



# Psychedelic Efficacy

How well might psychedelic drugs work to treat mental illness, compared with prescription psych meds? What insights can be drawn from anonymously-submitted psychedelic experience reports?

# Why Study Psychedelics?



## Therapeutic Uses

Intermittently used in conjunction with psychotherapy



## Advocacy

Decriminalization efforts benefit from wealth of information about effects relative to other drug treatment options



## History

Used for healing for thousands of years



## De/criminalization

Criminalized in the 20th century. Recent, partial decriminalization



## Investment

As psychedelics grow in accessibility, healthcare startups may wish to develop new variants based on past successes

# Unconventional Use Case...

Due to the history of criminalization, there are fewer formal (i.e. double blind) studies on the efficacy of psychedelics for treating mental illness, relative to what is known about prescription medications. At least **quantitatively, knowledge about psychedelics is relatively opaque.**



We do, however, have a wealth of informal information shared about people's experiences using psychedelic drugs for the purpose of treating mental illness and otherwise feeling good.

For decades, people have submitted **narrative psychedelic experience reports** to Erowid, reddit, and other forums. These reports are often submitted anonymously and may contain little or no quantitative data that would be needed for cross-drug comparison.



# ... Unconventional Data Science Method

**01** **Model to predict ratings based on reviews of psych meds**

Typically, a rating for a product's effect is easier to gather than a narrative review of that product. So why predict ratings based on the contents of reviews?

**02** **Apply the model to new data: psychedelic experience reports**

In order to make statistical comparisons with narrative reports about psychedelics, we need to be able to assign ratings using this unconventional model.



# 01 NLP & Training a Model

**NLP = Natural Language Processing**

# Training Data

**31,559  
reviews of  
prescription  
psych meds**

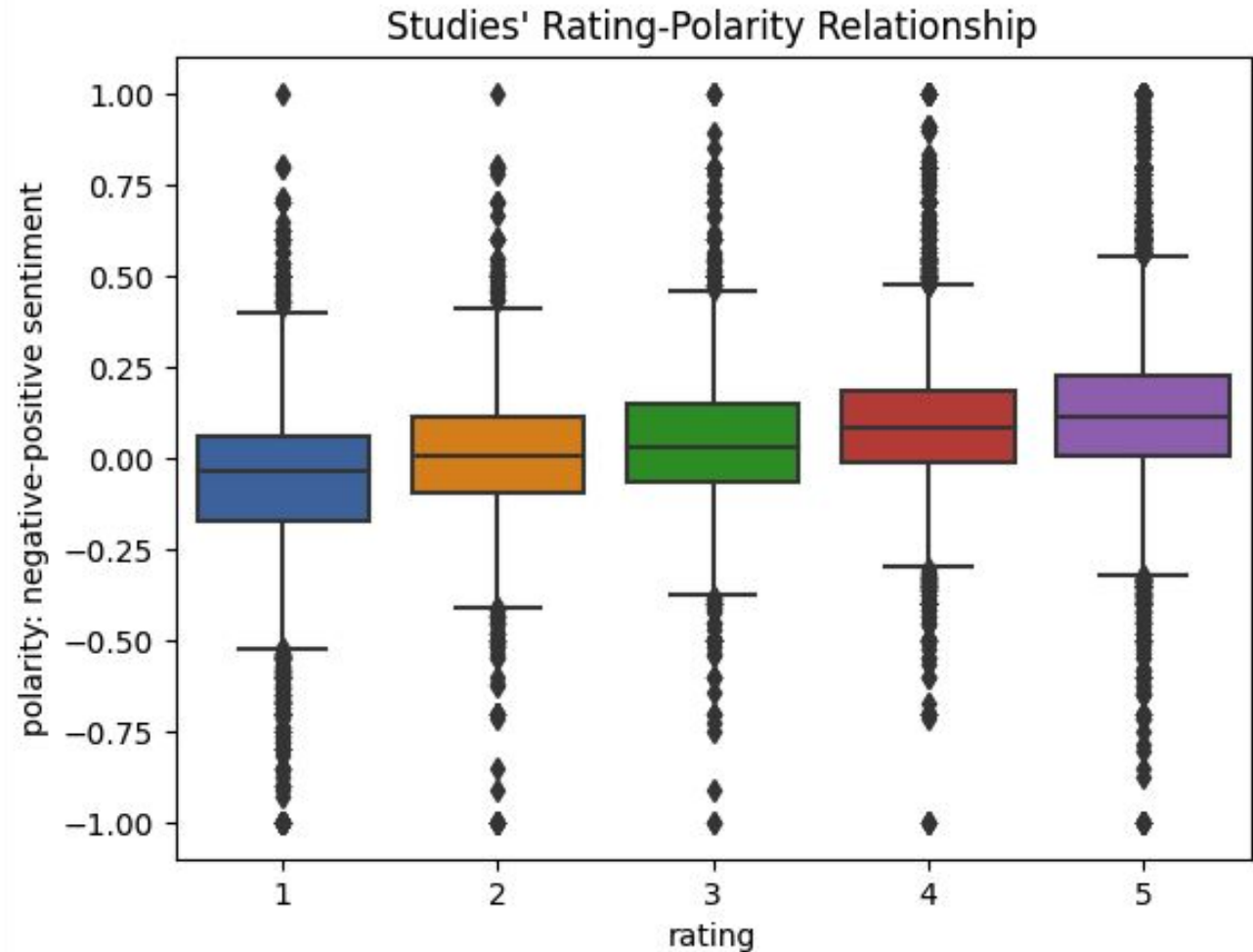
## **Original Features:**

- Drug
- Condition being treated
- Date
- Narrative Review
- Rating

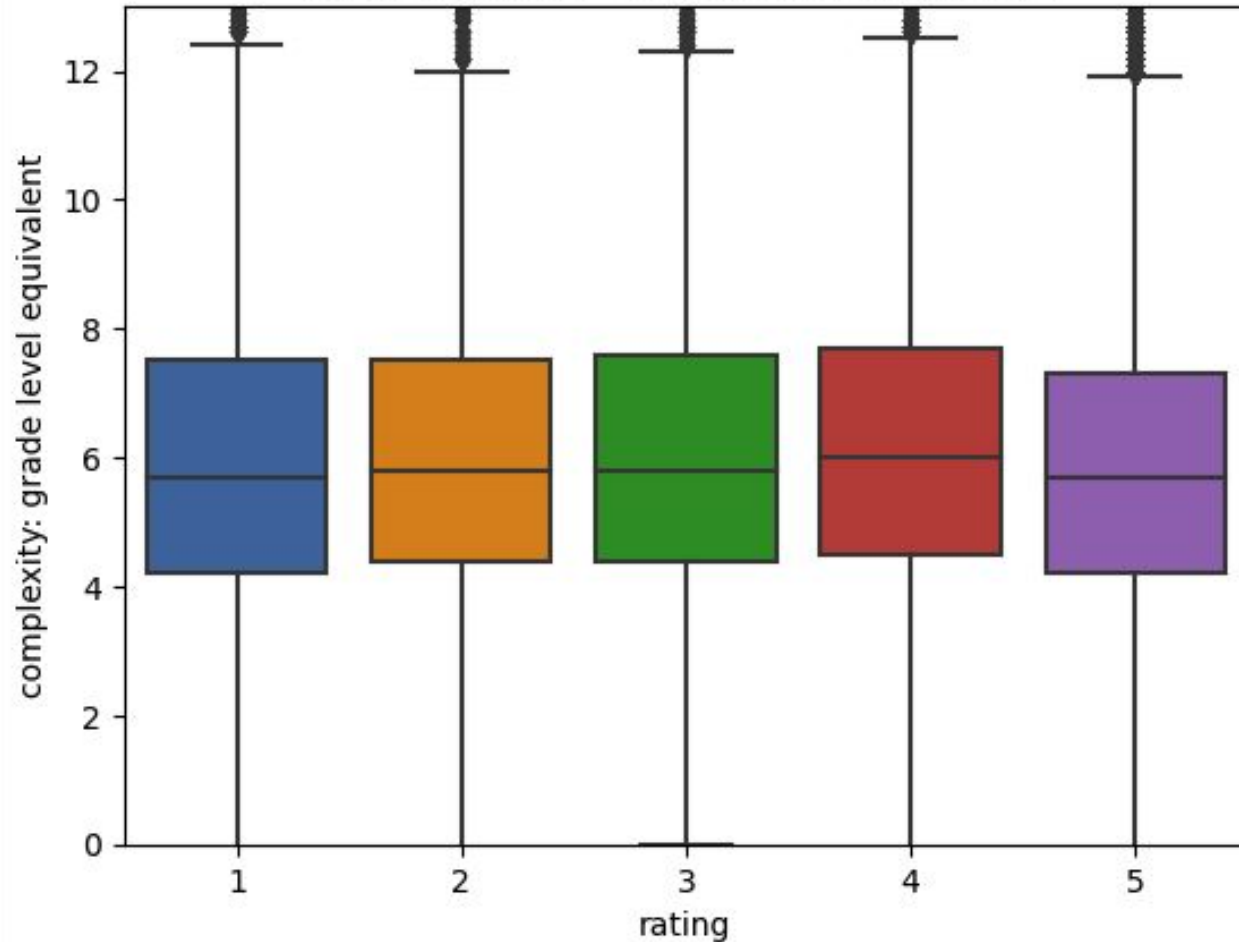
## **Engineered Features:**

- Text Complexity
- Review Length
- Subjectivity
- Sentiment Polarity
- Similarity with a Meta-Review
- Word Vector

# Key Feature: Polarity



Studies' Rating-Complexity Relationship



**Next Most  
Predictive  
Feature:  
Complexity**



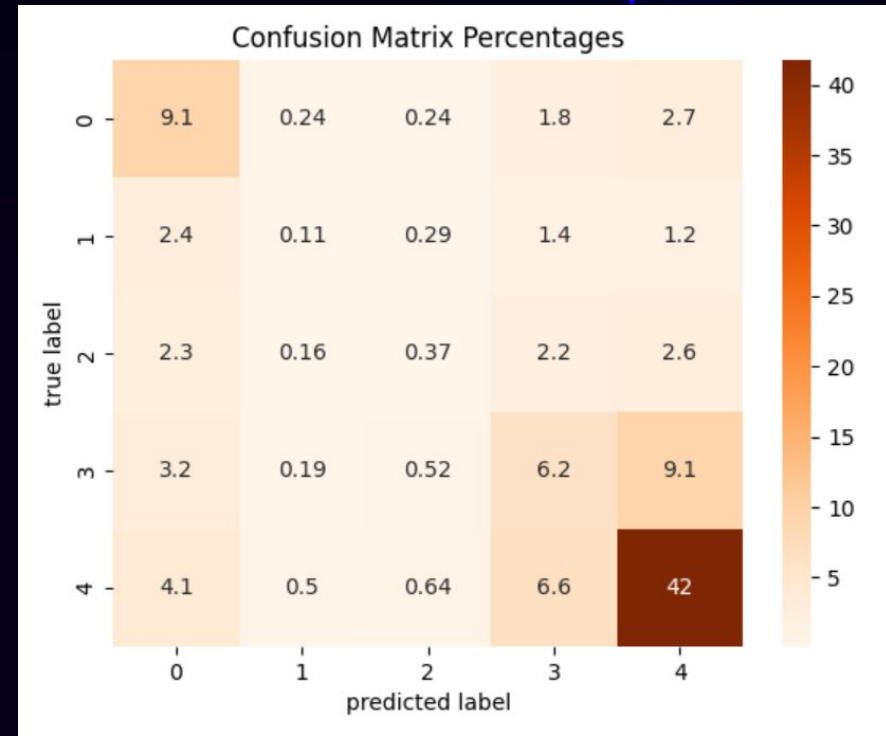
# Modeling

## Complement Naive Bayes Classifier:

Performed better than any other classifiers and also better than a regression model which would have assigned ratings on a scale of 0.0-4 rather than as categories 0, 1, 2, 3, and 4.

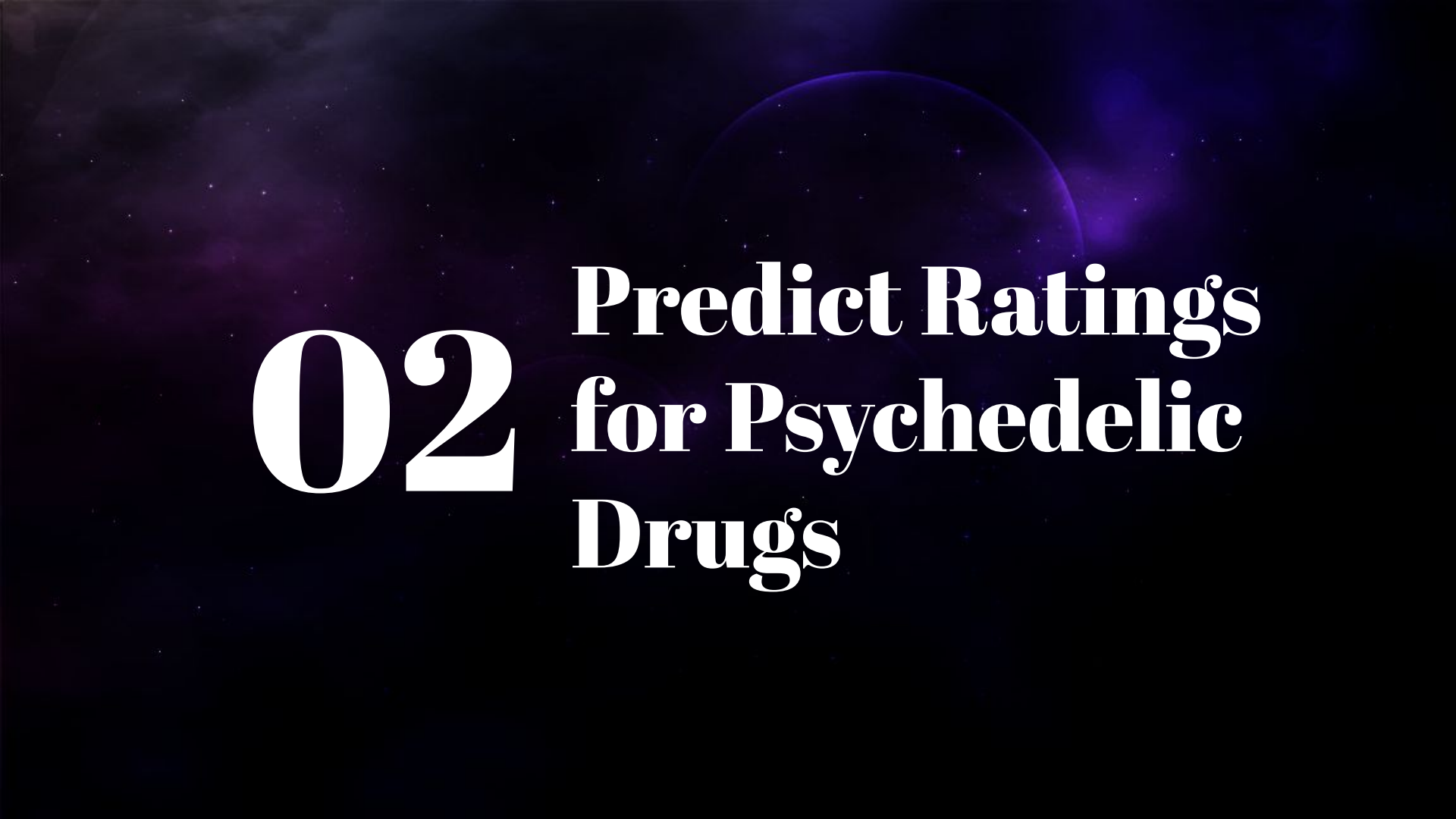
### Naive Model Metrics:

- Log Loss: 16.76 (lower is better)
- F1: 0.53 (higher is better)



### Final Model Evaluation:

- Log Loss: 1.27
- Roc-auc: 0.75
- F1: 0.58
- Accuracy Best K w/ k=2: 0.73

The background is a deep space scene featuring a vibrant purple nebula with wispy, glowing clouds. A large, dark planet with a thin, glowing purple ring is visible in the upper right quadrant. The overall color palette is dominated by dark blues, purples, and blacks, with bright white text providing high contrast.

# 02 Predict Ratings for Psychedelic Drugs

# Psychedelic Experience Reports

4,562 reports scraped from erowid.org experience vaults

Drug Categories Targeted in Scraping				
Category:	Tryptamines	Phenethylamines	Arylcyclohexylamines	Other Entheogens
Popular Examples:	LSD (Acid) Mushrooms DMT	MDMA (Molly) Mescaline 2C-X	Ketamine PCP PCE	Herbal Ecstasy Ibogaine Harmaline

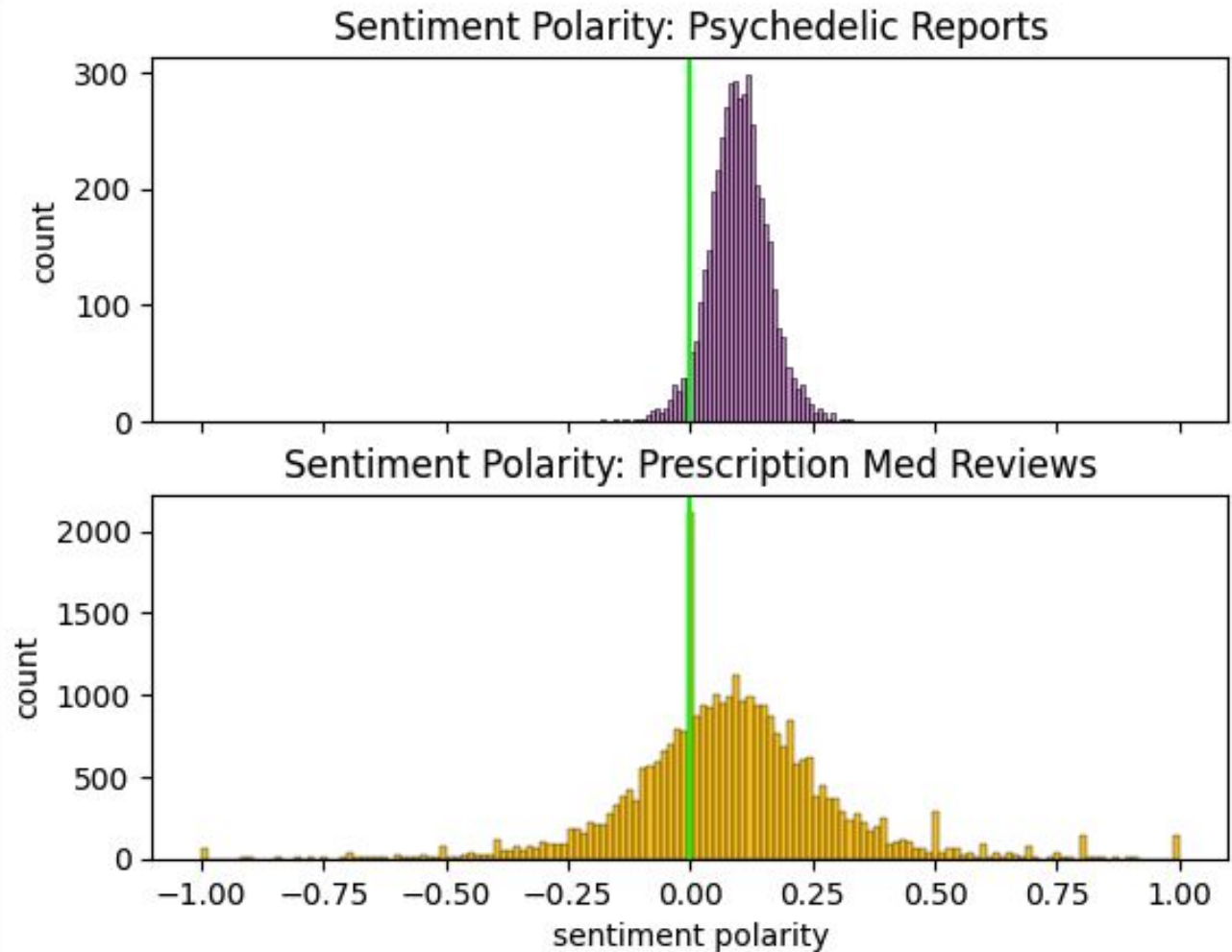
# Results

Average Ratings	
Psych Meds	Psychedelics
3.93	4.49

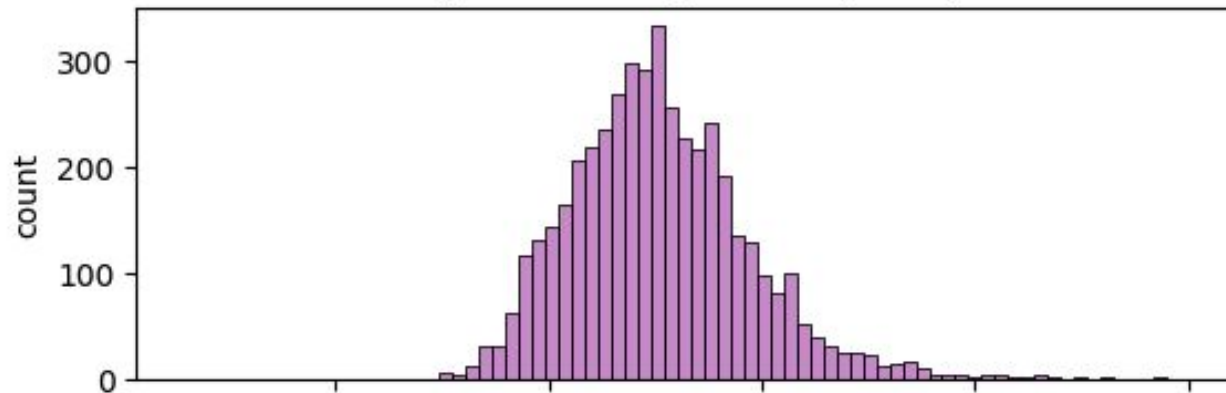
## Potential Explanations:

- **Straightforward:** People have more positive experiences with psychedelics.
- **Source:** Erowid does include “bad trips” but may be skewed toward psychedelic enthusiasts.
- **Sensitivity:** More sophisticated NLP techniques could lead a model to more accurately pick up on key features that may be associated with lower ratings.

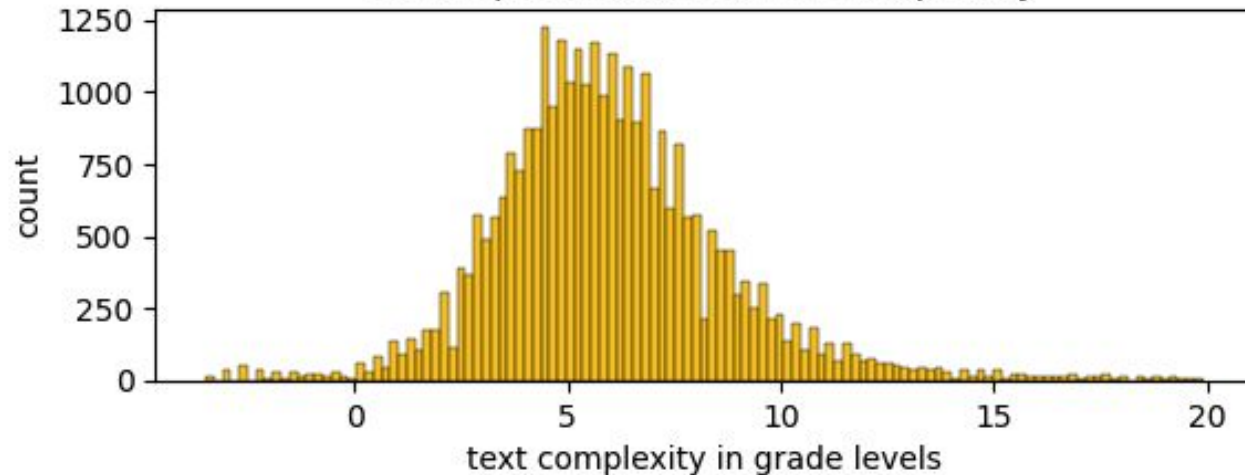
# Compare on Key Metric: Polarity



Psychedelic Report Complexity

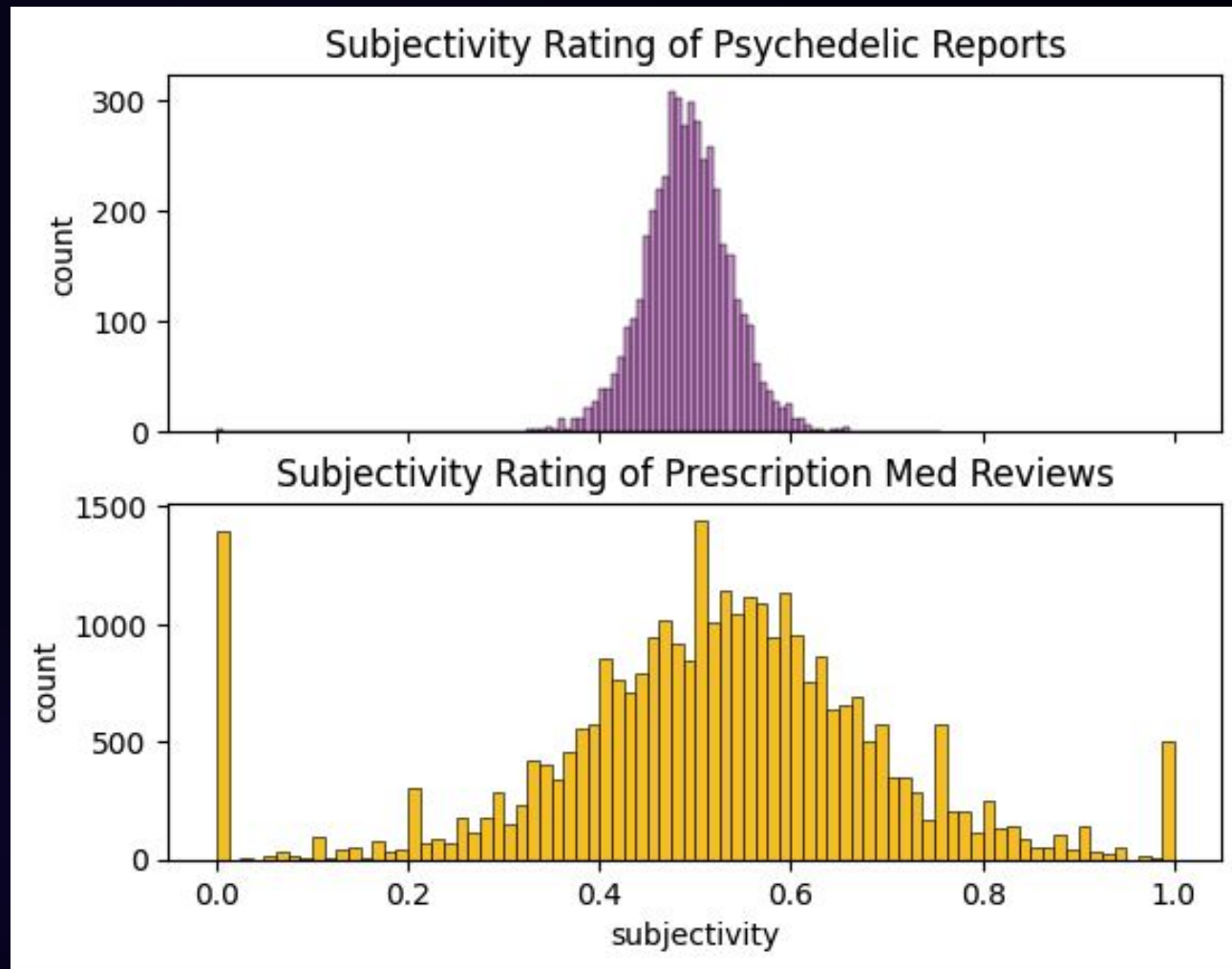


Prescription Med Review Complexity

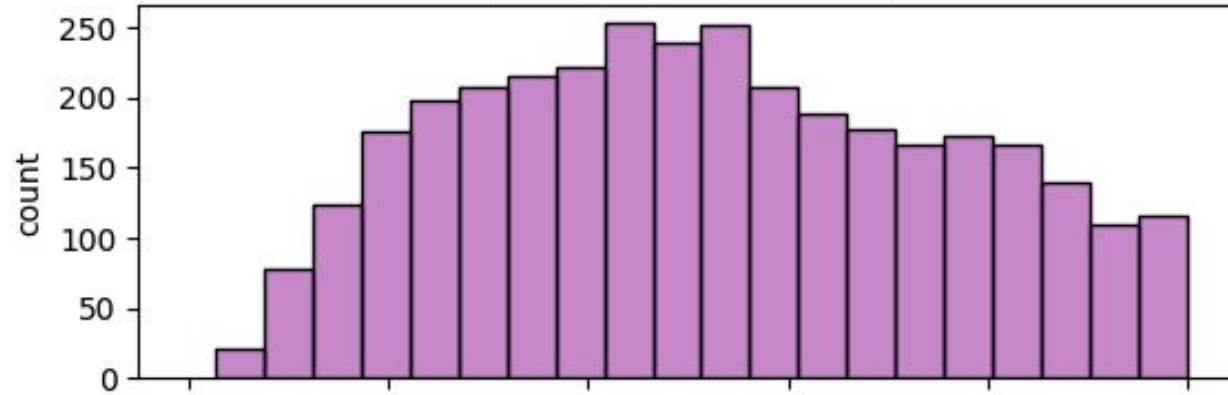


**Other  
Comparisons:  
Complexity**

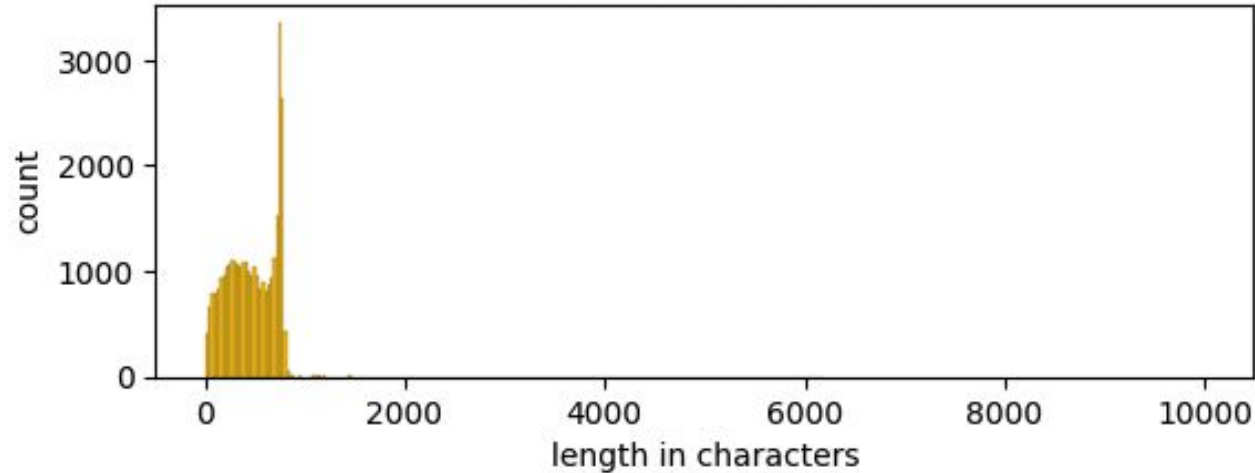
# Other Comparisons: Subjectivity



Psychedelic Report Length



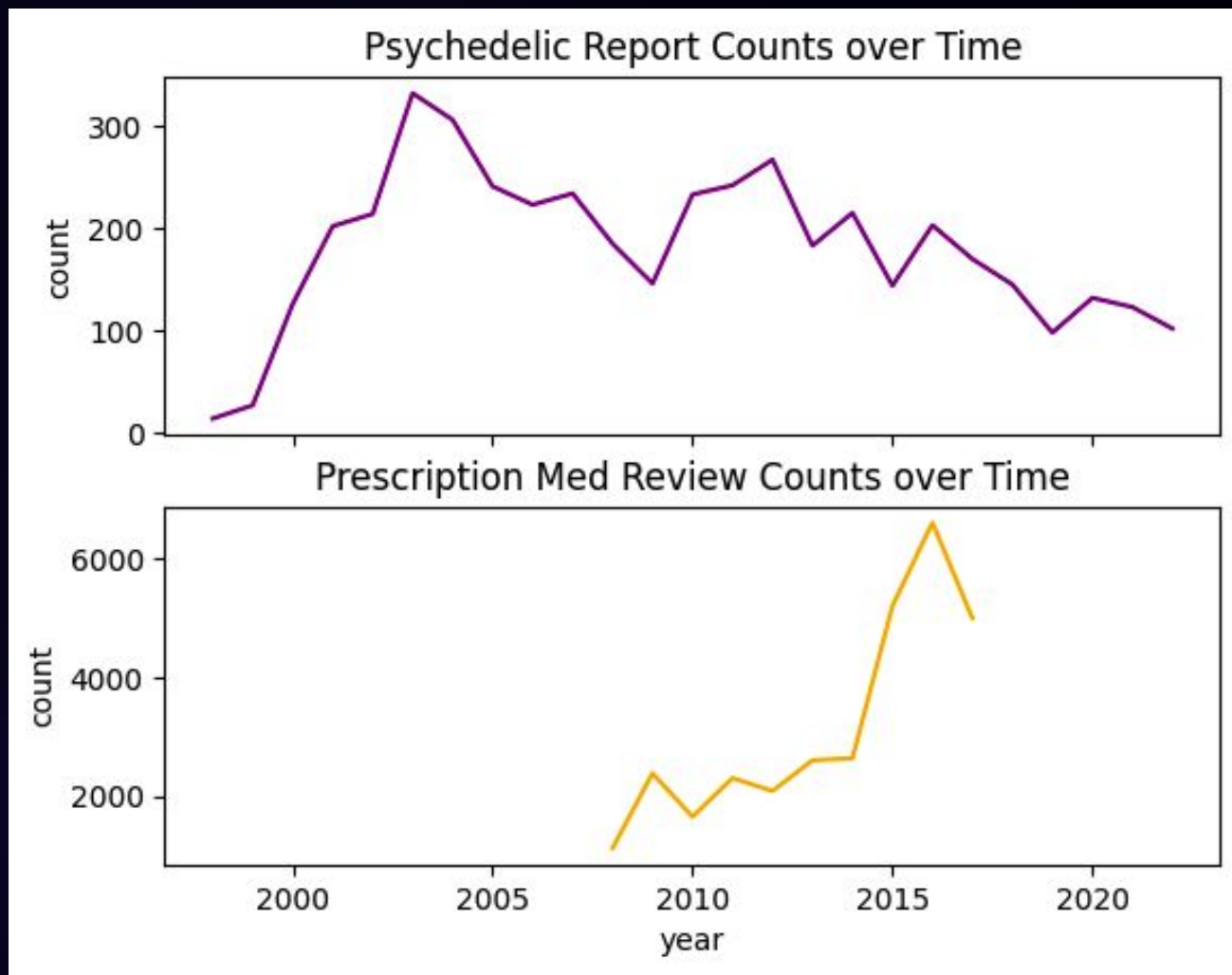
Prescription Med Review Length



**Other  
Comparisons:  
Length**



# Other Comparisons: Submission Year



# Comparing Words Used in Each Dataset

**Appear in Both  
Sets' Top 20 Most  
Common Words**

come,  
experience,  
friend, get,  
hour, know,  
look, much, no,  
thing, think,  
trip, try

**More Common in  
Psychedelic  
Experience Reports**

effect  
feel  
go  
like  
start  
take  
time

!, anxiety, day,  
depression,  
help, life,  
meditation, mg,  
month, sleep,  
week, work,  
year

**More Common in  
Prescription Psych  
Med Reviews**

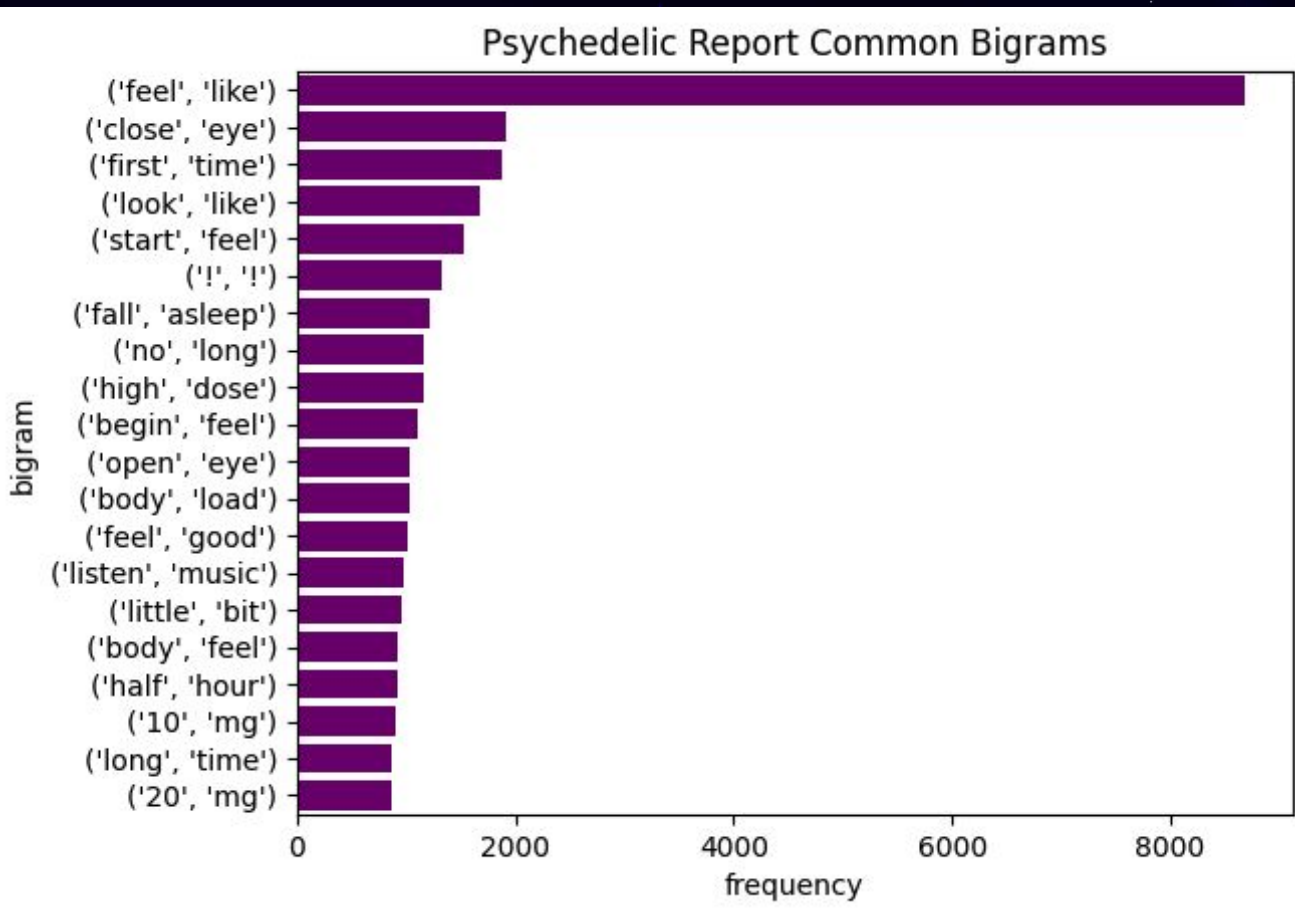
# What about Bigrams? (two-lemma phrases)

Appear in Both  
Sets' Top 20 Most  
Common Bigrams

!!

fall asleep  
feel like  
10 mg  
20 mg

lemma = basic version of a  
word, similar to a root word

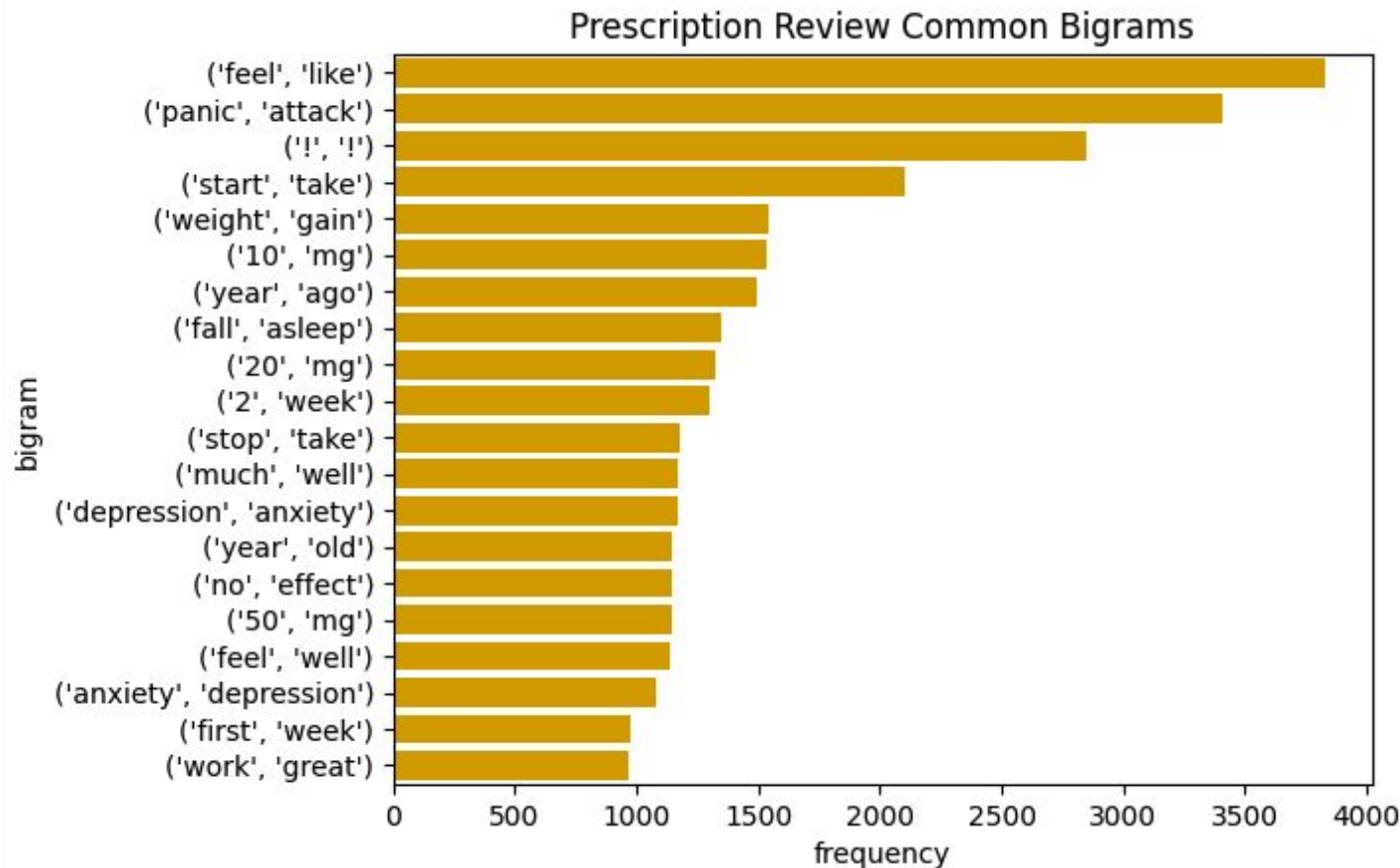


# Bigrams

Appear in Both  
Sets' Top 20 Most  
Common Bigrams

!!

fall asleep  
feel like  
10 mg  
20 mg



# And Trigrams?

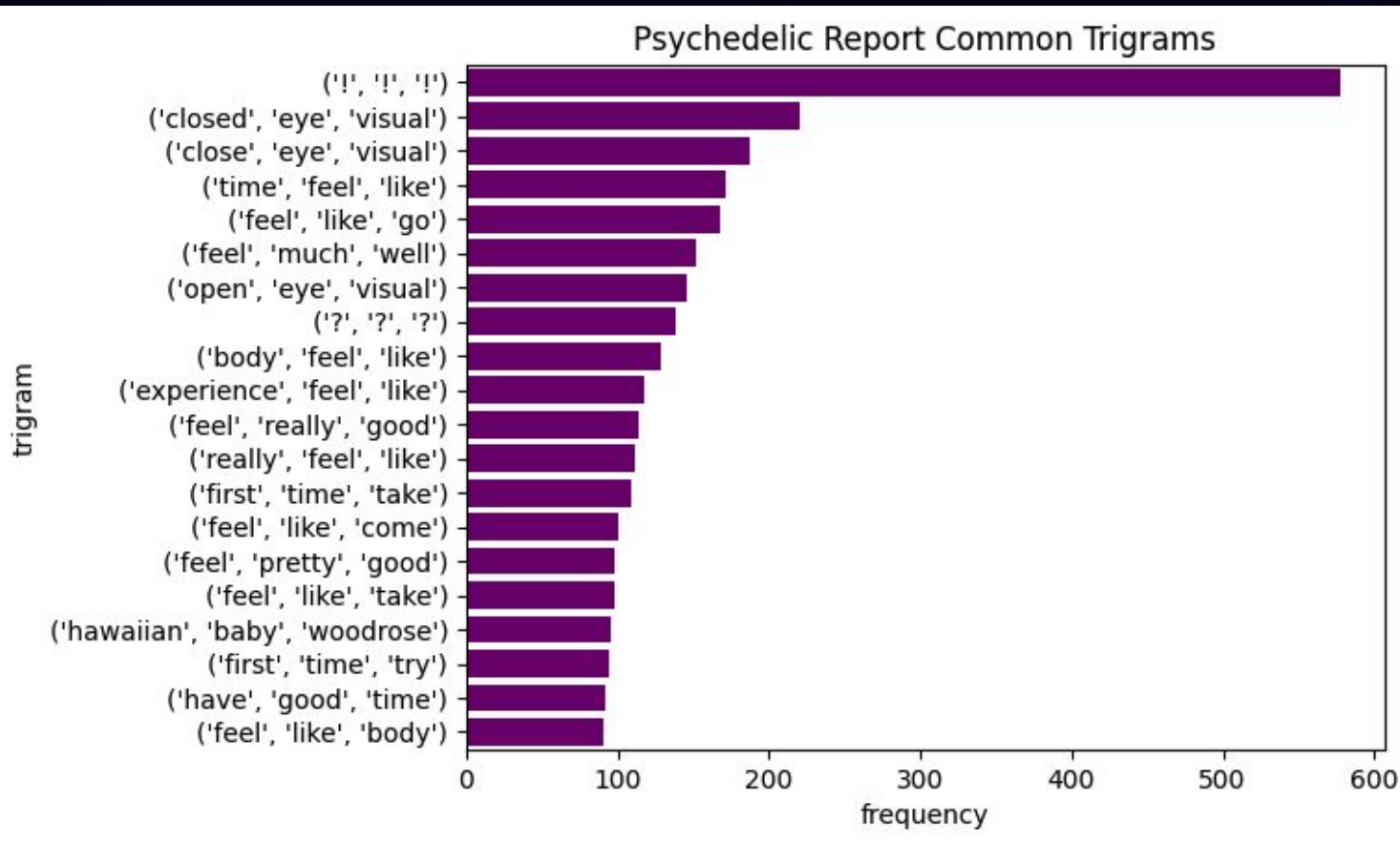
Appear in Both  
Sets' Top 20  
Most Common  
Trigrams

!!!

“feel like  
go”

“feel much  
well”

Note: high-frequency  
words like “it,” “the,”  
removed

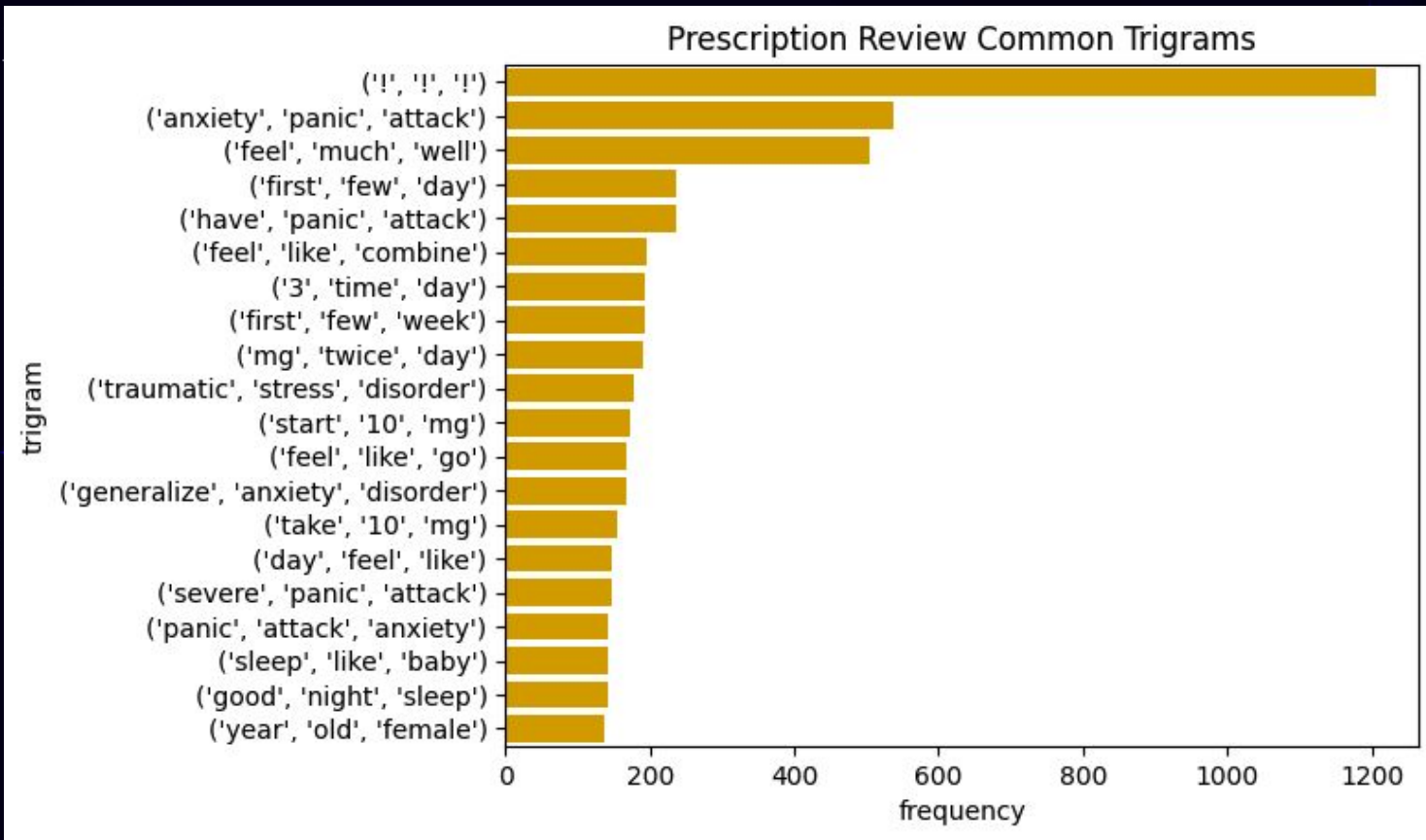


# Trigrams

Appear in Both  
Sets' Top 20  
Most Common  
Trigrams

!!!

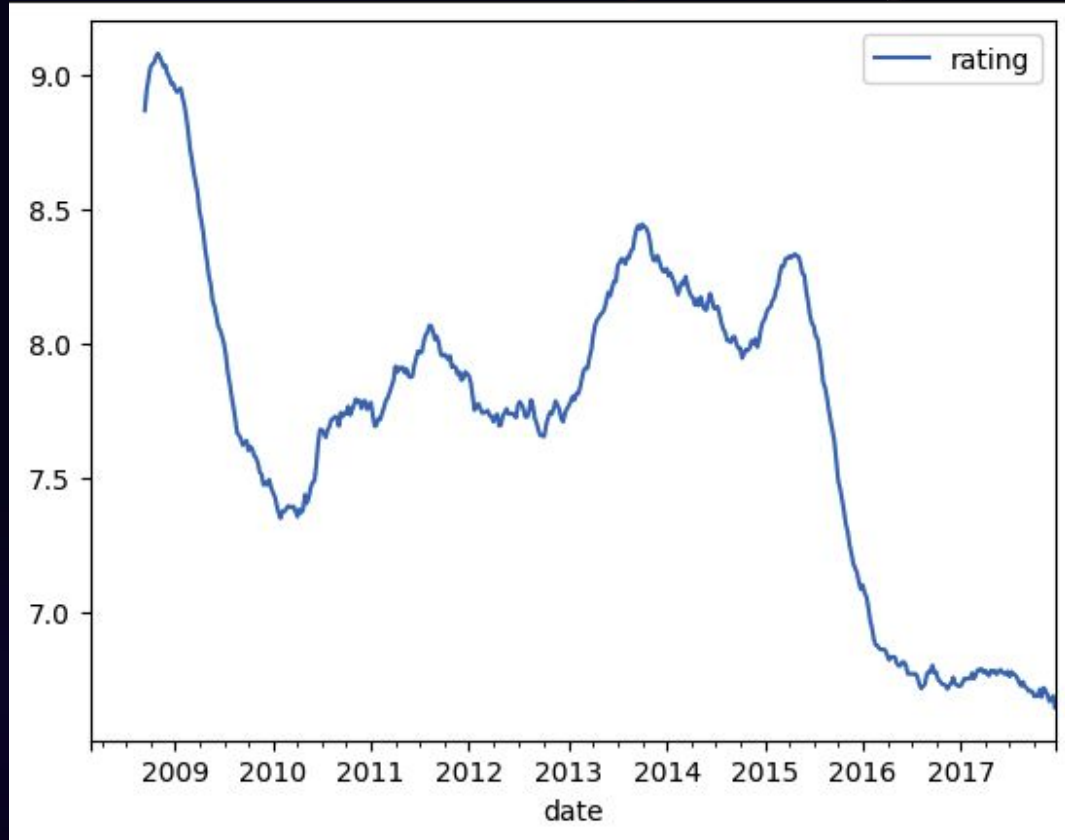
“feel like  
go”  
“feel much  
well”



# Interesting Discovery Along the Way

## Prescription Psych Meds' Average Rating Over Time on a Scale of 1-10.

- What happened in 2009 and 2016?
- (No months had average ratings under 6.5.)
- No such major variation over time exists among the psychedelic reports' ratings.



# Recommendations

## Healthcare

Explore further applications of psychedelic drugs, which have time and again been shown to work as well as or better than benzos, SSRIs, etc. for common mental illnesses for many people.

## Advocacy

Pursue decriminalization of all drugs. This report suggests favorable effects of psychedelics. Nobody has my permission, however, to use my work to spread myths about psychedelic drug users being wiser, safer, etc. than users of any criminalized substances. Nobody should be punished for putting things in their bodies in an attempt to relieve suffering or feel well, whether or not they succeed.

## Research

Conduct further studies of therapeutic applications of psychedelic drugs, as this analysis indicates promise for their efficacy but could be improved upon methodologically.



# Next Steps

- 1. Improve model:** Shift from word vectorization to word embeddings, to better pick up on nuances in text meaning and accommodate for differences in words used across datasets.
- 2. Expand Dataset:** For now, the only psychedelic experience reports analyzed were scraped from Erowid. Psychonaut Wiki or Reddit are other rich sources of narrative data. These could prove more similar to prescription med reviews in their distribution of sentiment polarity, complexity, length, etc. If that were the case, it would improve reliability of predicted ratings.



# Thanks

Do you have any questions?

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