The Database of Emotion Analysis using Physiological signals (DEAP) was used to evaluate the proposed stress recognition algorithm. In a controlled laboratory setting, EEG signals were collected using a wired-EEG appliance at a sampling rate of 512 Hz using 32 AgCl electrodes. (international 10/20 system positions). There were a total number of 32 participants and they had to rate 40 music videos in terms of the levels of arousal, valence, like/dislike, dominance and familiarity.(Koelstra, Muhl et al. 2012) Similar to another study, the ratings were used in this paper to label the signals into two levels of stress, high stress and low stress. High stress was when subjects rated positive (high) arousal level and negative (low) valence level while low stress was positive (high) arousal level and positive (high) valence level. These are adapted from a two-dimensional emotion model as discussed earlier. (Jebelli, Khalili et al. 2018) The participants had rated on a continuous 9-point scale after each trial. Thus, ratings between 0 and 4.5 were labelled as ‘low’ while ratings above 4.5 to 9 were labelled as ‘high’.

Data Preprocessing The data used from the dataset was already preprocessed at the source. It was down-sampled to 128Hz, a bandpass filter of frequency from 4-4.5Hz was applied and the EOG artefacts (i.e., eye movement) were removed.

Feature Extraction The raw data of channels AF3, AF4, F3 and F4 out of the 32 channels available were extracted. Figure 3: Extracting data from AF3, AF4, F3 and F4 For the frequency domain features, the alpha and beta power features were extracted with a window size of 1 second (128Hz) from the selected channels.(Jebelli, Khalili et al. 2018) 1. Alpha mean power: The power of the EEG signal in the range of the frequency domain 8-13Hz. It can be calculated as follows: α = power (EEG, f ∈ [8 Hz, 13 Hz]) 2. Beta mean power: The power of the EEG signal in the range of the frequency domain 13-30Hz. It can be calculated as follows: β = power (EEG, f ∈ [13 Hz, 30 Hz]) Figure 4: Extracting alpha and beta power features (a) 22 Figure 5: Extracting alpha and beta power features (b) Other than frequency domain features, Frontal EEG Asymmetry (FEA) features were also considered. This is because one’s mental status can be inferred from FEA and it is one of the significant neuroanatomical features.(Jebelli, Khalili et al. 2018) It measures the difference in power of the EEG signal between the two electrodes located at the front of the brain on each side.(Allen and Reznik 2015) Arousal and emotional valence are significant parameters that are known to be strongly related with one’s emotional states.(Bradley and Lang 1994) They are calculated respectively in the following equations: 𝑨𝒓𝒐𝒖𝒔𝒂𝒍 = 𝜶(𝑨𝑭𝟑 + 𝑨𝑭𝟒 + 𝑭𝟑 + 𝑭𝟒) 𝜷(𝑨𝑭𝟑 + 𝑨𝑭𝟒 + 𝑭𝟑 + 𝑭𝟒) 𝑽𝒂𝒍𝒆𝒏𝒄𝒆 = 𝜶(𝑭𝟒) 𝜷(𝑭𝟒) − 𝜶(𝑭𝟑) 𝜷(𝑭𝟑) Where α(i) and β(i) represent the mean power of the alpha and beta frequency band respectively from the i-th channel of the EEG signal