REPLICATION OF MACHINE-LEARNING ANALYSES TO PREDICT TREATMENT OUTCOME WITH ANTidepressANT MEDICATIONS IN PATIENTS WITH MAJOR DEPRESSIVE DISORDER

Background:
Antidepressant monotherapy remains the first-line treatment for major depressive disorder (Kennedy et al., 2016). However, 40-60% of patients will not initially respond (Hieronymus et al., 2016). Predicting a patient's treatment outcome based on clinical symptoms and episode features represents an exciting application of modern machine learning. We sought to independently replicate recent work predicting antidepressant outcomes using the STAR*D dataset, and then externally validate these models on new data from CAN-BIND-1 (Lam et al., 2016).

Methods:
We replicated and adopted Nie et al's methodology to predict initial antidepressant response, and externally validated these models using the CAN-BIND-1 clinical features database (Nie, Vairavan, Narayan, Ye, & Li, 2018). We then evaluated additional models to investigate the how different parameters affect prediction performance.

Results:
Our replicated models predicted treatment outcomes using STAR*D data with similar performance to Nie et al’s results. Our external validation's results varied depend on what outcome was predicted, with antidepressant response (≥50% reduction in severity) performing worse than predicting remission. Using a smaller set of features in both datasets does not seem to impact performance, and we find evidence that predicting antidepressant response may perform better with a greater number of subjects.

Conclusion:
We successfully replicate prior working predicting antidepressant treatment outcomes using clinical data. We then externally validate these models on a new dataset, finding similar performance when predicting if a patient will achieve remission, but reduced performance if predicting antidepressant response.

Clinical Relevance:
Though in its early stages, machine-learning approaches will likely eventually be used in clinical psychiatric practice, as they have promise to improve clinical care. It is important to replicate and externally validate such approaches to establish their robustness before clinical application.