QEEG-based machine learning model to predict the prognosis of coma after cardiac arrest

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BACKGROUNDS

While many neurological examinations are performed to predict the prognosis of patients with post-cardiac arrest syndrome (PCAS), previous studies have different optimal time and standard to evaluate the prognosis, inducing critically affect to the prediction [1-2].

Electroencephalography(EEG) can be the optimal candidate to predict the prognosis of PCAS. However, there is no objective standard for reading malignant EEG patterns for prognosis [3, 4].

Thus, we used quantitative EEG (QEEG) to classify the prognosis of coma patients with machine learning model.

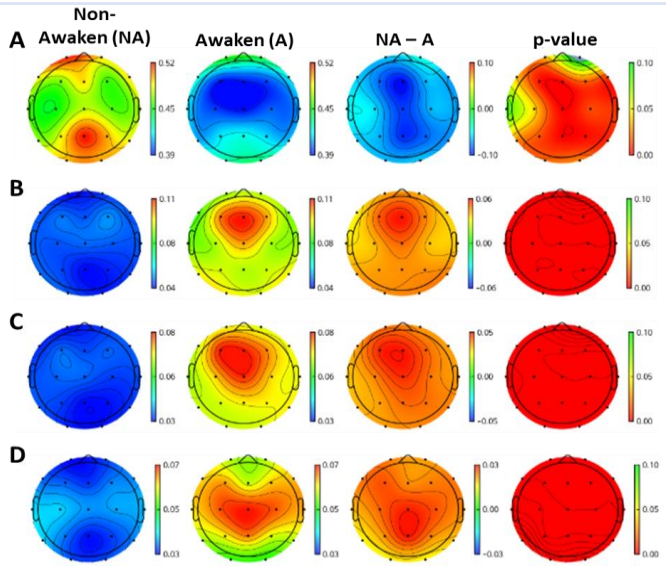

Figure 1. Relative spectral power of each group

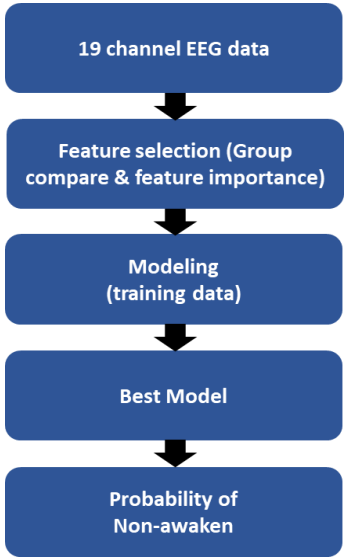

Figure 2. Modeling Process

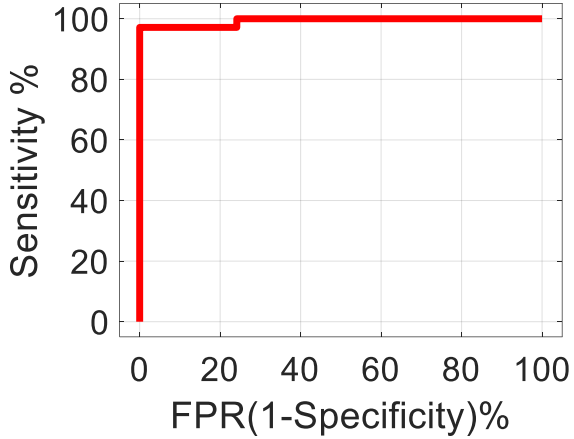

Figure 3. ROC curve of our best model

METHODS

We used EEG data from 185 patients with PCAS from the international 10-20 system with eyes closed for training machine learning (ML) algorithms.

The subjects were classified into two groups according to the Glasgow-Pittsburgh cerebral performance categories (CPC) scale: awaken group (CPC1-3), and non-awaken group (CPC4-5).

RESULT & CONCLUSION

Figure1 represents qEEG relative spectral power of each groups (A: Delta, B: Alpha1, C: Alpha2, D: Beta1). There were significant differences between Non-awaken group and Awaken group in almost all channels ($p<0.05$). These can be the important biomarker to predict PCAS.

Figure2 is flow chart of machine learning modeling using qEEG signals. Feature was selected by feature importance in tree-based ensemble models. Support Vector Machine (SVM) showed best result among various machine learning models (Tree-based model, LDA, KNN, etc.)

Figure3 shows ROC curve of the best model. **Our model showed 91.4% sensitivity (95% CI, 75.8-97.8) and 100% specificity (95% CI, 85.4-100)**, which is state of art performance.

REFERENCES

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