宏智生醫科技股份有限公司
HippoScreen Neurotech Corp

Stress EEG Assessment System

Product Brochure

It's all about your brain.

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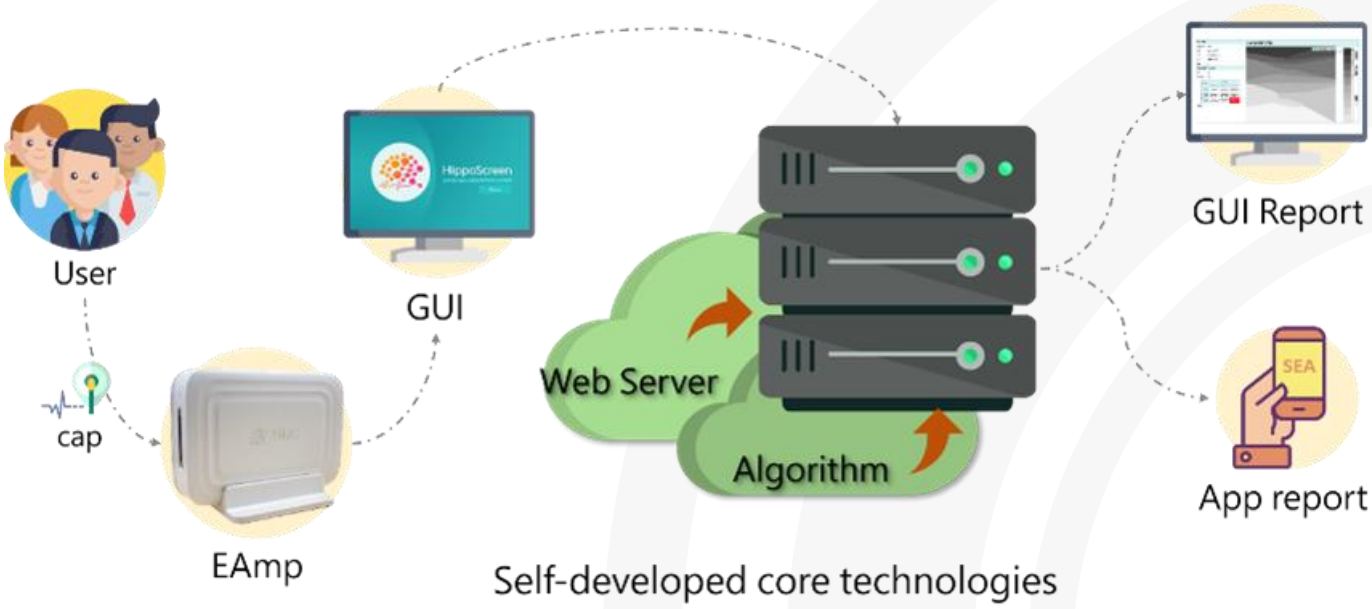
Introduction

According to World Health Organization (WHO), approximately 280 million people in the world have depression. Depression is a leading cause of disability, a significant contributor to the global burden of disease, and leading to suicide in the worst cases. Mental health has become an urgent and important issue in modern society, and how to provide an objective and quantifiable assessment method is also a major challenge that needs to be overcome.

System Design Purpose

The Stress EEG Assessment (SEA) system developed by HippoScreen Neurotech Corp. (HNC) includes an EEG amplifier for data collection and signal processing, a GUI for test process control, and an AI algorithm for data analysis. It records 90-second brainwave signals to analyze with AI algorithm, and then provides objective and quantifiable stress evaluation index and intuitive data distribution maps in the assessment report. SEA system is a powerful AI helper for professional medical personnel in mental health screening and clinical practice.

System Architecture



The EEG amplifier (EAmp) suppresses noise and amplifies the subject's brainwave signal, performs analog-to-digital conversion, and then transmits it to the computer. The GUI provides user-friendly operation for the detection process, while data analysis is done through AI algorithms deployed on the cloud. The assessment report generated after the analysis is completed is not only returned to GUI, but also stored in the cloud database. The professional medical personnel can login to the report website to access the assessment result.

Detection Process

01 Wear EEG Cap

02 Fill in basic information and PHQ-9 questionnaire

03 Inject gel into electrode

04 Gaze at the display for 90 seconds

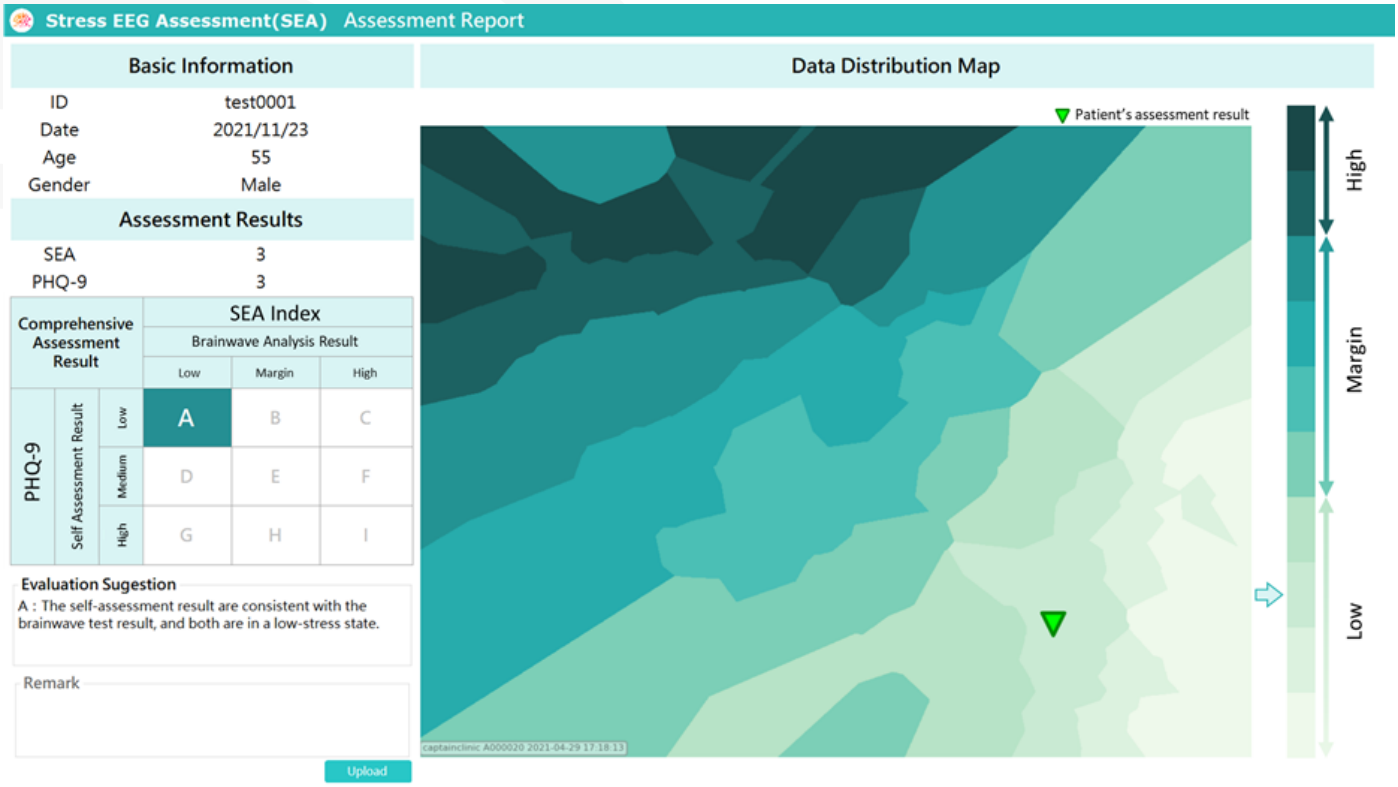
The detection process is quite simple and it only takes about 15-20 minutes, including the setup of the detection and the generation of the assessment report.

First of all, the operator will help the subject to wear the EEG cap, and guide the subject to fill in basic information and PHQ-9 questionnaire to make a simple self-assessment. Then the operator will inject the conductive gel to reduce the impedance and ensure the received EEG signal quality. After the setup is completed, the subject just sits relaxed and gazes at the display for 90 seconds. The 90-second EEG data is analyzed to generate assessment report in the cloud.

Actual Scene

Because brainwave detection is sensitive to interference, it needs to be done in a separate room. When capturing 90-second brainwave signals, avoiding sudden loud noises or light flickering, otherwise, the analysis results may be affected.

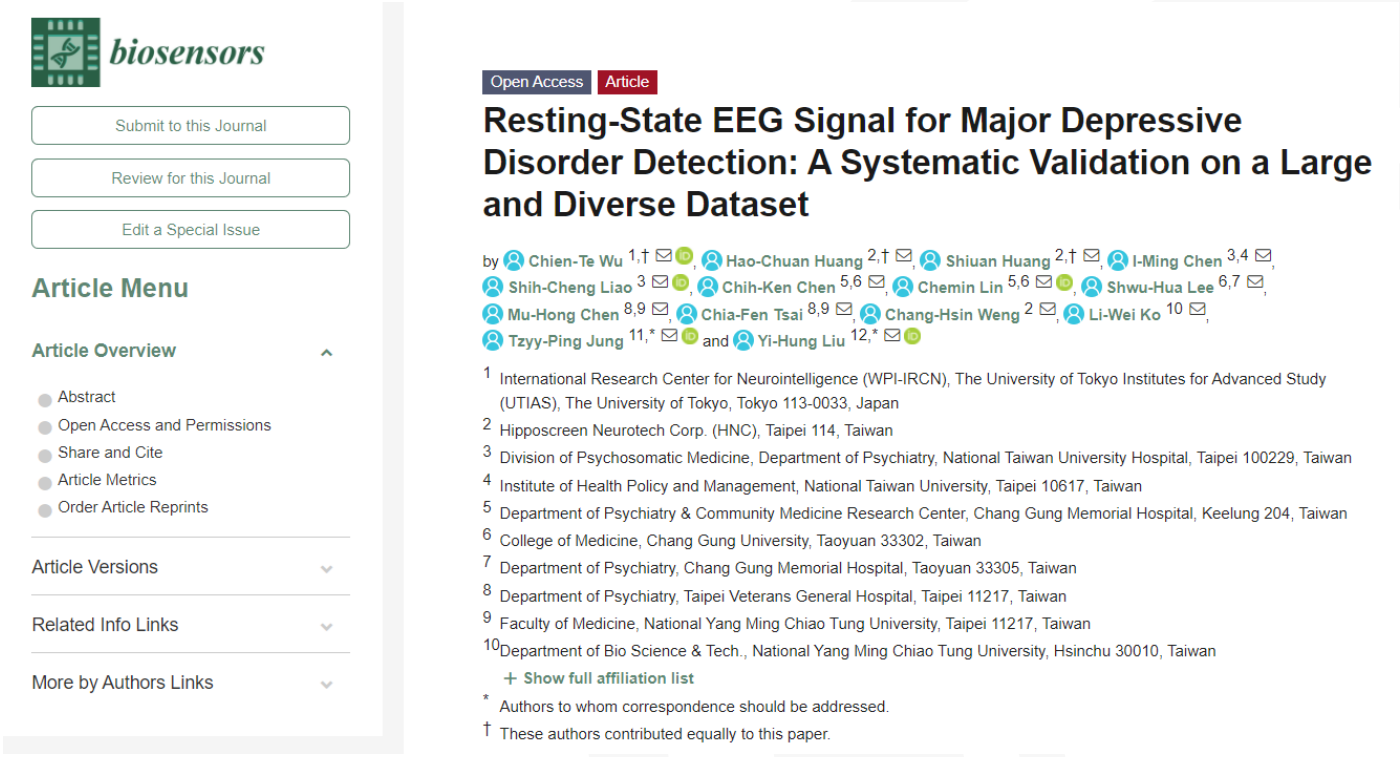
Assessment Report



The data distribution map on the right side of the evaluation report is obtained by using the brain wave data collected by the IRB research project in cooperation with three medical centers in Taiwan, plus the subject's brain wave data for feature extraction and analysis. Color depth can be mapped to the SEA index ranging from 1 to 10, representing the probability of suffering from depression. The green dot is the data point for the test subject. The closer the green dot is to the dark area, the higher the stress of the test subject.

As for the nine-grid table on the left, it is a comprehensive evaluation of the PHQ-9 score of the self-assessment result and the SEA index of the brain wave analysis result. Through the comprehensive evaluation, it can help professional medical personnel to understand the mental state of the subjects more quickly and accurately.

Published Paper



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Open Access Article

Resting-State EEG Signal for Major Depressive Disorder Detection: A Systematic Validation on a Large and Diverse Dataset

by Chien-Te Wu [1,†], Hao-Chuan Huang [2,†], Shiuan Huang [2,†], I-Ming Chen [3,4], Shih-Cheng Liao [3], Chih-Ken Chen [5,6], Chemin Lin [5,6], Shwu-Hua Lee [6,7], Mu-Hong Chen [8,9], Chia-Fen Tsai [8,9], Chang-Hsin Weng [2], Li-Wei Ko [10], Tzyy-Ping Jung [11,*] and Yi-Hung Liu [12,*]

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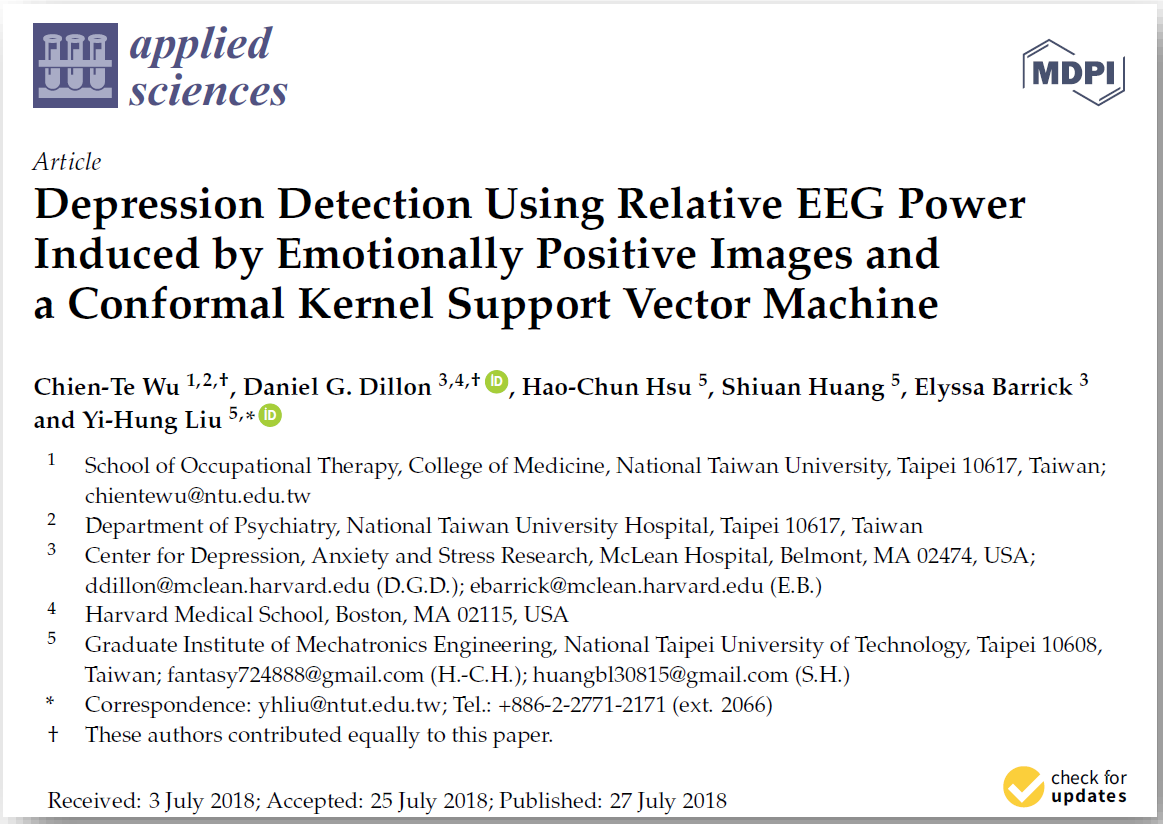
Collaboration with 3 medical centers (4 sites) in Taiwan to collect the biggest multi-site EEG depression dataset in the world. The optimal feature subset and classifier achieve a high five-fold cross-validation accuracy of 91.07% on the training set (140 MDD and 140 HC) and 84.16% on the independent test set (60 MDD and 60 HC). This paper has been published at biosensors in December’ 21.



applied sciences

MDPI

Article

Depression Detection Using Relative EEG Power Induced by Emotionally Positive Images and a Conformal Kernel Support Vector Machine

Chien-Te Wu [1,2,†], Daniel G. Dillon [3,4,†], Hao-Chun Hsu [5], Shiuan Huang [5], Elyssa Barrick [3] and Yi-Hung Liu [5,*]

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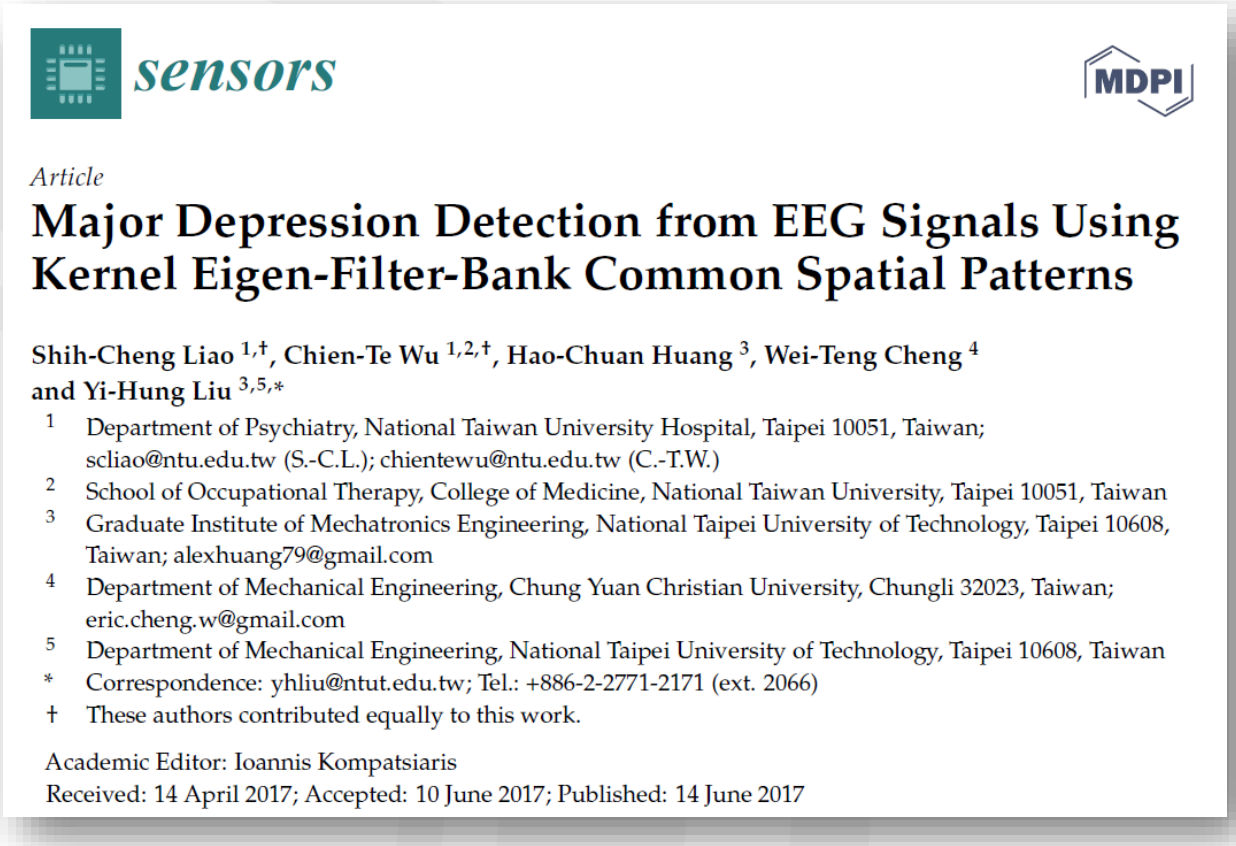
Collaboration with Dr. Daniel G. Dillon (Harvard Medical School & McLean Hospital) on depression detection from EEG signals. The experiment result (Sensitivity = 87.50%, Specificity = 80.65%) has been published at applied sciences in July’ 18.



sensors

MDPI

Article

Major Depression Detection from EEG Signals Using Kernel Eigen-Filter-Bank Common Spatial Patterns

Shih-Cheng Liao [1,†], Chien-Te Wu [1,2,†], Hao-Chuan Huang [3], Wei-Teng Cheng [4] and Yi-Hung Liu [3,5,*]

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Collaboration with Dr. Shih-Cheng Liao (Department of Psychiatry, National Taiwan University Hospital) on depression detection from EEG signals. The experiment result achieved 81.23% accuracy (Sensitivity = 83%, Specificity = 81%) and has been published at Sensors.