**Pain Recognition With Physiological Signals Using Multi-Level Context Information**

**ABSTRACT:**

Automatic pain recognition is essential in healthcare. In previous studies, automatic pain recognition methods preferentially apply the features extracted from physiological signals for conventional models. These methods provide good performance but mainly rely on medical expertise for feature extraction of physiological signals. This paper presents a deep learning approach based on physiological signals that have the role of both feature extraction and classification, regardless of medical expertise. We propose multi-level context information for each physiological signal discriminating between pain and painlessness. Our experimental results prove that multi-level context information performs more significantly than uni-level context information based on Part A of the BioVid Heat Pain database and the Emopain 2021 dataset. For Part A of the BioVid Heat Pain database, our experimental results for pain recognition tasks include Pain 0 and Pain 1, Pain 0 and Pain 2, Pain 0 and Pain 3, and Pain 0 and Pain 4. In the classification task between Pain 0 and Pain 4, the results achieve an average accuracy of 84.8 B1 13.3% for 87 subjects and 87.8 B1 11.4% for 67 subjects in a Leave-One-Subject-Out cross-validation evaluation. The proposed method adopts the ability of deep learning to outperform conventional methods on physiological signals.

**Existing System:**

For machine learning, there are many effective methods used in pain recognition. In  the authors explore both video and physiological data, they manually propose features extracted from each signal channel (EMG, ECG, EDA) for pain perception, and their results indicate the Random Forest (RF) model  is effective for automatic pain recognition. Similarly, the authors in perform a broad spectrum of different feature extraction algorithms to extract robust information from EMG, ECG and EDA signals for the RF classifier. In  the authors perform complex signal preprocessing for BVP, ECG and EDA. They then extract statistical features for each of the signal channel. Feature selection and principal component analysis are performed to select high-quality features from the statistical features.

**Disadvantages**

1. Less Secure
2. Low **Detection and Monitoring**

**Proposed System:**

In propose paper author employing multilevel deep learning algorithms for pain recognition as all existing uni-level traditional machine learning algorithms are not good at recognition. Multilevel algorithm giving good accuracy compare to uni-level algorithms like SVM, Random Forest, Linear Regression etc. In propose work author optimizing, selecting features and performing classification using multilevel algorithms like CNN + BI-LSTM (bi-directional LSTM).

**Advantages**

1. More Secure
2. High **Detection and Monitoring**

**SYSTEM REQUIREMENT:**

**HARDWARE REQUIREMENTS:**

# Processor - I3(min)

* Speed - 1.1 GHz
* RAM - 4GB(min)
* Hard Disk - 500GB

**SOFTWARE REQUIREMENTS:**

* Operating System - Windows 10/above
* Programming Language - Python 3.7 with Jupyter Notebook