

## A Linear Regression Model for Estimating Anxiety Index Using Wide Area Frontal Lobe Brain Blood Volume

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**Abstract :** Major depressive disorder (MDD) is one of the most common mental illnesses today. It is believed to be caused by a combination of several factors, including stress. Stress can be quantitatively evaluated using the State-Trait Anxiety Inventory (STAI), one of the best indices to evaluate anxiety. Although STAI scores are widely used in applications ranging from clinical diagnosis to basic research, the scores are calculated based on a self-reported questionnaire. An objective evaluation is required because the subject may intentionally change his/her answers if multiple tests are carried out. In this article, we present a modified index called the “multi-channel Laterality Index at Rest (mc-LIR)” by recording the brain activity from a wider area of the frontal lobe using multi-channel functional near-infrared spectroscopy (fNIRS). The presented index aims to measure multiple positions near the F<sub>pz</sub> defined by the international 10-20 system positioning. Using 24 subjects, the dependencies on the number of measuring points used to calculate the mc-LIR and its correlation coefficients with the STAI scores are reported. Furthermore, a simple linear regression was performed to estimate the STAI scores from mc-LIR. The cross-validation error is also reported. The experimental results show that using multiple positions near the F<sub>pz</sub> will improve the correlation coefficients and estimation than those using only two positions.

**Keywords :** frontal lobe, functional near-infrared spectroscopy, state-trait anxiety inventory score, stress

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