Cover Letter

Respected Sir/Mam, I am "SOUMEN DAS" is very much interested to joinyour Institution through the vacant position. Sir I have 4 years of research experience along with 4 years of teaching experience and also having UGC-NET Score(52% ,Dec,2012) mentioned inside my CV. Now my request to you sir please have look into my profile if found suitable then please give me a chance to face the interview.

Sir, currently I am dealing with **"Non-Invasive Cognitive Stress estimation"** using Physiological property like GSR, ECG, EEG, Respiration Rate etc.

Many cognitive tools (NASA-TLX ,CLIMATE ,SWAT) are available but they are based on self-reported questionnaire systems(response-bias).Still there is a need for fully automated task independent psycho physiological cognitive stress validator .Physiological bio-feedback measurement (GSR , EEG ,EMG ,PPG etc) over psychological task based experiment plays a vital role in cognitive load estimation."Cognitive Stress" is a construct measure (exists in the human brain that is not directly observable like stress, anxiety, fear, sadness etc). To capture these kinds of physiological features we need biofeedback devices (GSR, EMG, ECG, EEG, PPG etc). Although Invasive measure always gives better accuracy over non-invasive, for research purposes we will adopt non-invasive (GSR & EEG devices) measurement. GSR is an indirect method which captures the amount of sweat secretion (in terms of resistivity) of the skin(kilo ohm) whereas EEG is a direct method to capture the five signals (alpha ,beta ,theta ,gamma, delta) though scalp using standard 10-20 rule of electrodes attachment. During the experiment many bias/artifacts came under consideration like sweat bias, anxiety bias, non-event specific stimulus that are related to GSR whereas eye blinking, electrode displacement related to EEG. The measurement can take place in two different ways: "subjective measure"(Questionnaire system ,likert scale) and "task based psychological measure" to capture the amount of working memory used to deal with the task (intrinsic cognitive load).For subjective measure we consider different templates although sometimes which is not so accurate due to the user's wrong response (response-bias). For any questionnaire system reliability (necessary) and validity (sufficient) measures are very important otherwise usability acceptance reduces drastically. State-Trait anxiety questionnaire, Beck Anxiety Inventory questionnaire are very essential to handle these biases. Now the question is how to prove the reliability and validity of these protocols. Cronbach's alpha and convergent validity measures are the mechanism those handles reliability and validity issues respectively .GSR is still not sufficient to annotate the class label based on CL thresholding, because due to individual skin variability sweat secretion rate differs and also influenced by different psychological tasks which demand different degrees of working memory resources to handle the intrinsic element interactivity, hence go for multi-modal approach.

Procedure:

1. Real Time Data Collection. (Features: Time Stamp, GSR resistivity value, Stress Position)
2. Perform Pre-processing to remove data-bias.
3. Convert resistivity to conductivity (kilo ohm to micro Siemens).
4. Perform Statistical Analysis to compute (mean, median, mode, SD, skewness, kurtosis, z-score, T-score, baseline deviation, tonic & phasic value etc).
5. Threshold Finding for (No load /Load) for cognitive stress.
6. Remove artefacts' (Anxiety Bias, Sweat Bias) and establish reliability and validity.
7. Find out Normalized scores for some essential features and also correlation.
8. Induced Rank System for the Normalized values.
9. Re-rank the event-related skin conductance responses.
10. Use ML/ ANN for training, classification and validation.

Soumen Das