UBC Department of Psychiatry

Predicting Function After Escitalopram Treatment Using Machine Learning

John-Jose Nunez, Yang Liu, Tejas Phaterpekar, Bo Cao, Sakina J. Rizvi, Sidney Kennedy, Roumen Milev, and Raymond Lam

Introduction

Major depressive disorder (MDD) is a leading cause of disability globally[1], impairing function at work, at home, and socially. Many patients with depression remain impaired despite treatment, including over a fifth of those who have achieved remission[2].

Machine learning (ML) allows predictive models to be trained to predict clinical outcomes. This could allow patients to understand if a treatment will help their function and could allow ineffective treatments to be avoided.

So far, studies have examined how ML can be used to predict depressive symptoms. This is the first study examining whether ML can be used to predict functional outcomes of patients with MDD undergoing treatment with an antidepressant.

Methods

Data and Outcomes:

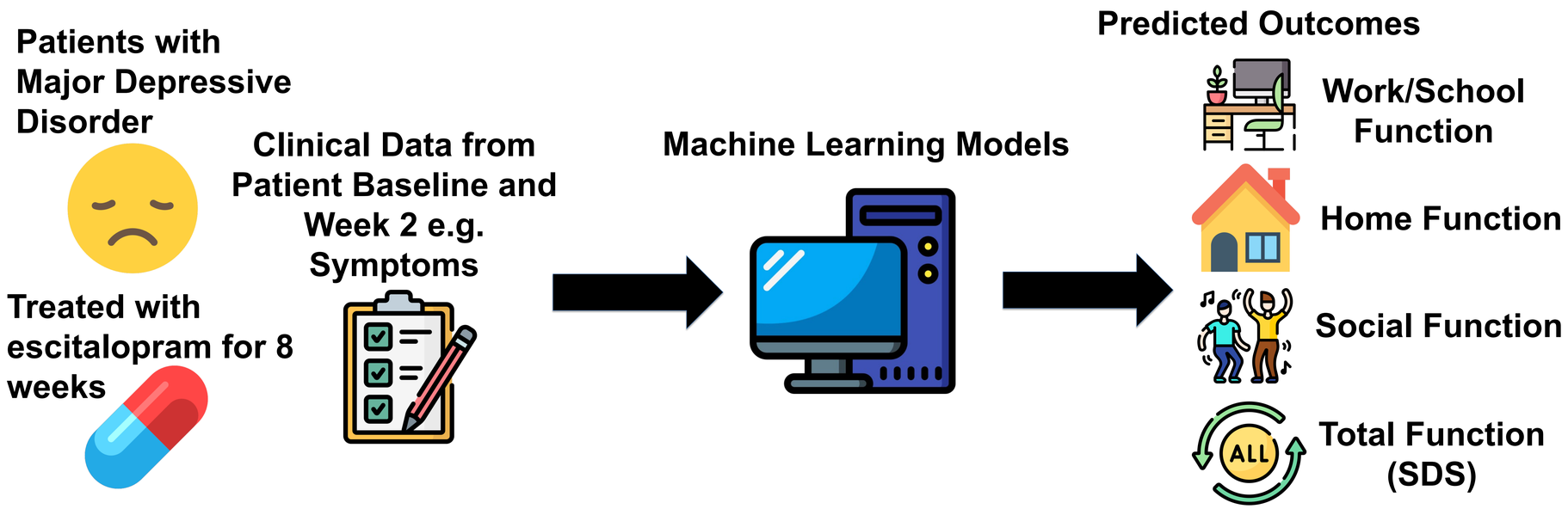
- Data came from the CAN-BIND-1 study (n=324)
- Data was processed using a pipeline to allow modularity and reproducibility
- We predicted changes in the Sheehan Disability Scale (SDS): changes in total score and its three subdomains (work/school, social, home). We used previously established cutoffs to identify functional response and remission.

Predictive Modelling:

- We used five ML models as used in a prior study[3] with this dataset: L_2-regularized logistic regression, elastic net, support vector machine, random forests, and gradient-boosted decision trees.
- Given that we did not have an external dataset to conduct external validation, we instead use nested cross-validation. This is a technique that better establishes validity by reducing the effect of overfitting compared to standard cross-validation. Our implementation used three outer folds and five inner folds.
- We trained models using all features (k=296) and an expert-curated set of features (k=55)

Model Interpretation :

- We used Shapley Additive Explanations (SHAP) values[2], a model-agnostic technique for determining feature importance.



Results

- Our predictive performance was similar to when using these data and models to predict changes in depression symptoms.
- Predicting the specific functional domains results in higher performance than predicting changes in total SDS score
- Different data is important for predicting different domains. For example, hypomanic symptoms and anxiety are more related to predicting work function, while depressive symptoms seem more related to function at home.

Conclusion

This study investigates using machine learning with clinical data to predict functional outcomes after treatment of depression with escitalopram. This technique may allow patients to better decide on their treatment, and for ineffective treatment to be avoided.

Reference / Bibliography

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