PAPER : DEAP: A Database for Emotion Analysis using Physiological Signals

Url : <https://www.eecs.qmul.ac.uk/mmv/datasets/deap/doc/tac_special_issue_2011.pdf>

Summary :

* Use Russell’s valence-arousal scale, Arousal can range from inactive (e.g. uninterested, bored) to active (e.g. alert, excited), whereas valence ranges from unpleasant (e.g. sad, stressed) to pleasant (e.g. happy, elated). Dominance ranges from a helpless and weak feeling (without control) to an empowered feeling (in control of everything). For self-assessment along these scales, we use the well known self-assessment manikins (SAM)
* it is the only database that uses music videos as emotional stimuli. For each video, a one-minute highlight was selected automatically
* 32 participants took part in the experiment and their EEG and peripheral physiological signals were recorded as they watched the 40 selected music videos. Participants rated each video in terms of arousal, valence, like/dislike, dominance and familiarity. For 22 participants, frontal face video was also recorded

EXPERIMENT SETUP

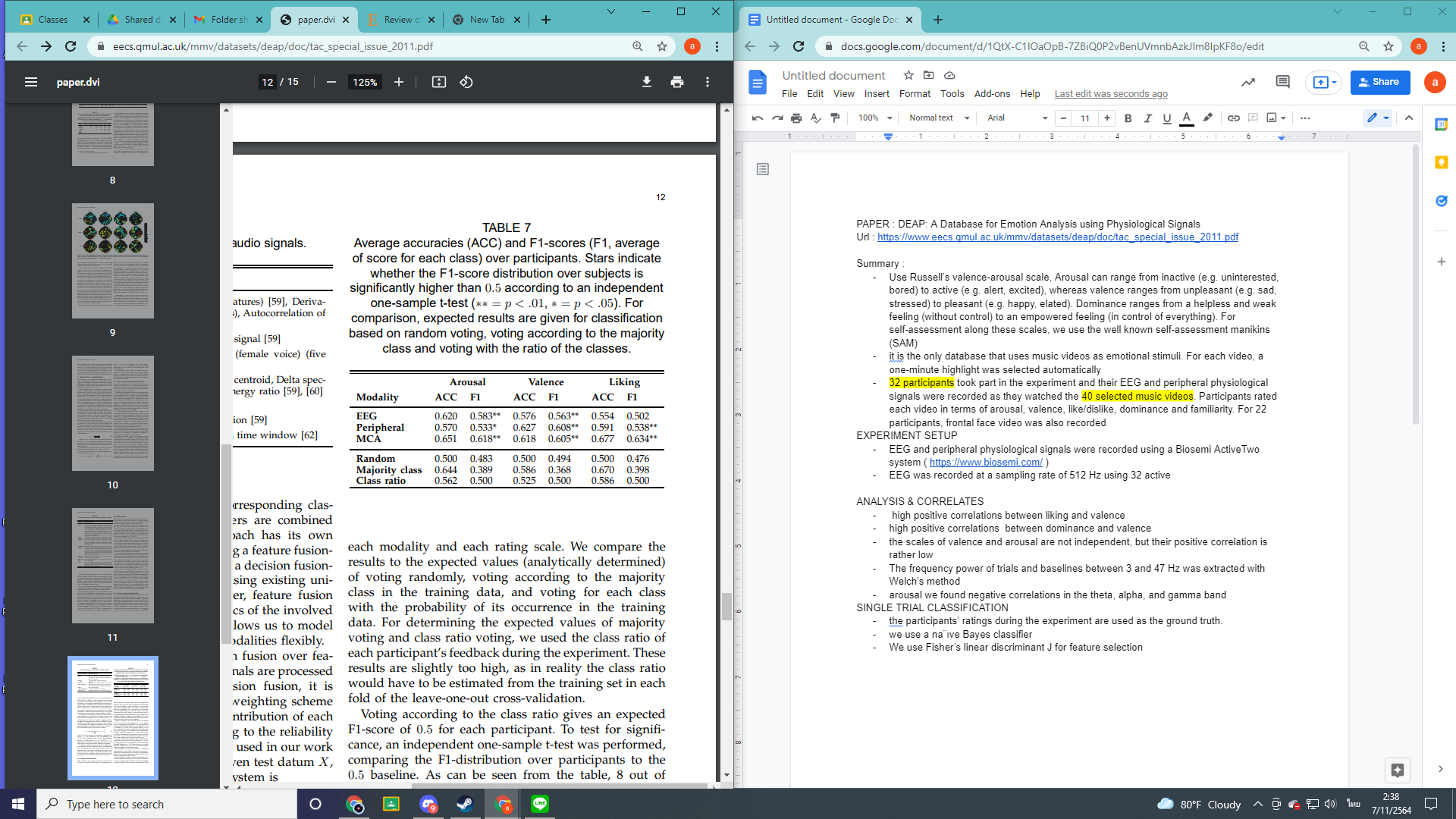
* EEG and peripheral physiological signals were recorded using a Biosemi ActiveTwo system ( <https://www.biosemi.com/> )
* EEG was recorded at a sampling rate of 512 Hz using 32 active

ANALYSIS & CORRELATES

* high positive correlations between liking and valence
* high positive correlations between dominance and valence
* the scales of valence and arousal are not independent, but their positive correlation is rather low
* The frequency power of trials and baselines between 3 and 47 Hz was extracted with Welch’s method
* arousal we found negative correlations in the theta, alpha, and gamma band

SINGLE TRIAL CLASSIFICATION

* the participants’ ratings during the experiment are used as the ground truth.
* we use a na¨ıve Bayes classifier
* We use Fisher’s linear discriminant J for feature selection



Paper : Review of the emotional feature extraction and classification using EEG signals

Url : <https://reader.elsevier.com/reader/sd/pii/S2667241321000033?token=BEC809AAF6D8967DF1F871898C4DB7728542CA96180E20154099C0C2C1413BCB193C45F6F8CA9F87BCAF3E9E29264FFE&originRegion=eu-west-1&originCreation=20211106183238>

Summary :

* This paper is about the difference of accuracy with different model/feature extraction.
* This paper do on many dataset (SEED, DEAP , IAPS , IADS, HCI )
* 5 type eeg frequency band delta (0.5–4 Hz), theta (4–8 Hz), alpha (8–13 Hz), beta (13–30 Hz), and gamma ( > 30 Hz)

Features extraction and analyses

* feature extraction will directly affect the accuracy of the emotion classification
* Traditional EEG feature extraction such as extracting the power spectrum of a specific frequency band and the energy ratio of the different frequency bands.
* Traditional EEG feature extraction requires EEG analysts to have rich experience and knowledge, the extracted feature level is low, the generalization ability is poor, and the classification accuracy cannot be improved.
* New EEG signal feature extraction methods.   
  Short-Time Fourier Transform (STFT), Power Spectral Density (PSD),   
  statistical, Wavelet Transform (WT), Differential Entropy (DE),   
  sample entropy (SE), wavelet entropy (WE),   
  and empirical mode decomposition (EMD)
* EEG feature analysis methods for emotion recognition from four perspectives:   
  1. time domain analyses - less information loss , need to have rich experience and knowledge

2. frequency domain analyses - features such as logarithm energy spectrum, (PSD), (DE), (HOS), and (HOC) are extracted for analysis

3. time-frequency domain analyses - will not lose the original signal’s time-domain information, it can be guaranteed during the analyses process higher resolution ,

(STFT), (WT),(WPT),(HHT) are extracted for analysis

4. non-linear feature analyses

EEG emotion classification

* The classification effect of the traditional machine learning algorithms is generally not as good as the deep learning algorithms. As you can see on Table2 page 35