

## **Developing a Real-time AI-CDSS based on Natural Language Processing for Mental Disorder Classification**

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Psychological test battery reports (battery reports) are essential because it helps to obtain customized treatment direction for mental disorder patients. However, the content and style of each battery report are different, making it subjective and unstructured. Therefore, AI-CDSSes that accurately predict reports in real-time are needed to help the doctor's diagnosis. The study aimed to develop real-time AI-CDSSes that can accurately classify mental disorders based on the battery reports. The study used free text of battery reports written by clinical psychologists as input data and physicians' mental disorder diagnoses as output data. The models were divided into two groups: shallow machine learning and deep learning. Four models were developed for each group and different natural language processing methods were applied to each model. The study compared and validated the eight models' accuracy and speed performance and concluded that the shallow machine learning model is the most appropriate for automatically classifying mental disorders using battery reports. In this study, we analyzed the data using Shallow Machine Learning (SL) and Deep Learning (DL) series. In the SL series, we used Naïve Bayes, Random Forest, eXtreme Gradient Boosting, and Light Gradient Boosting models, and in the DL series, we used Long Short-Term Memory and Gated Recurrent Unit models. The accuracy and speed performance of the all models. The accuracy and ROC\_AUC were about 0.90 and 0.87 ROC\_AUC for all models, respectively. The real-time AI-CDSS prediction time was within 1s for all models, especially SL models predicted up to 400 times faster than DL models. This study compared the effectiveness of SL and DL models in classifying mental disorders using battery reports. We developed a real-time AI-CDSS based on each model and found that both SL and DL models had similar accuracy. However, SL models were up to 400 times faster than DL models, making them more suitable for clinical use.