Predicting Psychotropic Medication Ratings

by Preethi Panyam

Introduction

- Millions of US adults take medication for mental health disorders
  - 19% are on some medication and ~10% receive therapy or counseling
  - 13% of US adults take antidepressants
- Doctors only see patients periodically & for a brief period of time
  - Only treat *symptoms* but are unaware of *context*
- Ultimately patient knows *best* whether medication is working

Problem Statement:

Is it possible to predict patient ratings for various psychotropic drugs based on the drug class, type of mental health disorder, and the patient text review?

Data Used:

Drug Reviews

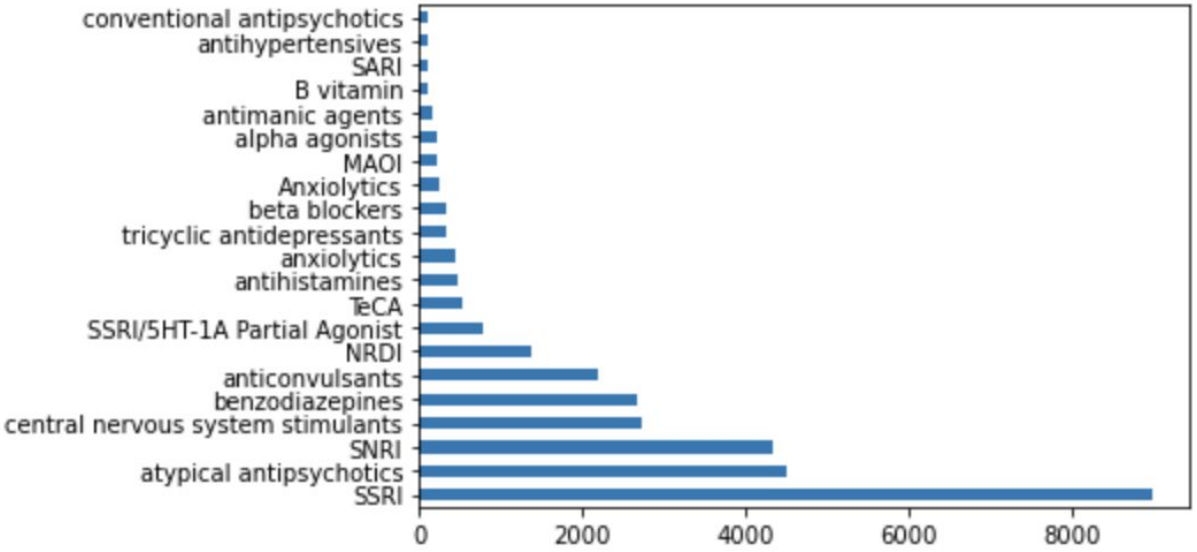
- Drug Review dataset web-scraped from Drugs.com
- ~200,000 patient reviews
  - Selected only psychiatric conditions
  - Final ~32,000 reviews

Drug Classes

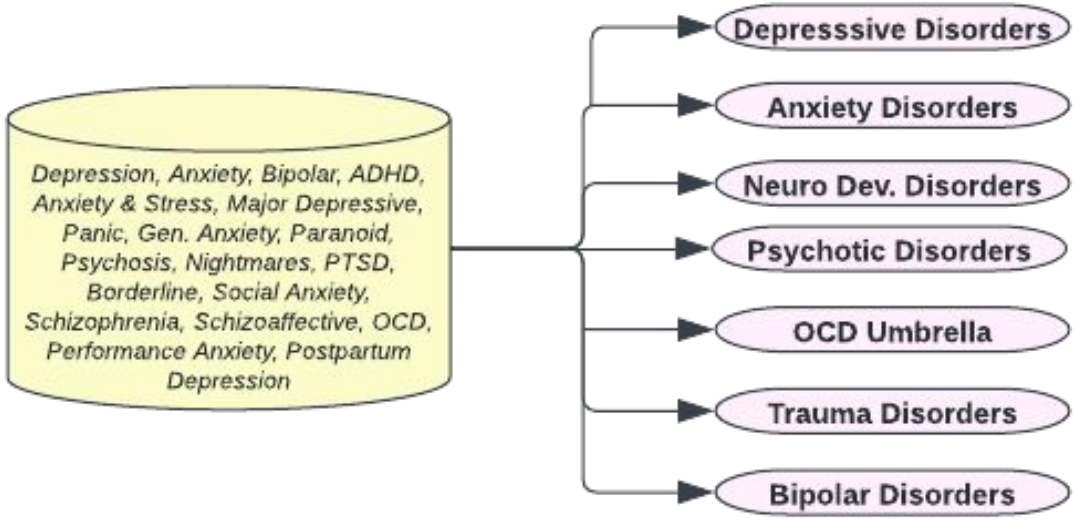
- Looked up drug classes & merged with main dataset
- Drug Classes = Mechanism of Action
- Relationship b/w mechanism of action and drug efficacy for different conditions

Data Cleaning & Pre-processing

- Dropped drug classes <100 values
- Cleaned text data (removed quotes, replaced special characters, etc.)
- Converted 21 mental health conditions into 7 classes (dropped if <100)



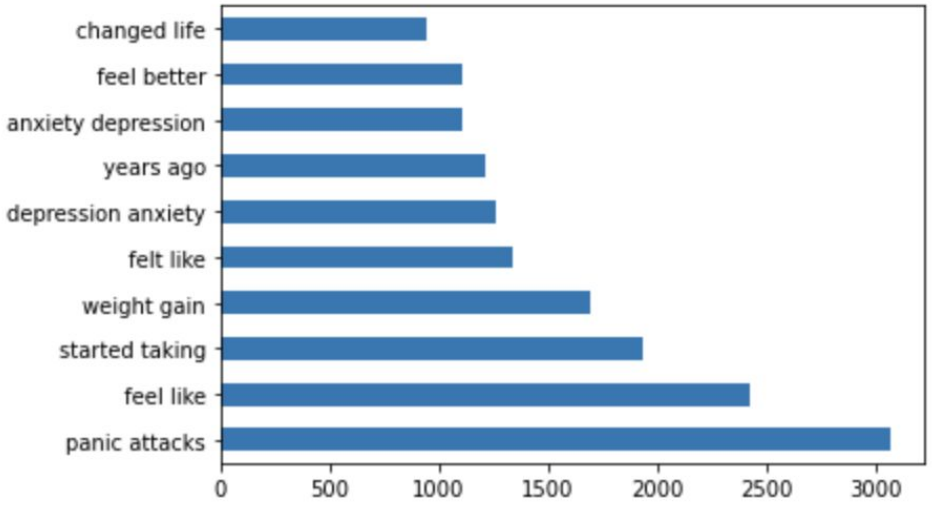
Data Cleaning & Pre-processing



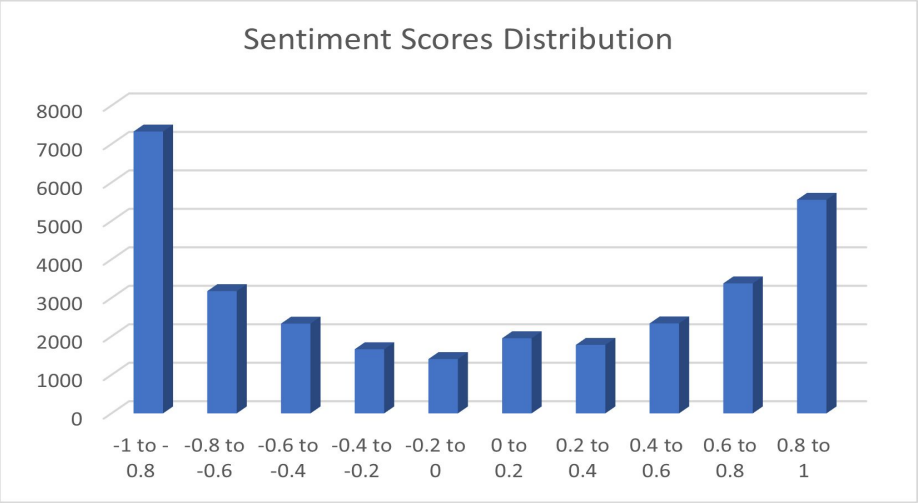
Collapsed 20 mental health conditions into 7 main disorder categories for easier analysis

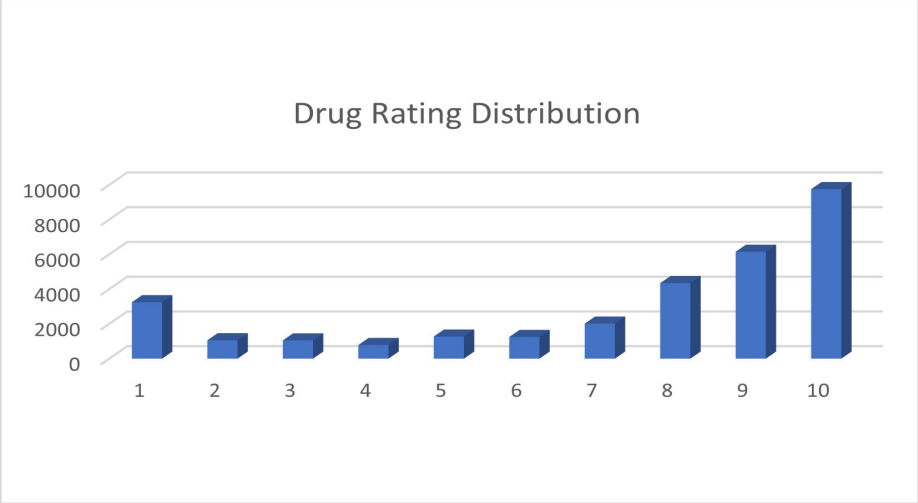
EDA

- Converted categorical data to dummy variables (condition & drug class)
- Dropped drug name & rating usefulness count
- Found most common words (unigrams, bigrams)
- Converted text data to sentiment scores



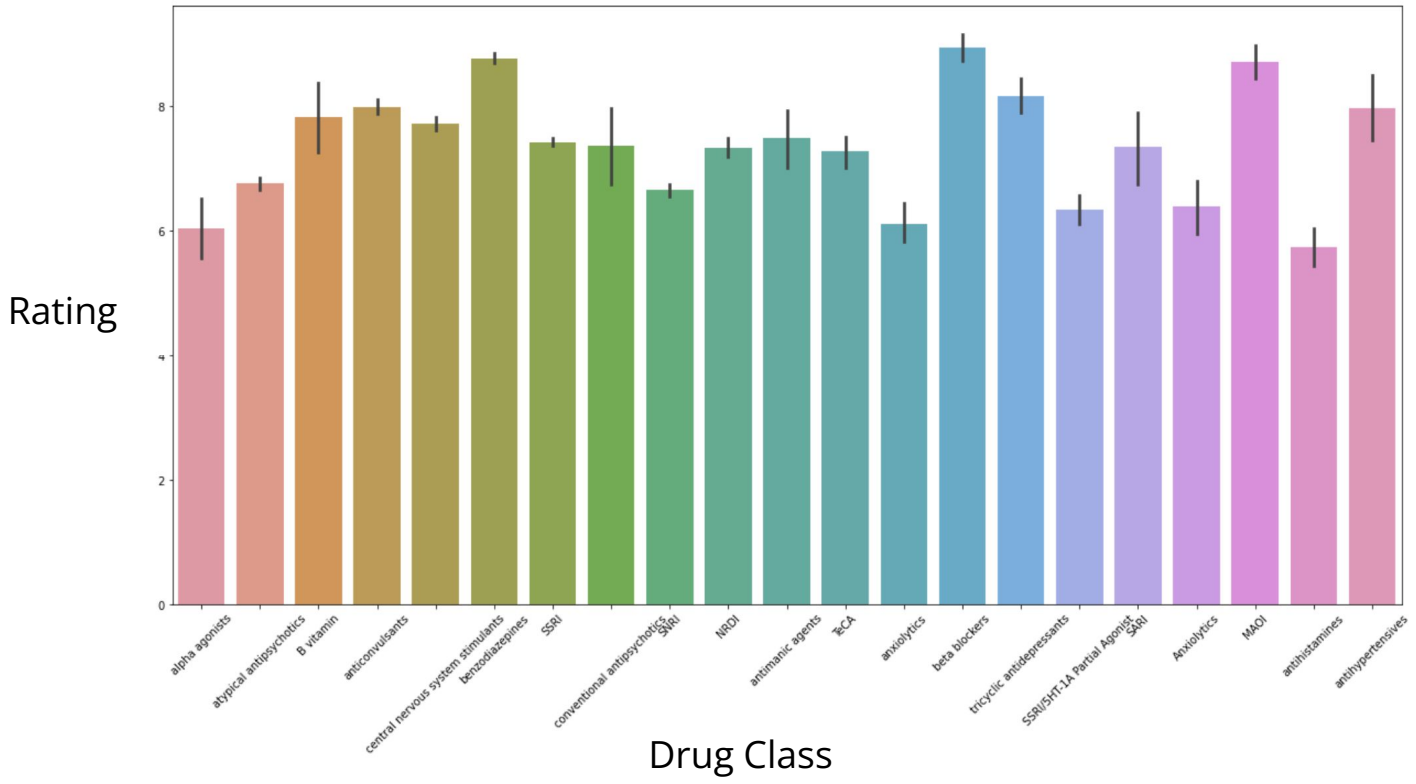
EDA



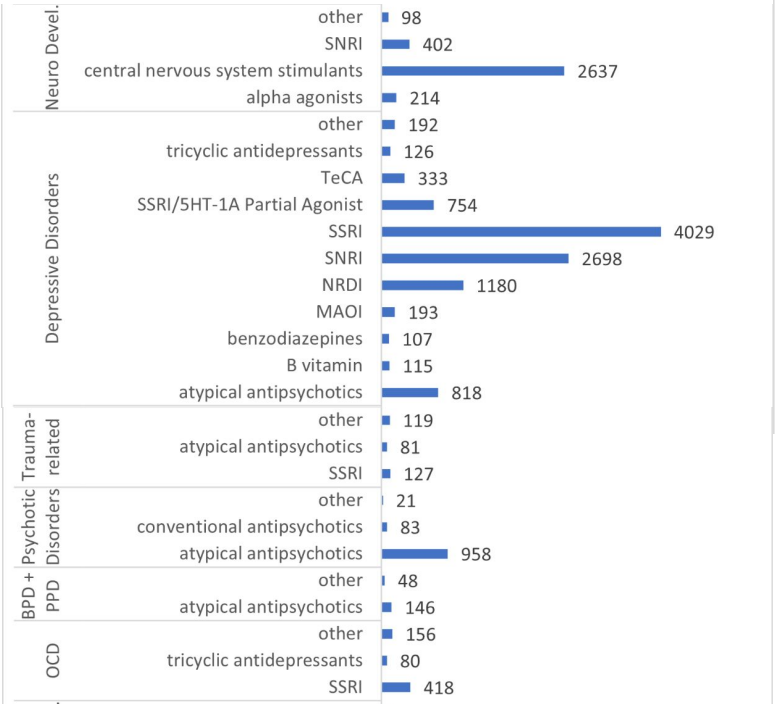


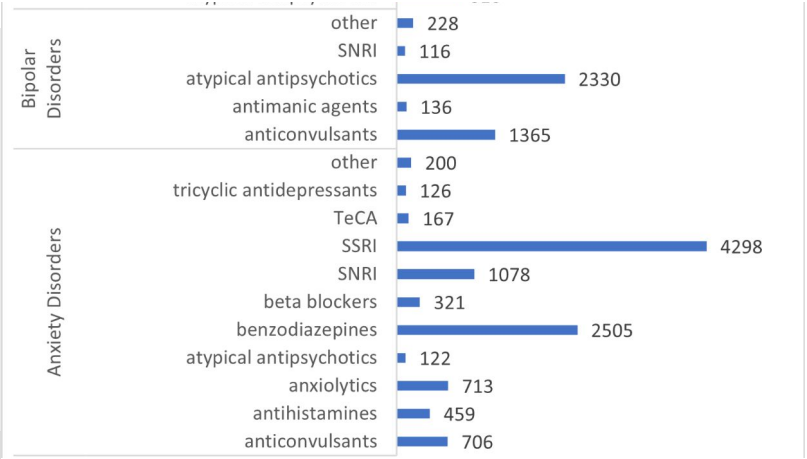
Drug Ratings had 0.3 correlation w/ Sentiment Scores

EDA: Drug Class by Rating



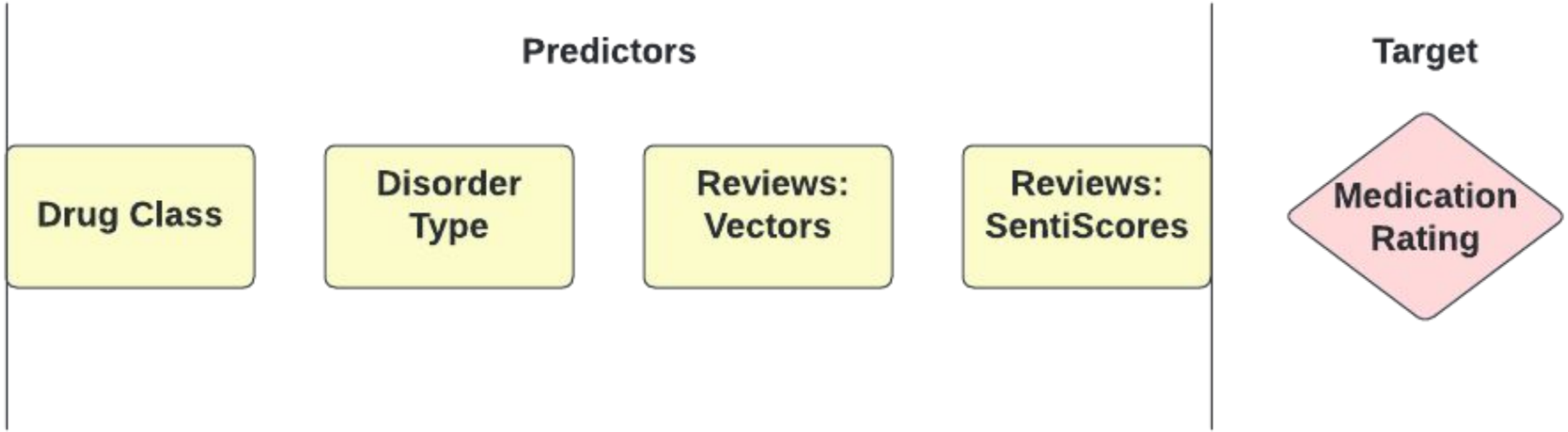
EDA: Medications by Condition & Class





Many classes of drugs prescribed for each type of disorder ~ SSRIs, SNRIs & antipsychotics are most common

Model Overview



Models

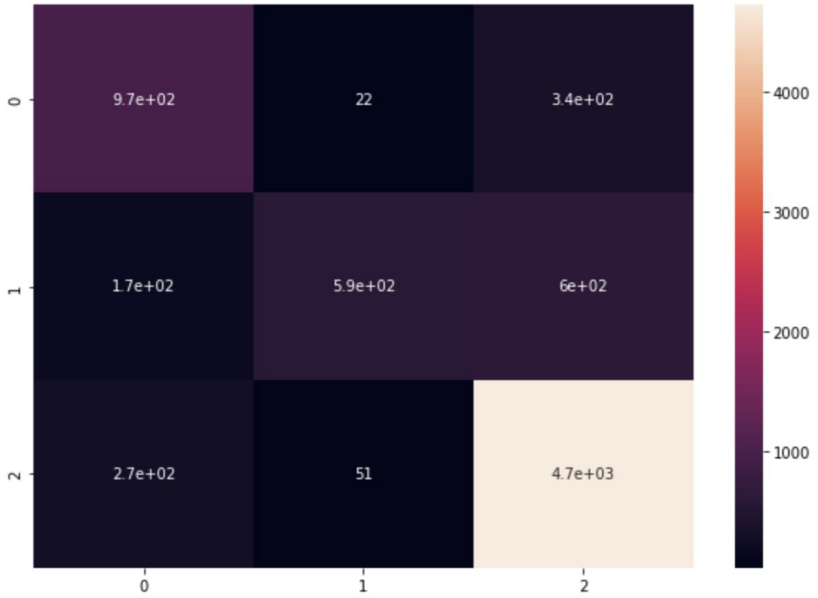
- Tried various models ~ many initially had low scores
- Ratings as:
  - continuous : 1-10
  - 10 classes: 1-10
  - 3 classes: low (1-3), medium(4-7), high(8-10)
- Final Model: Random Forest Classifier predicting 3 classes of Ratings

Model	Train	Test
Logistic Regression	0.37	0.37
Naive Bayes	0.35	0.35
Random Forest Regressor	0.93	0.56
Random Forest Classifier	0.98	0.81

Final Model Results: RFC w/ 6 hyperparameters

Metric	RFC	Baseline
Accuracy	0.81	0.65
F1_Low	0.71	0
F1_High	0.88	0.79
F1_Weighted	0.80	0.51

Hyperparameters:
n_estimators, max_depth max_features, class_weight, oob_score, criterion



Conclusion

- Model can successfully predict psychotropic drug ratings from type of mental health disorder, class of drug (i.e. mech of action) & text reviews
- Many external factors will impact model:
  - Comorbidities
  - Context behind prescription
  - Medication adherence
  - Life events after prescribing
  - Psychiatrists & psychologists work separately
  - Side-effects

Future Directions

- Streamlit App for predicting medication rating
- Possible Stakeholders:
  - Drug developers/drug discovery
  - Psychiatrists
- Patients can also double-check prescription reviews from friends and/or predict how effective a medication can be

Thank you! Questions?