

Prediction model for potential depression using sex and age-reflected quantitative EEG biomarkers

Purpose

- Depression is one of the world's life-threatening mental disorders, especially as a result of COVID-19 syndrome and economic stagnation, the number of potential depressive patients is soaring.
- According to WHO(World Health Organization), a population more than three hundred million people is suffering because of depression.
- Diagnosis should be made through interviews with doctors and accompanying tests such as Beck Depression Inventory (BDI) and Hamilton Depression Rating Scale (HDRS). Rapid action is difficult due to the lack of experts in hospitals and counseling facilities, and accurate self-diagnosis is difficult due to ambiguity of symptoms.
- Therefore, using a concept of brain activity that is both objective and time-saving, biomarker study was proceeded.
- Among the methods of measuring brain activity, EEG data, which is less time and expensive and easy to measure, aims to help predict and diagnose potential depression early.

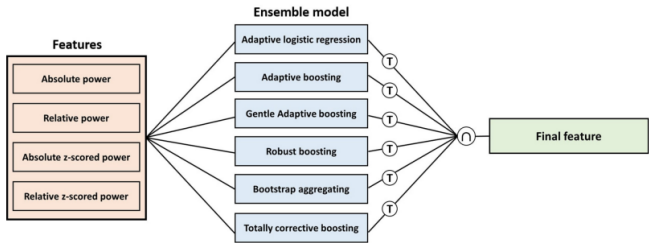
Subjects / Methods

- Depression : 116 people(Male = 23 people, Female = 95 people, Age level = 58.66, BDI= = 21.17) / Healthy People : 80 people(Male = 44 people, Female = 36 people, Age level = 48.66, BDI = 0)
- Sample rating using 19 channels that used 10 to 20 international standards.
- Recording brainwave at least 5 minutes while eyes closed to 250Hz and resting state.
- EEG data is preprocessed using iSyncBrain (iMedisync Inc., Ltd.) and converted to z-score compared to Normative Database, which is a health of the same gender and age.

Results

[Algorithm]

- A total of 532 features were selected using a tree-based ensemble model for optimal features.
- A 10-fold cross validation model established a potential depression prediction algorithm.



[Paired t-test Results]

- Compared to a group with normal potential depression, the values of Beta2 and Beta3 are significantly higher at absolute power.
- Alpha2, Beta2, and Beta3 values are significantly higher in relative power, and it is consistent with the results based on clinical diagnosis in previous studies.

[Classification Result of Optimal Algorithm]

Accuracy : 92.31%, Sensitivity : 88%, Specificity : 100%

Discussion

- It was confirmed that the feature converted to z-score was suitable for the potential depression prediction model compared to the Normative Database, which is the same gender health.
- Potential depression prediction algorithms screen potential depression patients with high accuracy with biomarkers such as beta2, beta3, and alpha2.
- Therefore, it is expected that QEEG will play an important role in early diagnosis and treatment by efficiently screening potential depressive patients and patients who need preemptive treatment.

