][3][4][5][6]. In the new era, stress has been extended related to finances, work, and relationships; it is now a familiar feeling people face each day in their lives. People facing stress are increasing at a fast rate. WillisTowersWatson [7] reported that "75% of the U.S. employers ranked stress as their top health and productivity concern, but employers and employees disagreed on its causes". These findings are based on responses from 487 U.S. employers in Willis Towers Watson's 2015/2016 Global Staying@Work Survey and more than 5000 U.S. employees in Willis Towers Watson's 2015/2016 Global Benefits Attitudes Survey. American Psychological Association [8] reported that the percentage of Americans who experienced at least one symptom of stress over the past month rose from 71 percent in August 2016 to 80 percent in January 2017.

According to Cacioppo, Tassinary, and Berntson [9], chronic psychological stress carries many pathophysiological risks, such as cerebrovascular disease, cardiovascular disease, immune deficiencies, and diabetes. Francis [10] said that young adults spend more than six hours a day "stressed out." It is essential to classify whether someone is stressed before becoming a serious illness [11]. This problem called for a solution where stress can be recognized before it worsens.

Machine Learning is a branch of artificial intelligence that focuses on machines' ability to learn from experience [12]. A computer with the ability has rules put into it to allow it to resolve problems

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