

Single classifier vs. ensemble machine learning approaches for mental health prediction

ABSTRACT

Early prediction of mental health issues among individuals is paramount for early diagnosis and treatment by mental health professionals. One of the promising approaches to achieving fully automated computer-based approaches for predicting mental health problems is via machine learning. As such, this study aims to empirically evaluate several popular machine learning algorithms in classifying and predicting mental health problems based on a given data set, both from a single classifier approach as well as an ensemble machine learning approach. The data set contains responses to a survey questionnaire that was conducted by Open Sourcing Mental Illness (OSMI). Machine learning algorithms investigated in this study include Logistic Regression, Gradient Boosting, Neural Networks, K-Nearest Neighbours, and Support Vector Machine, as well as an ensemble approach using these algorithms. Comparisons were also made against more recent machine learning approaches, namely Extreme Gradient Boosting and Deep Neural Networks. Overall, Gradient Boosting achieved the highest overall accuracy of 88.80% followed by Neural Networks with 88.00%. This was followed by Extreme Gradient Boosting and Deep Neural Networks at 87.20% and 86.40%, respectively. The ensemble classifier achieved 85.60% while the remaining classifiers achieved between 82.40 and 84.00%. The findings indicate that Gradient Boosting provided the highest classification accuracy for this particular mental health bi-classification prediction task. In general, it was also demonstrated that the prediction results produced by all of the machine learning approaches studied here were able to achieve more than 80% accuracy, thereby indicating a highly promising approach for mental health professionals toward automated clinical diagnosis.