



Healthcare meets IT

- This dataset: healthcare/IT Interface
- Goal: track the safety and effectiveness of drugs over time.
- Clinical trials are limited in number of participants and timespan (e.g. Covid vaccination..).
- Through user reviews a big amount of information about the over time.



Sentiment Analysis (and beyond)

UCI Drug Dataset

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Features in the dataset



●

DRUG
(CATEGORICAL)

●

CONDITION
(CATEGORICAL)

●

REVIEW
(TEXT)

●

USEFUL_COUNTS
(NUMERICAL)

●

RATING [1-10]
(NUMERICAL)

PREDICTOR

DID NOT USE
(ASK ME ABOUT IT)

TARGET VARIABLE

CONVERTED TO
BINARY:
1-6 > "0"
7-10 > "1"

Drug types and medical conditions in the dataset



3,199

UNIQUE DRUGS



837

UNIQUE CONDITIONS



130,285

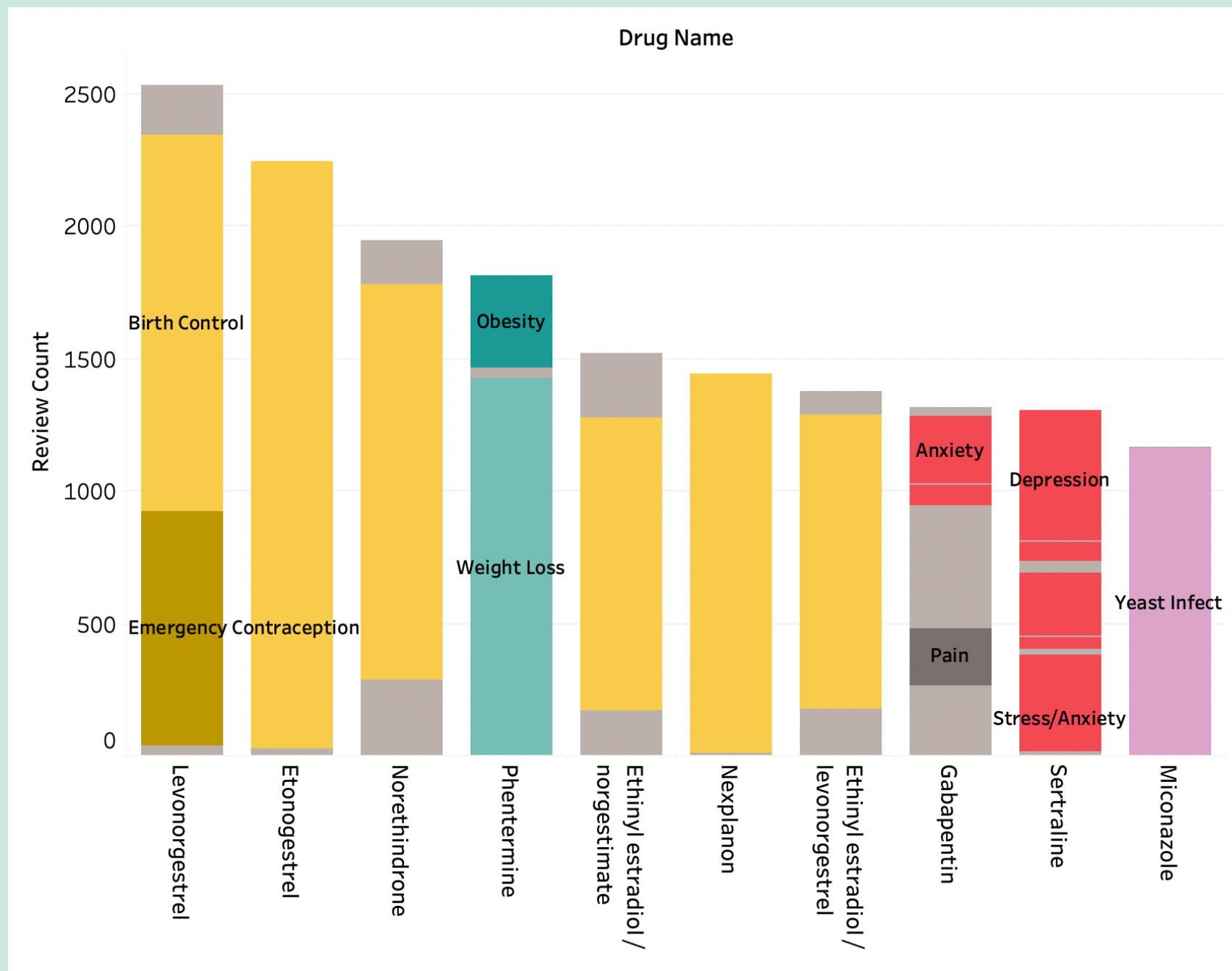
UNIQUE REVIEWS

* COLLECTED OVER A 9 YEAR
TIME SPAN (2008-2017)



Drug types and medical conditions in the dataset

Top 10 reviewed drugs, with most common target Condition

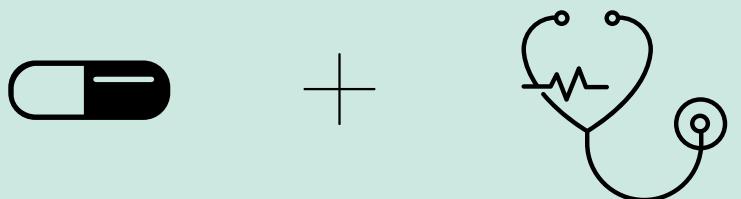


Most common conditions targeted by top 10 drugs in the dataset:

- Birth control and termination
- Mood disorders
- Weight loss

Drug recommender

The dataset allows users to
find the best and worst drugs
for the condition they are
suffering from
press below for link:





Main predictive feature: patient reviews

POSITIVE REVIEW	
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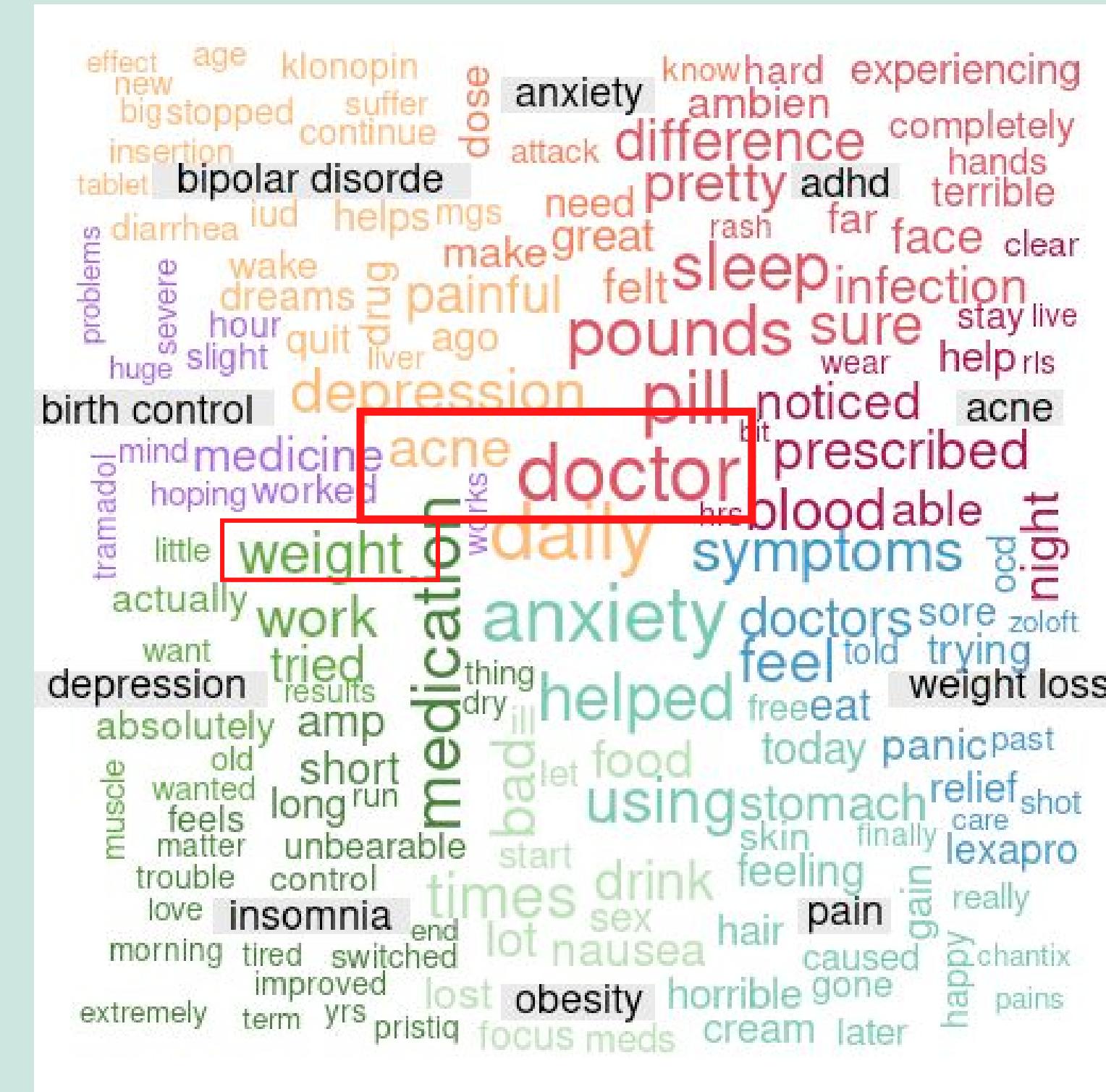
"Absolutely **saved my life**. I've tried numerous drugs over 15 years and this is a **miracle**. No **side effects** whatsoever. I feel **better** than I ever have in my life".

NEGATIVE REVIEW	
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"Absolutely **terrible** experience on Tirosint - landed in ER with chest **pains**, **dizziness**, extremely **disoriented**."

Word Clouds

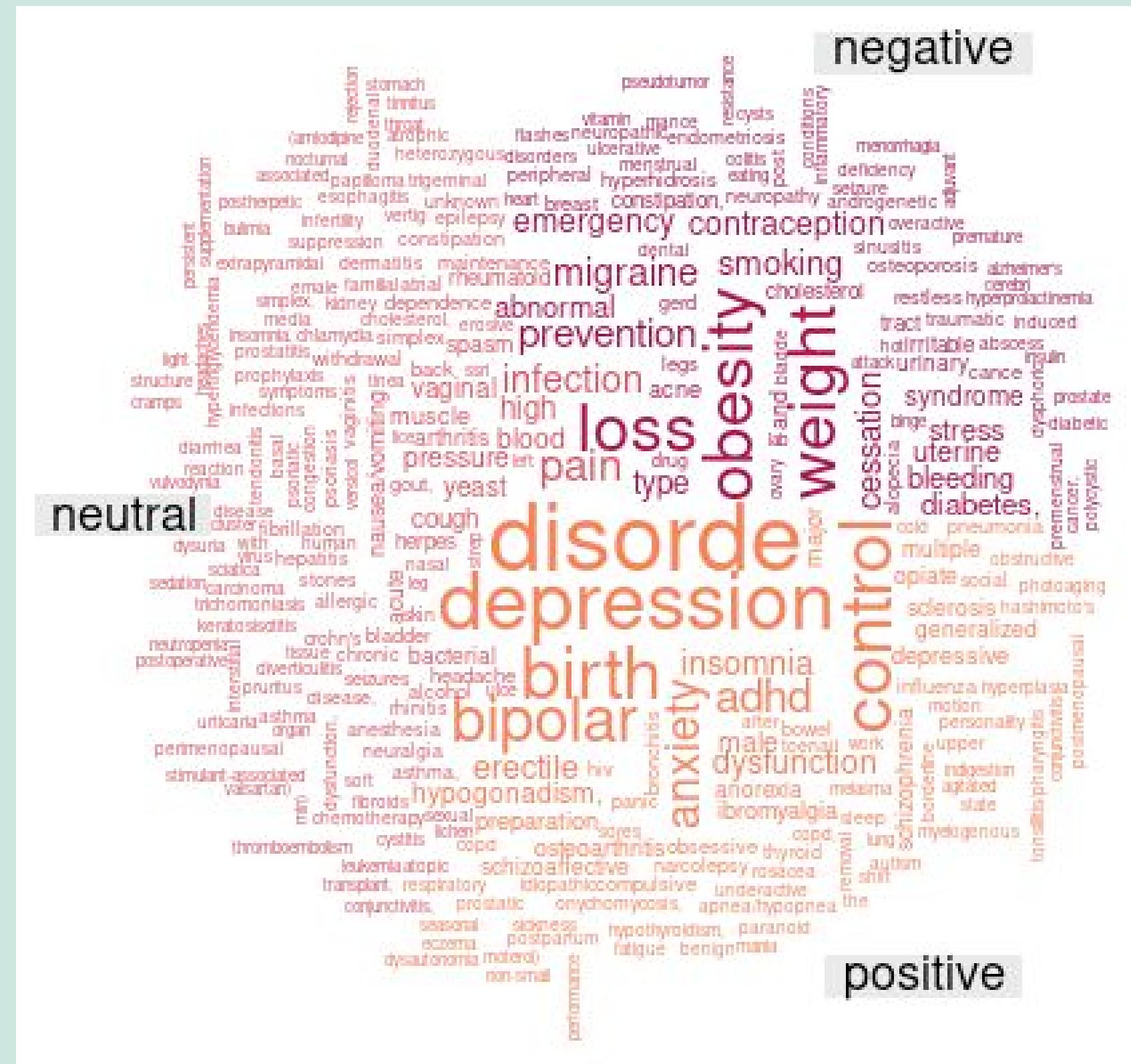
Most frequent words associated with top 10 Conditions



- Credit goes to Giovanni Marelli
for assisting with Word Clouds.

Word Clouds

Reviews compared
against word lists
associated with
positive / neutral /
negative items



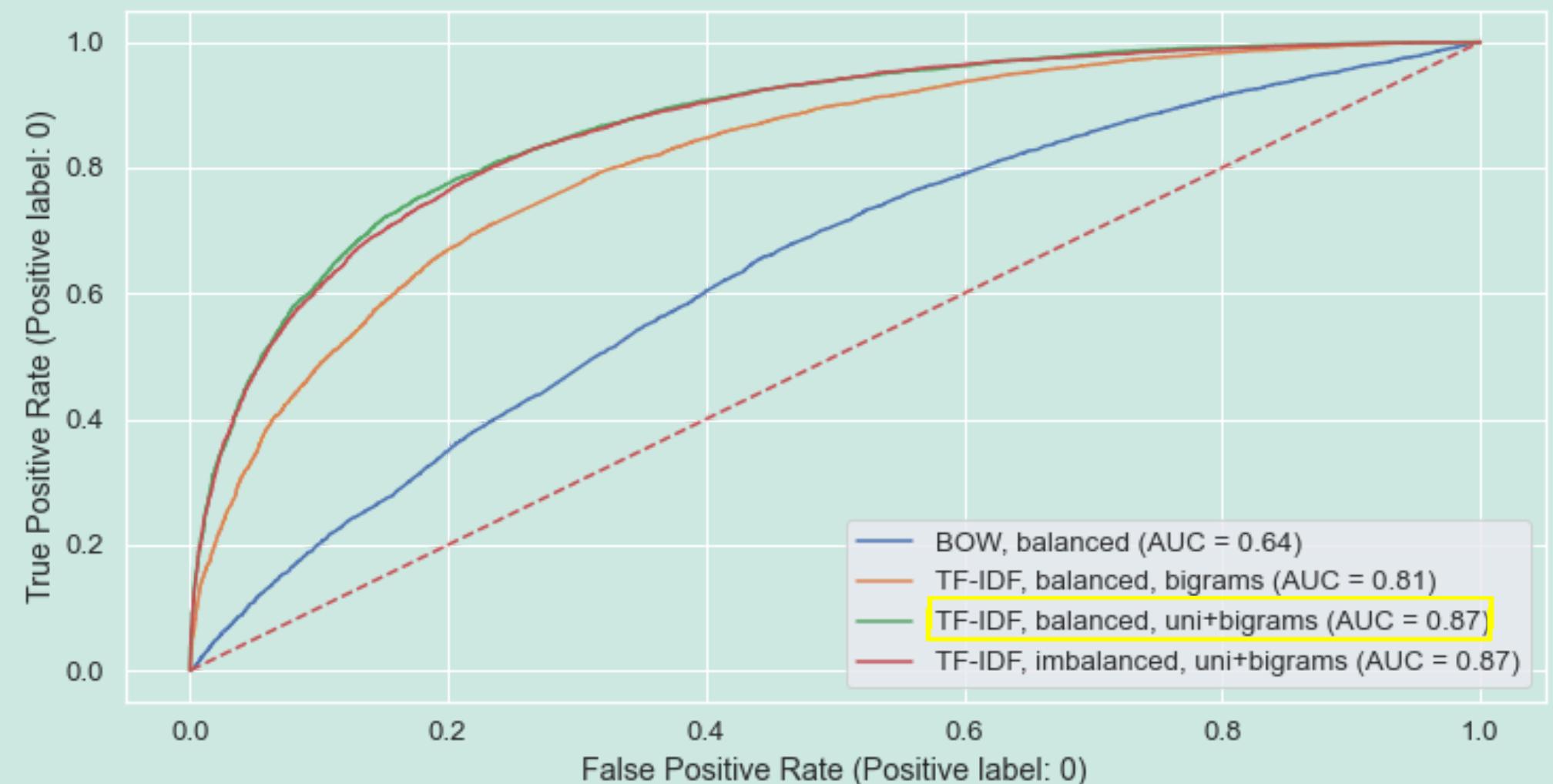
Model Comparison

- Using Random Forests

1. **TF-IDF > BOW**
2. **Downsample > full sample**
 - (Better recall for both categories)
3. **Uni + bigrams > bigrams only**

Overall Best model:

TF-IDF + uni & bigrams
[balanced sample]



Conclusions and Future Ideas

- General:
 - Most common conditions people review on are birth control, mood disorders, pain, obesity, and skin conditions.
 - The current dataset allows us to identify medical conditions which are relatively well treated (e.g. depression), and target ones which are not (e.g. weight loss, female hair loss), and require more research.
- Sentiment Analysis:
 - Advantage: allows a much more fine grained assessment of drugs and medical conditions, discovering new associations previously unexpected.
 - Would improve with defining a 'neutral' category (did not make it to incorporate in actual model).
 - Use models which allow more semantic mapping of words than BOW/TF-IDF allow (Word2Vec).

THANKS !



Appendix

Balanced

Results obtained for the TRAIN SET				
=====				
The Cohen's Kappa is: 0.96				
	precision	recall	f1-score	support
0	0.98	0.98	0.98	34967
1	0.98	0.98	0.98	35194
accuracy			0.98	70161
macro avg	0.98	0.98	0.98	70161
weighted avg	0.98	0.98	0.98	70161
=====				
Results obtained for the TEST SET				
The Cohen's Kappa is: 0.57				
	precision	recall	f1-score	support
0	0.79	0.79	0.79	8884
1	0.78	0.78	0.78	8657
accuracy			0.79	17541
macro avg	0.79	0.79	0.79	17541
weighted avg	0.79	0.79	0.79	17541

Imbalanced, more 1s!

Results obtained for the TRAIN SET				
=====				
The Cohen's Kappa is: 0.99				
	precision	recall	f1-score	support
0	1.00	0.99	0.99	35026
1	0.99	1.00	1.00	69202
accuracy			1.00	104228
macro avg	1.00	0.99	0.99	104228
weighted avg	1.00	1.00	1.00	104228
=====				
Results obtained for the TEST SET				
The Cohen's Kappa is: 0.46				
	precision	recall	f1-score	support
0	0.84	0.45	0.58	8825
1	0.77	0.96	0.85	17232
accuracy			0.78	26057
macro avg	0.81	0.70	0.72	26057
weighted avg	0.80	0.78	0.76	26057