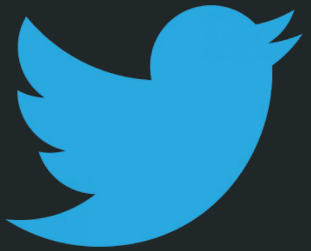
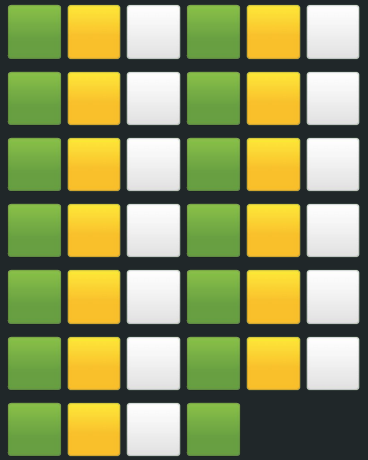
Predicting Wordle User Activity from Tweets

David Tersegno

DSIR 222

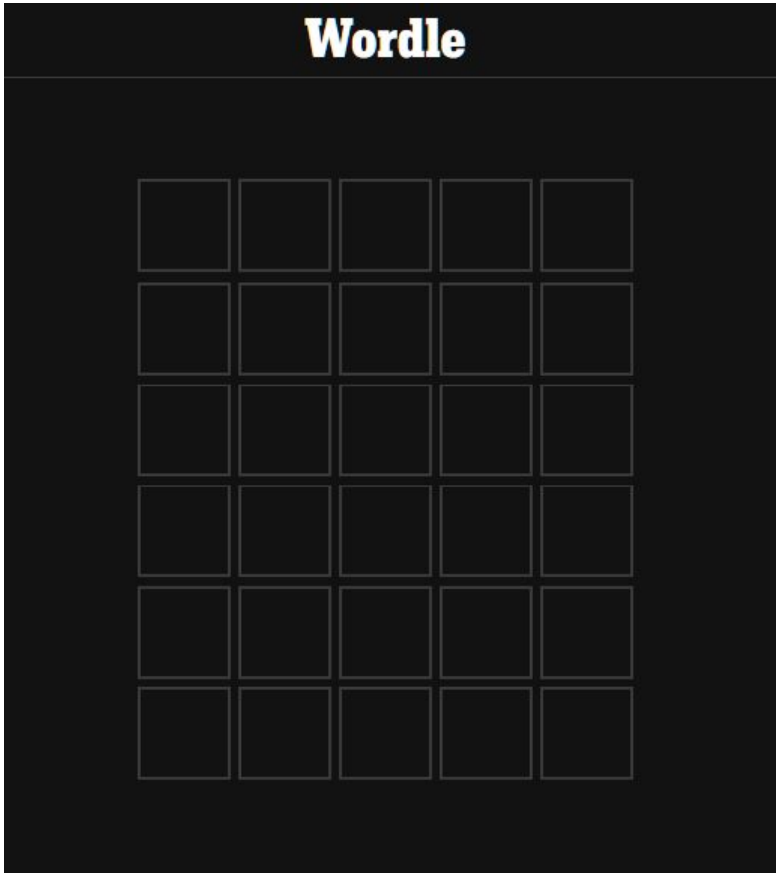
General Assembly capstone





What is Wordle?

- A game of guess-the-word
- Six guesses maximum
- Game tells you which letters are in the solution word
- Game tells you whether letters are placed correctly (🟩) or incorrectly (🟨)
- A row of 🟩🟩🟩🟩🟩 = win!



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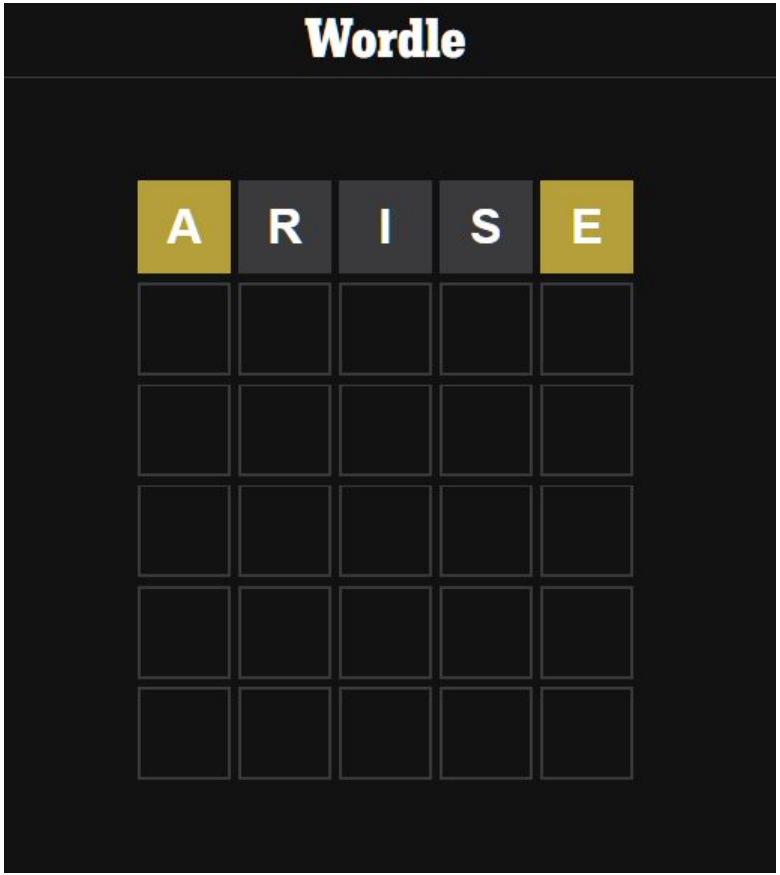

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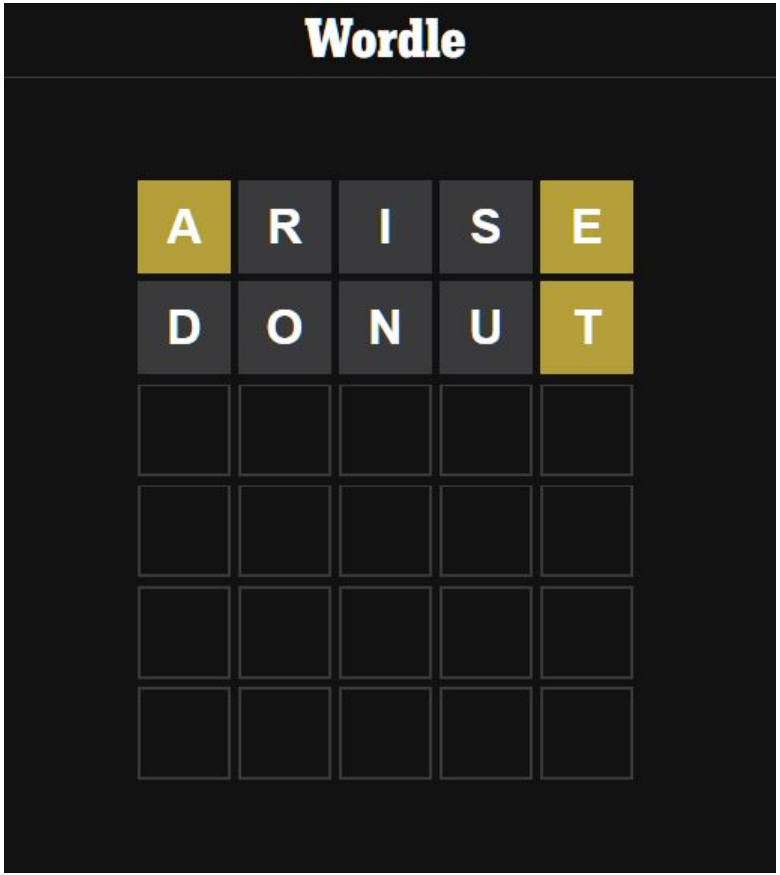

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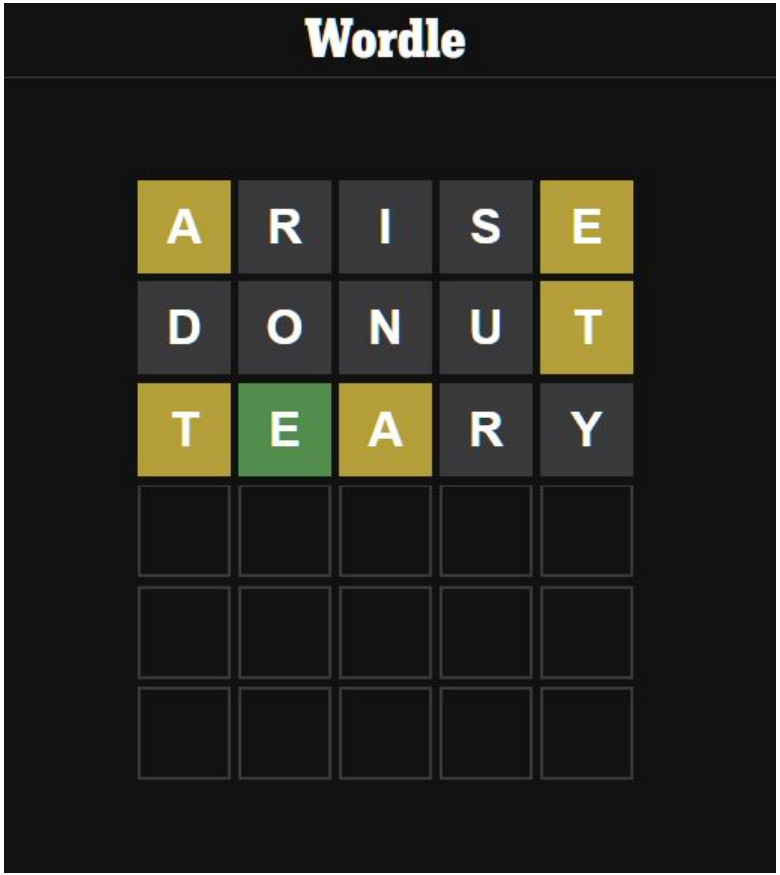

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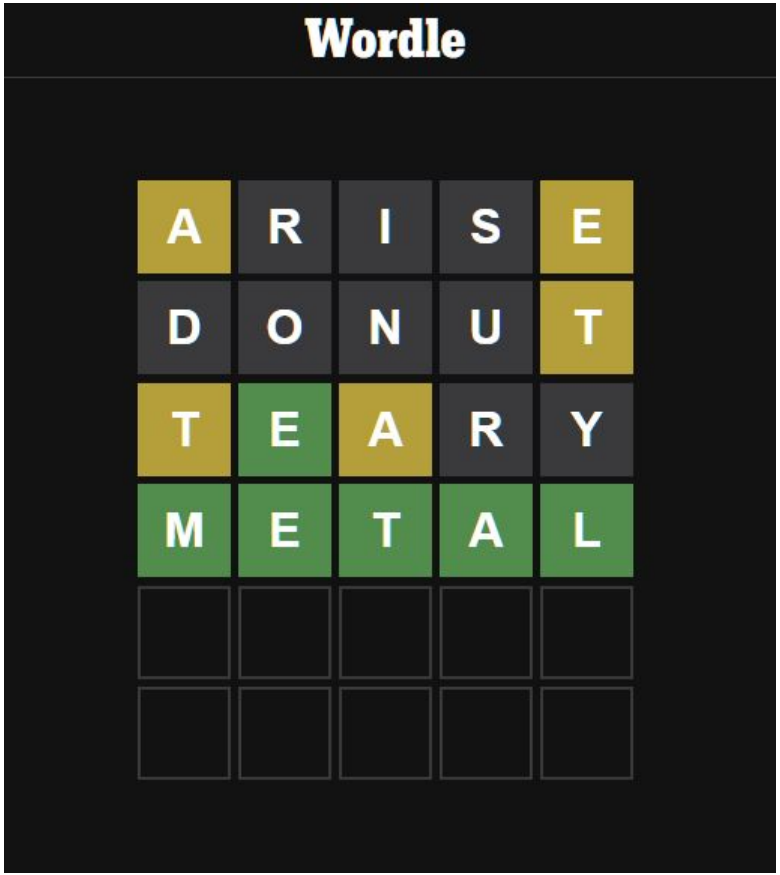
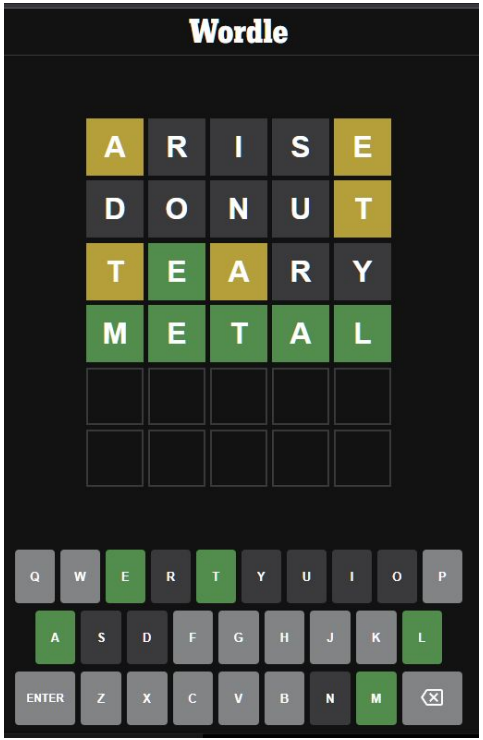


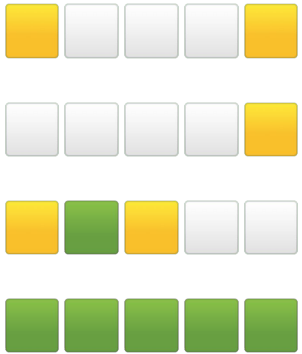
Sharing, comparing, competing

game

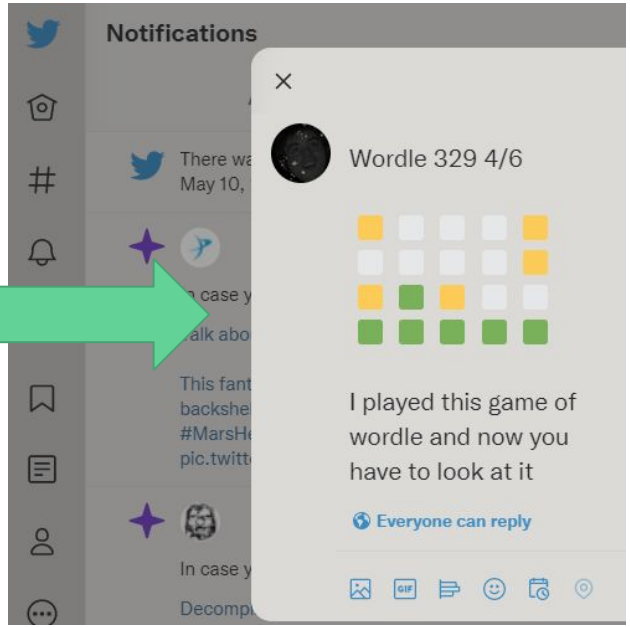


text

Wordle 329 4/6



tweet



Problem Statement

Forecast the rate of Wordle-sharing tweets on Twitter using the Twitter API.

This value reflects the current popularity of the game as well as community engagement.

It is surely correlated strongly with the number of server requests.

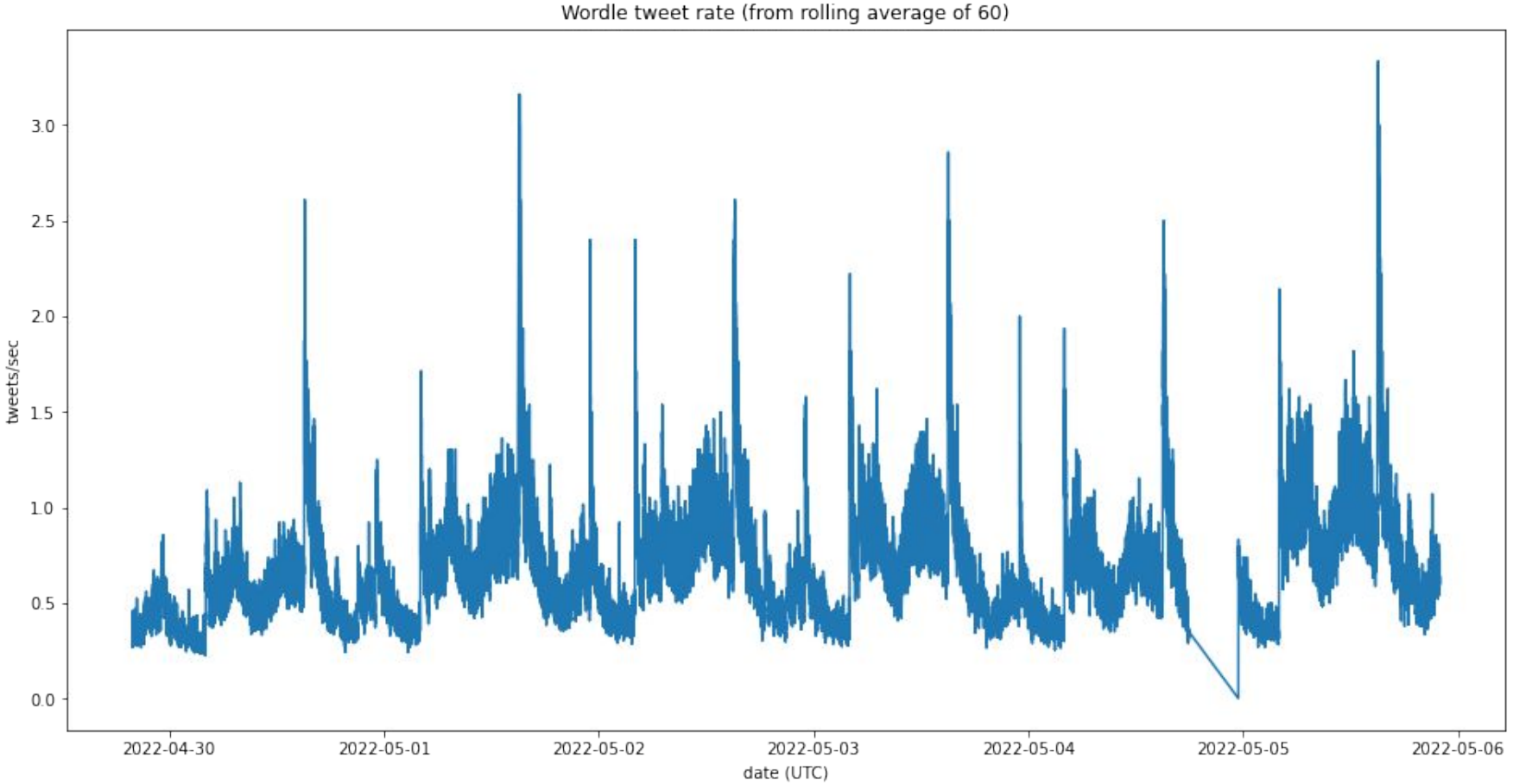
Gathering Data

Data on tweets with “🟩” and “Wordle” in their text was gathered was gathered for tweets made between April 29th and May 5th, 2022.

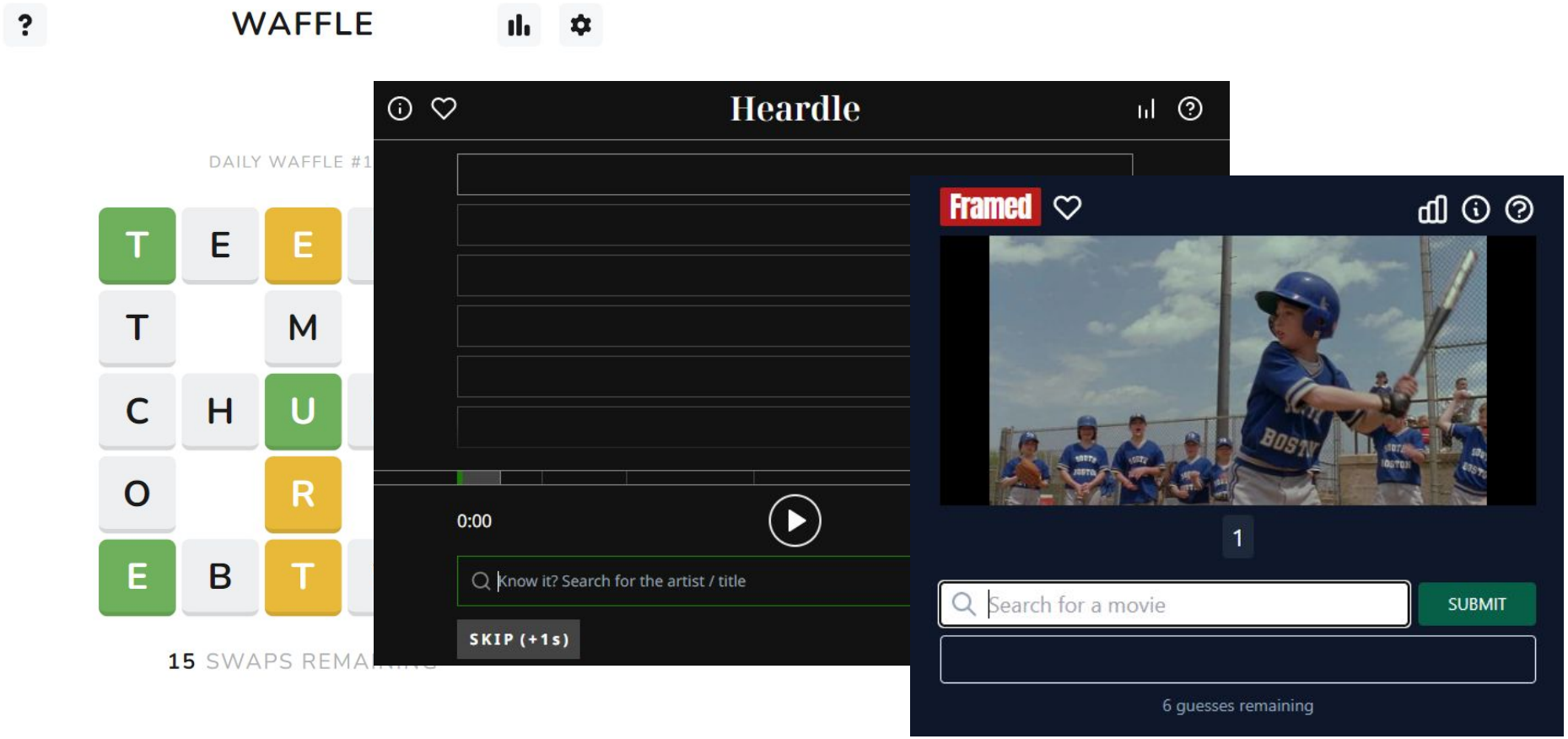
Data included:

- UTC time of tweet post
- Tweet text
- Links
- Retweet, likes, quote numbers
- Username and id
- User reported location
- Twitter-assigned tweet language

Tweets — Rates



Variants

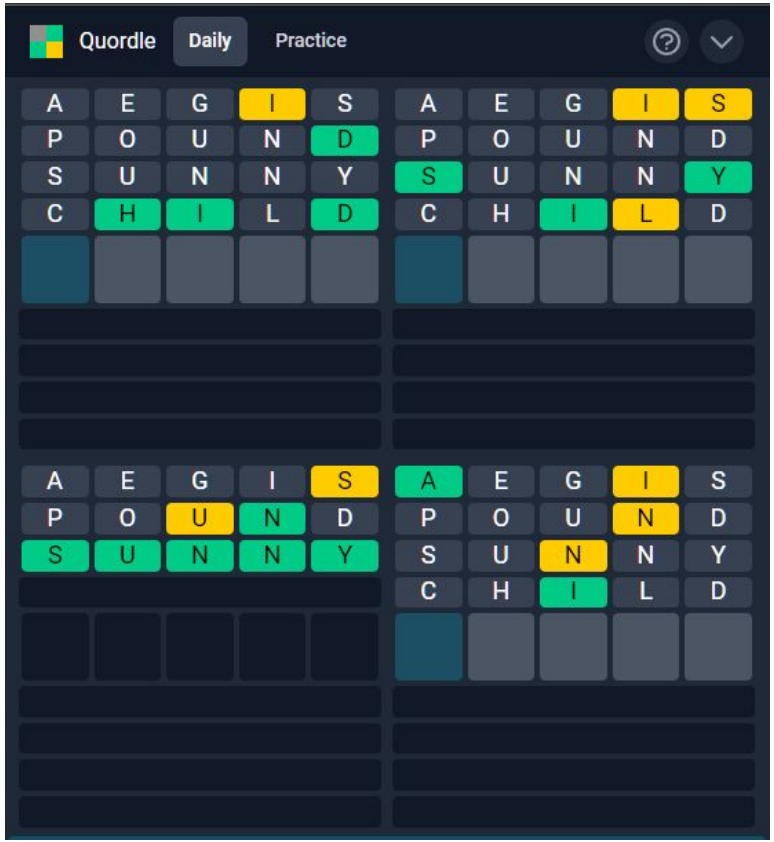

WAFFLE
DAILY WAFFLE #1
T E E
T M
C H U
O R
E B T
15 SWAPS REMAINING
Heardle
0:00
Know it? Search for the artist / title
SKIP (+1s)
Framed
1
Search for a movie
SUBMIT
6 guesses remaining

Variants — number of simultaneous games

Dordle

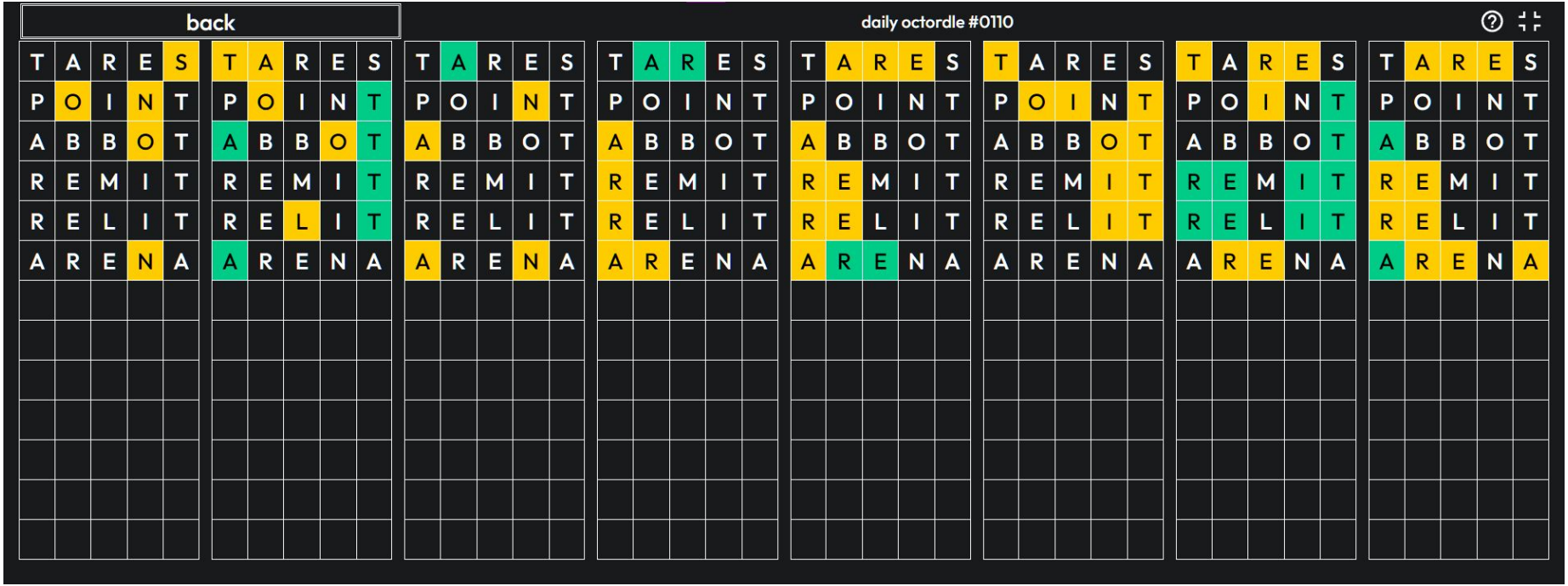
Variants — number of simultaneous games

Quordle



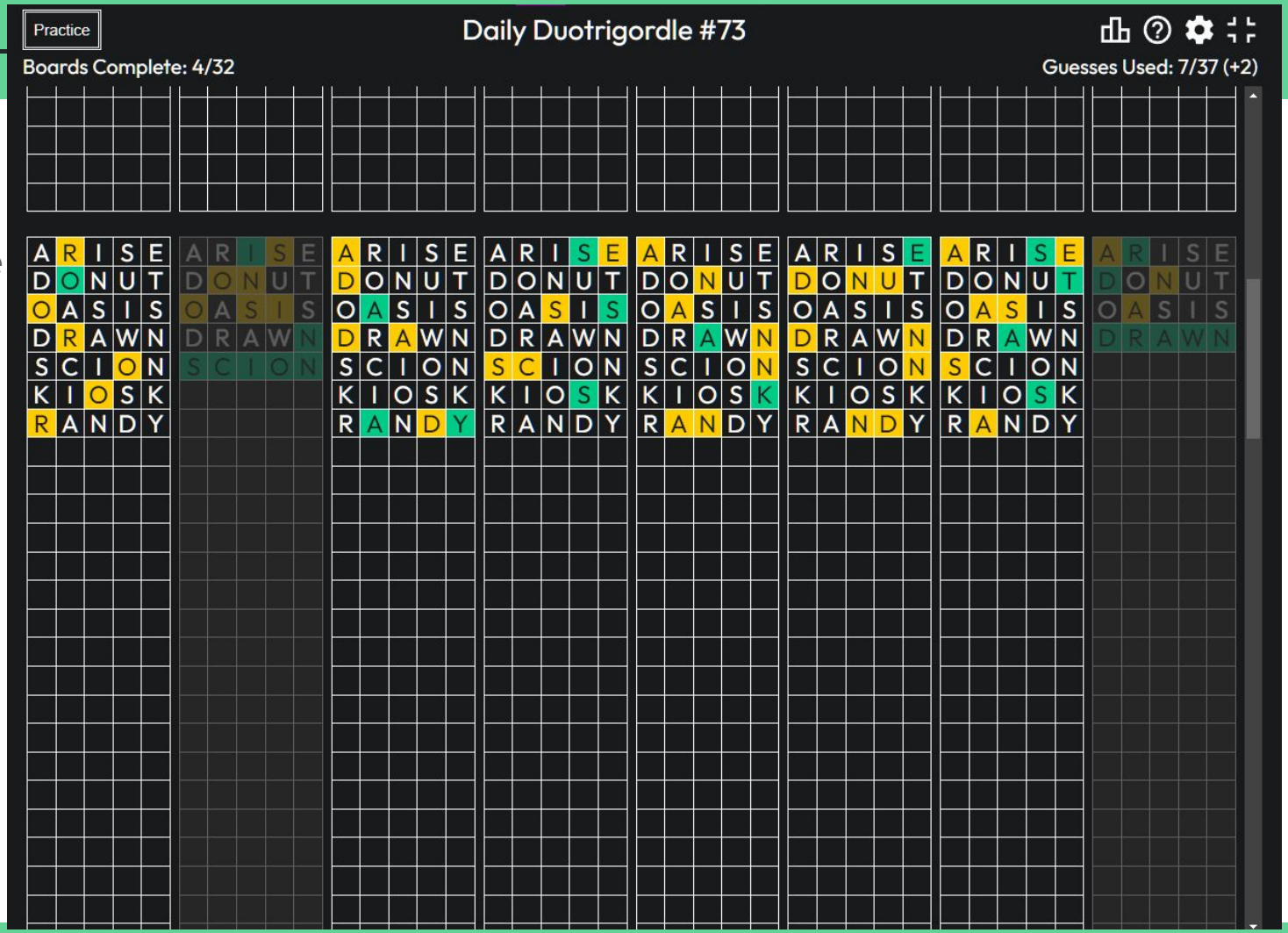
Variants — number of simultaneous games

Octordle

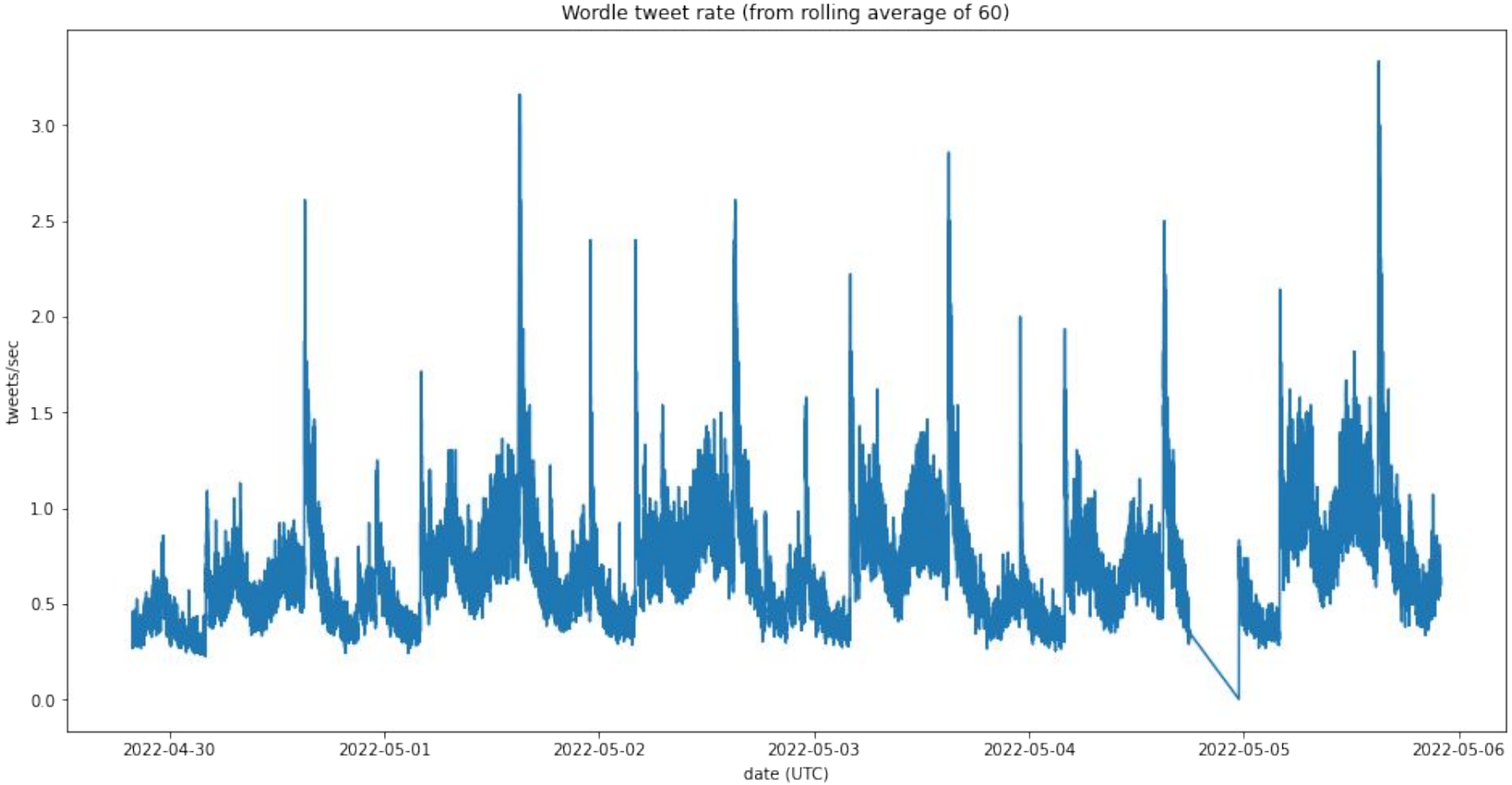


Variants

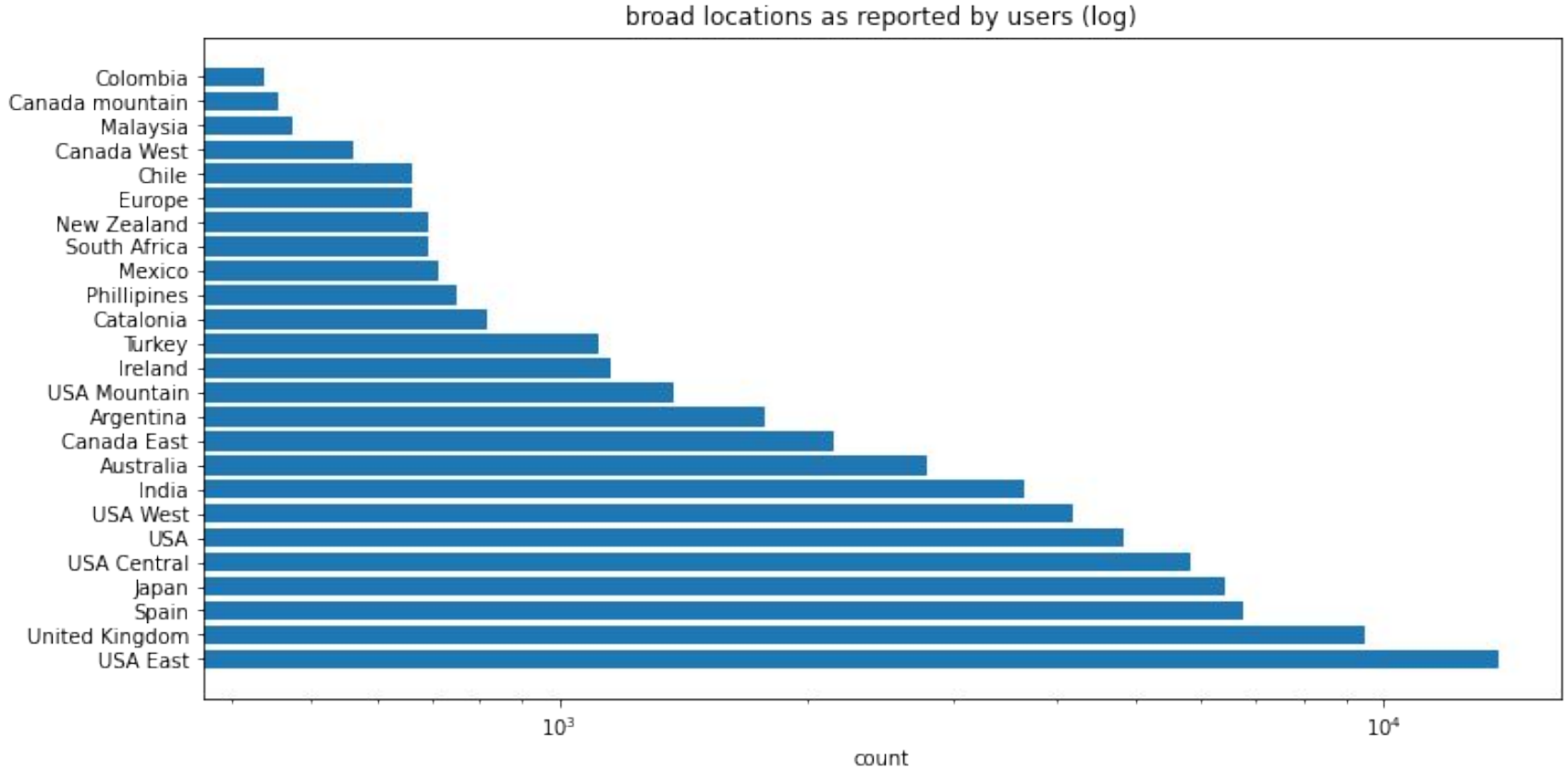
Duotrigordle



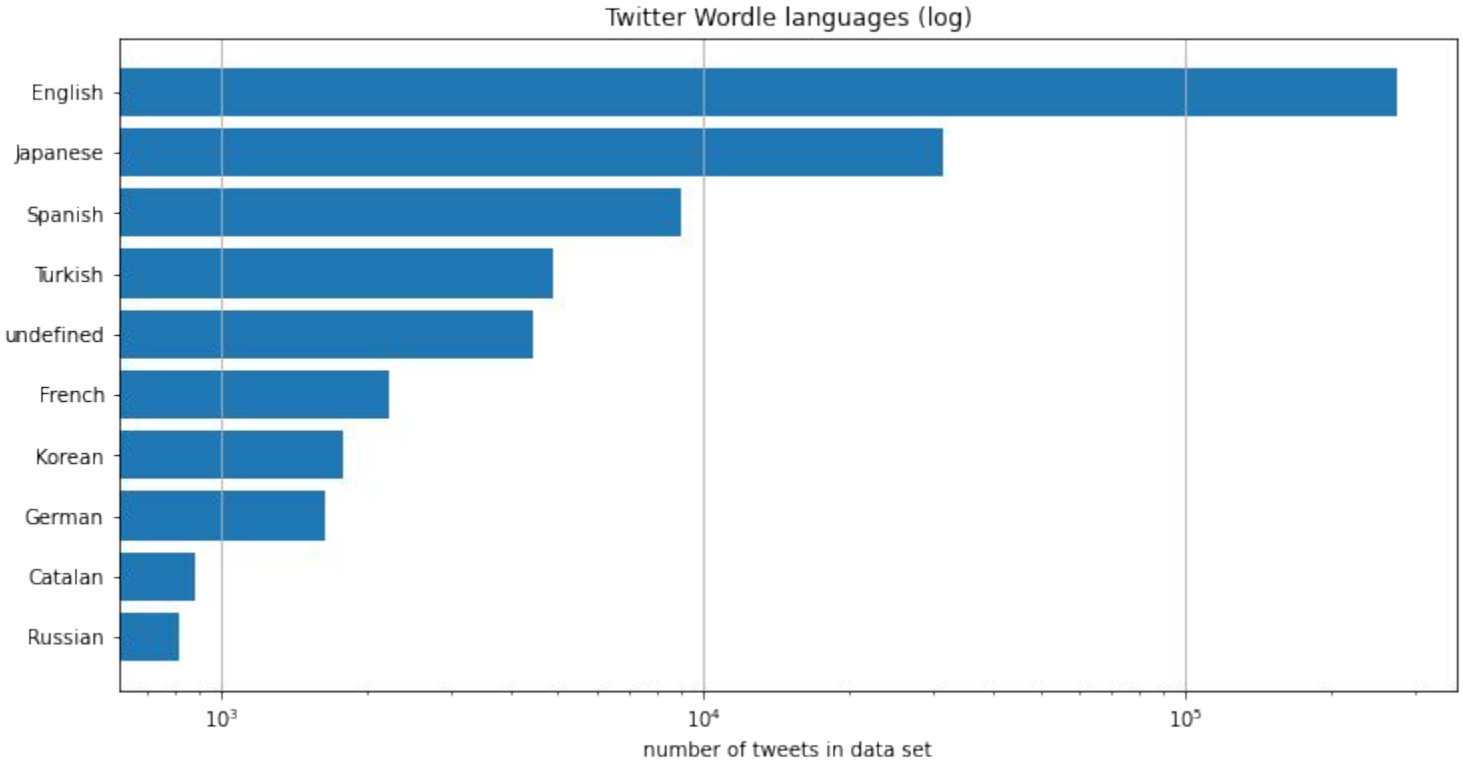
Tweets — Rates



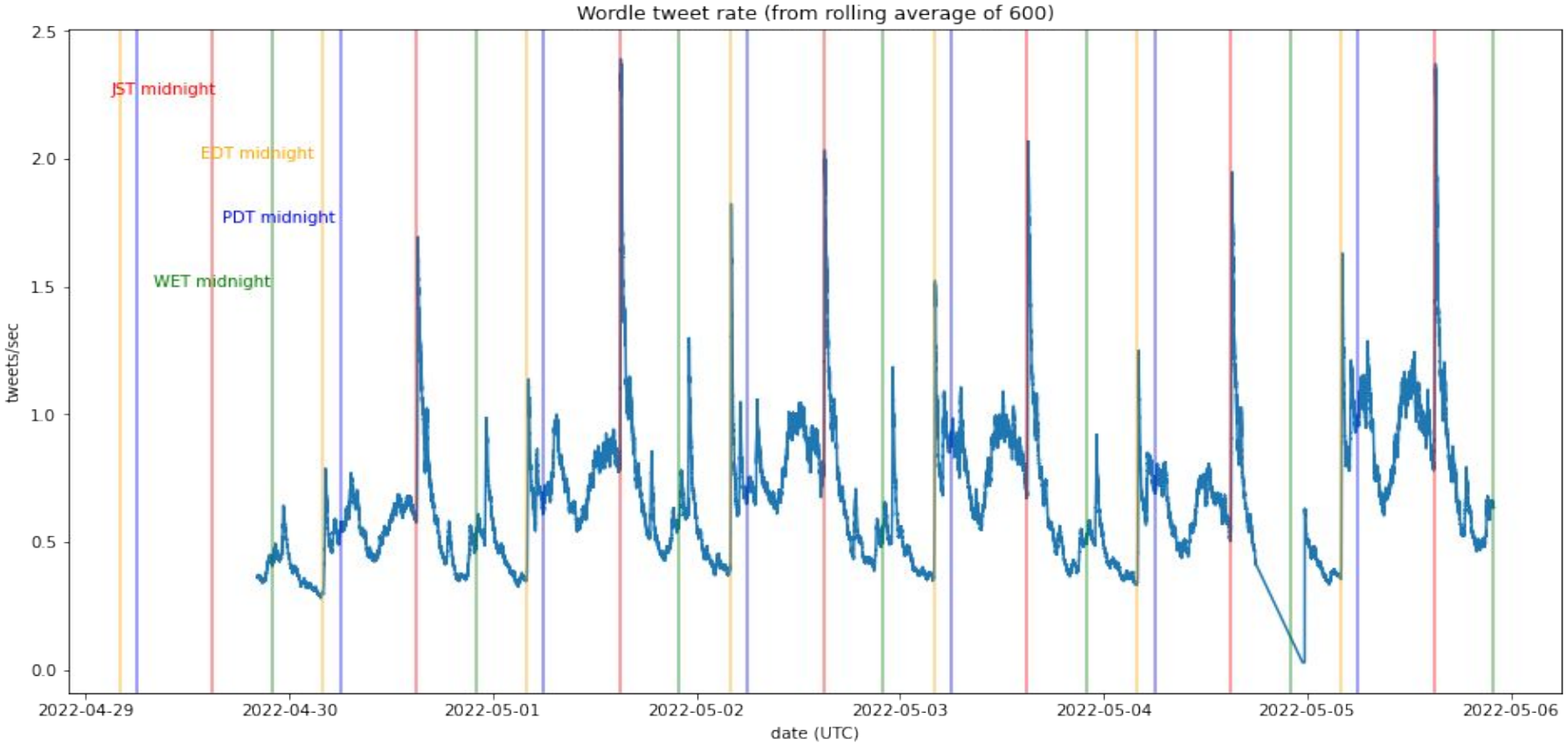
Tweets — User reported location



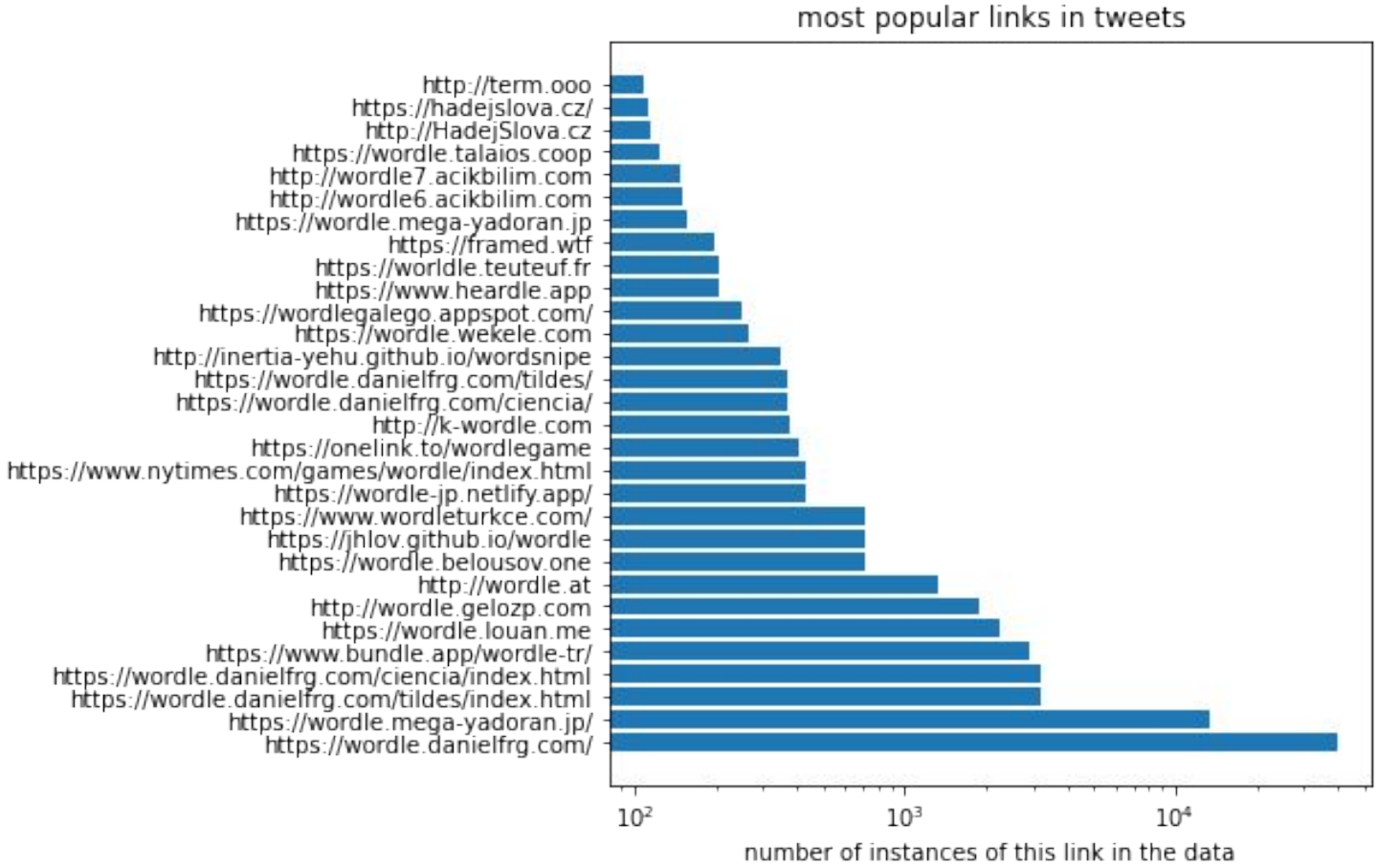
Tweets — Language



Tweets — Rates



Tweets — Links



A large number of links were to foreign language versions.

Revised Problem Statement

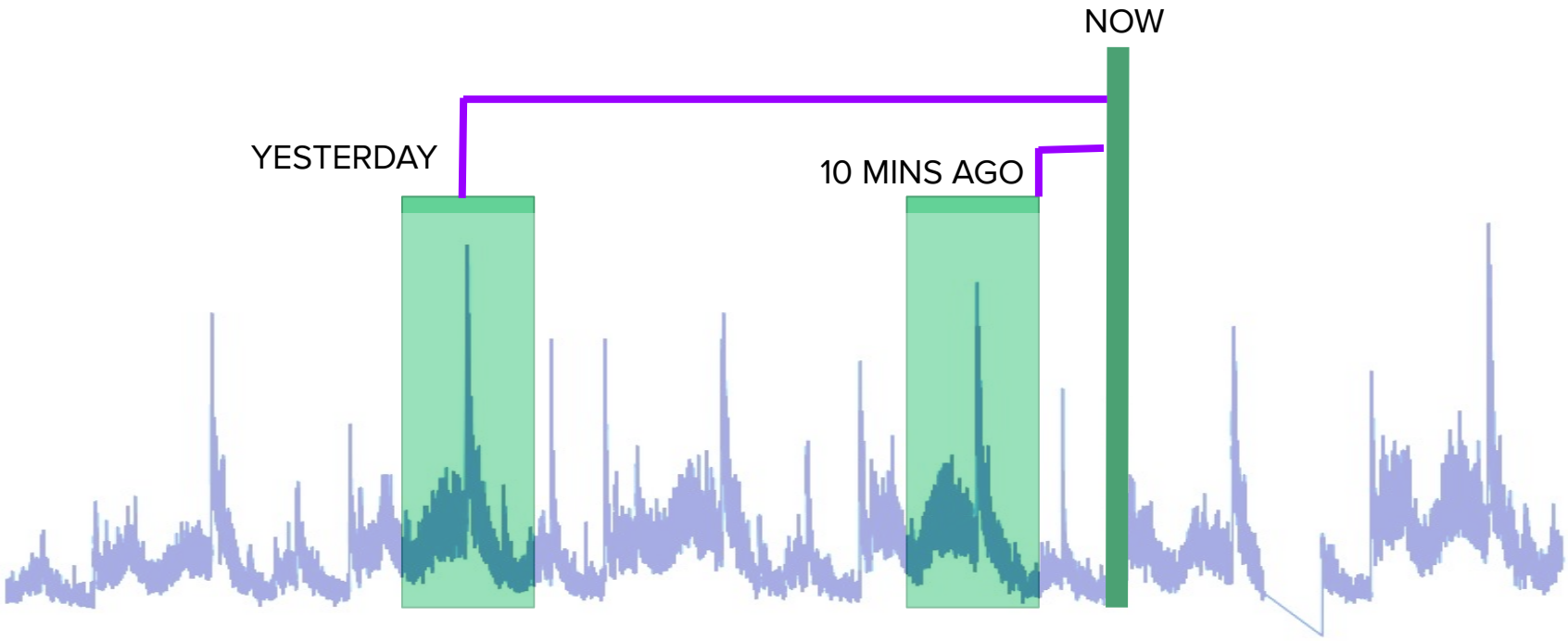
Forecast the rate of all ‘🟩’ & ‘Wordle’ resulting tweets on Twitter using the Twitter API on the minute timescale, ten minutes in advance.

Forecast the fraction of these tweets that are distinctly the NY Times Wordle.

Designing a model

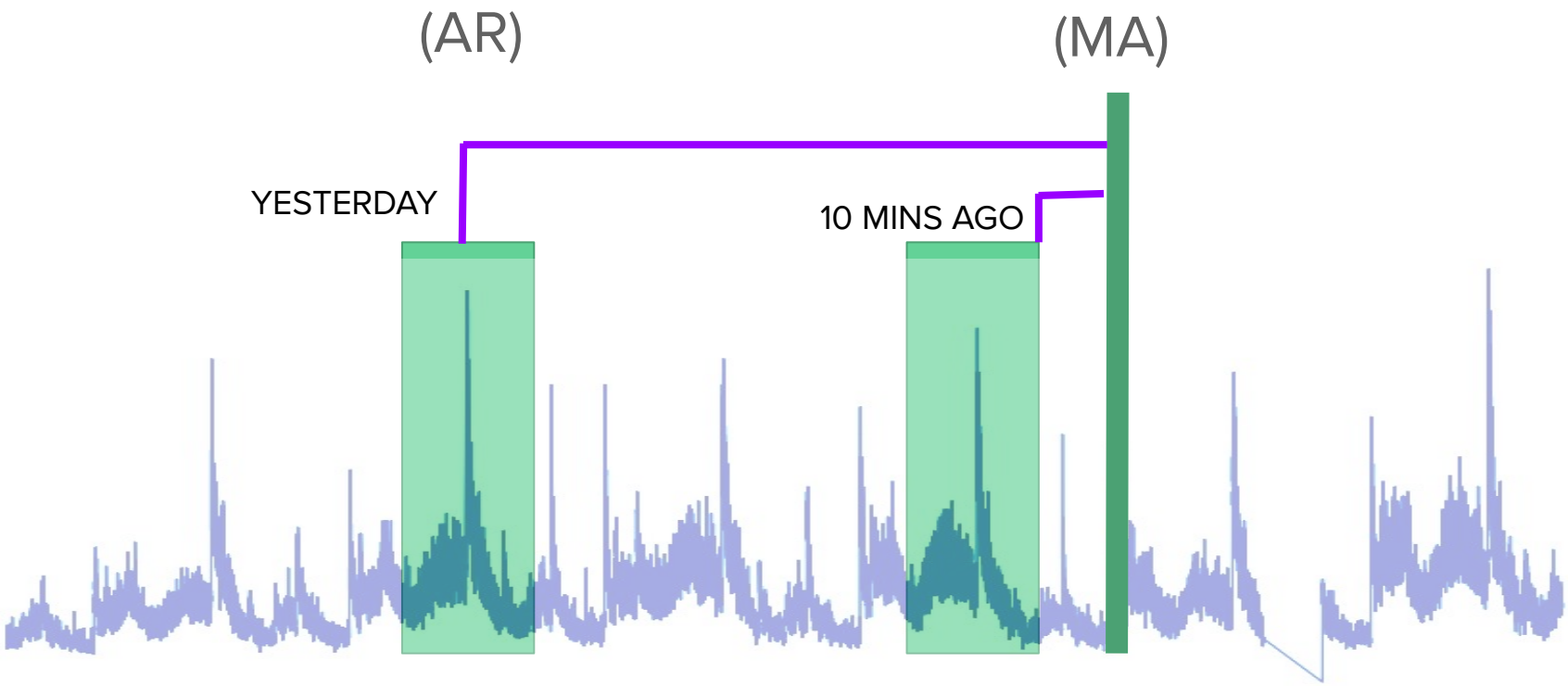
Q: This is a time series problem, so why not ARIMA?

A: Data is too high frequency for the (likely) seasonality.



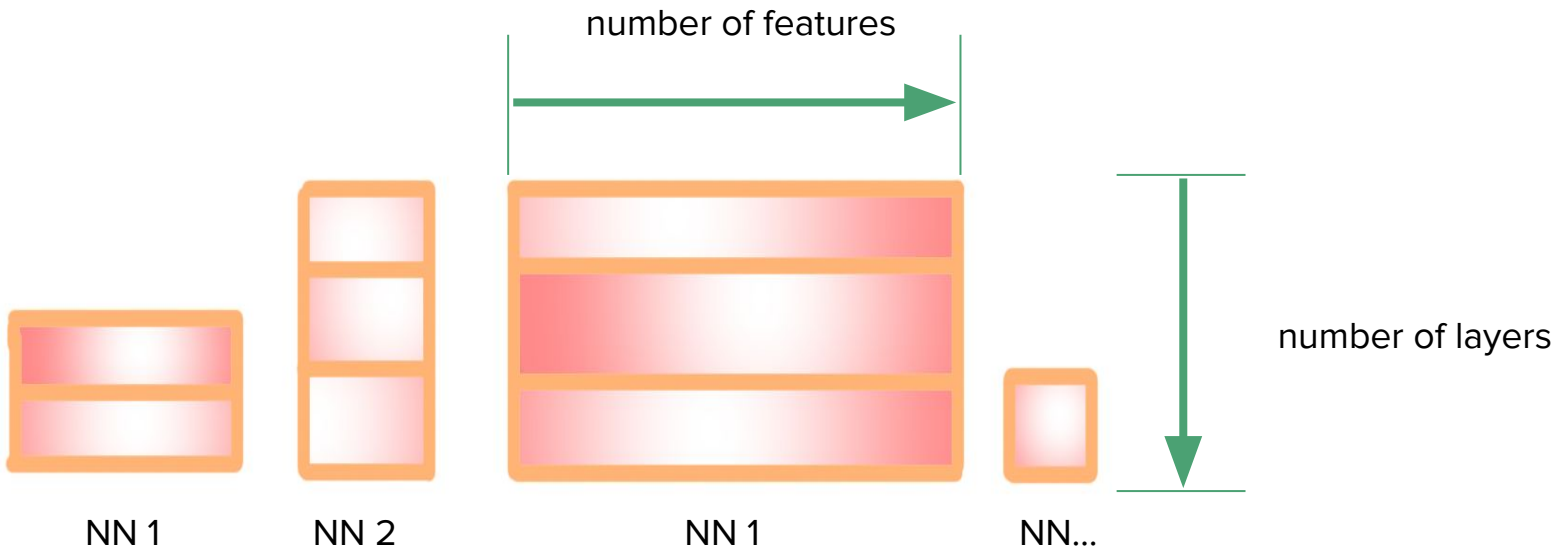
Designing a model

Assume a daily seasonality and pick out a small number of likely-important recent rates.



Designing a model

These data, as well as the time, rates for the numbers of tweets by language, linked game and user location, were fed to neural networks.



Designing a model

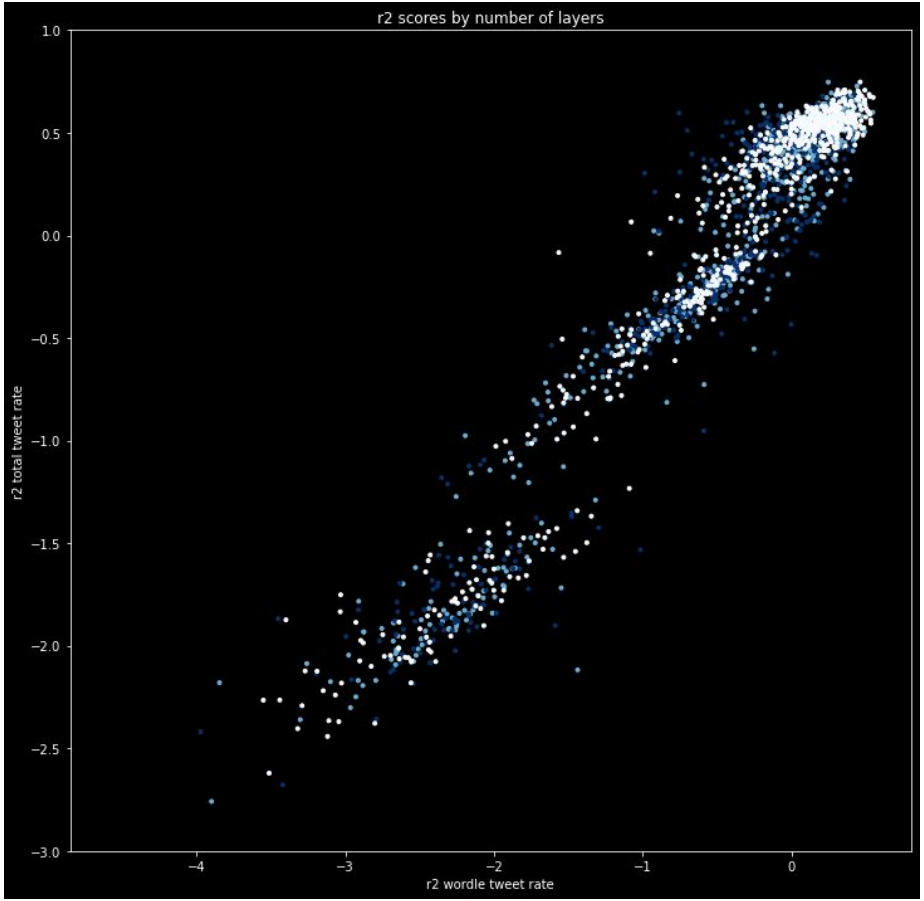
The 2187 trained models had:

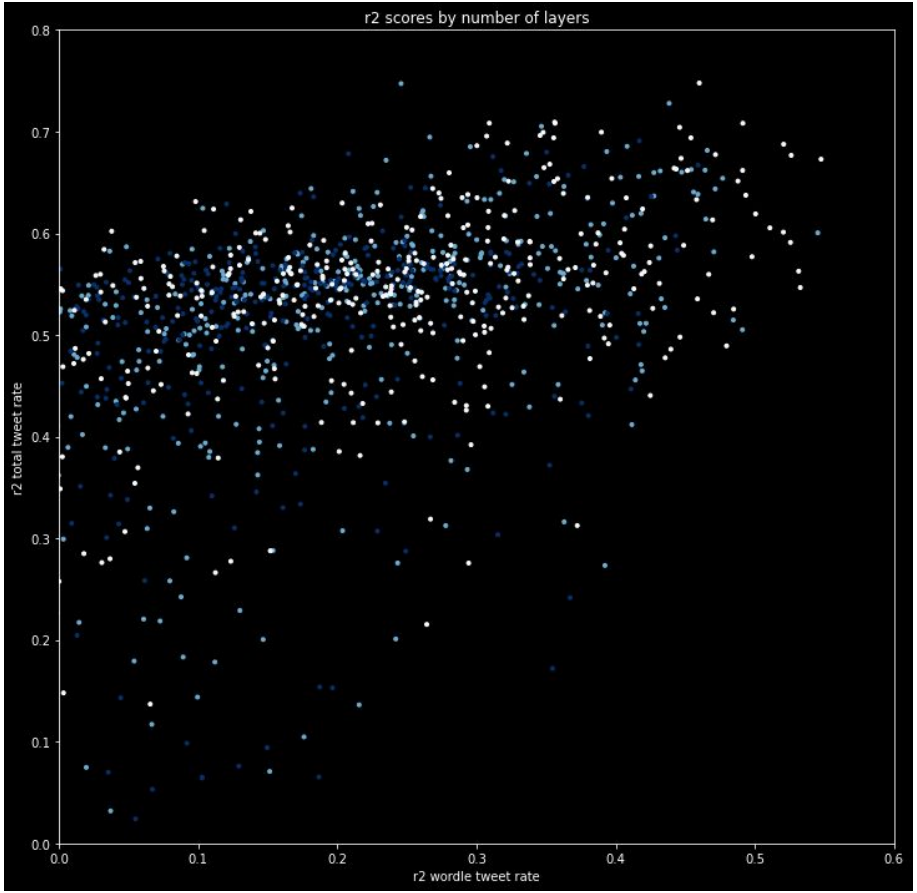
- 0 to 25 popular tracked games by hashtag
- 0 to 20 of the most assigned languages
- 0 to 25 distinct general user-reported locations
- One 10-minute lagged tweet rate value, plus up to 9 more
- One 24-hour lagged tweet rate value, plus up to 20 on either side

- Variable depth
- Variable early stopping patience

They used the post-May 4th-gap data as a validation set.

Model Comparisons — Number of layers (brighter is larger!)





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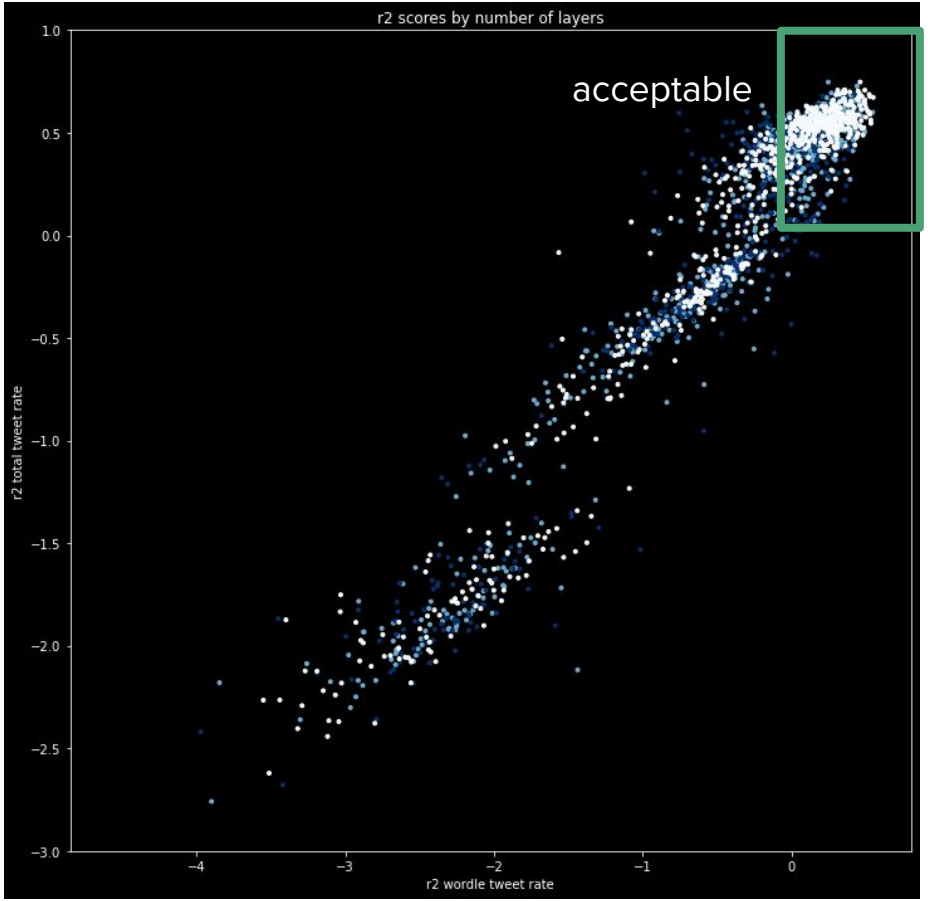
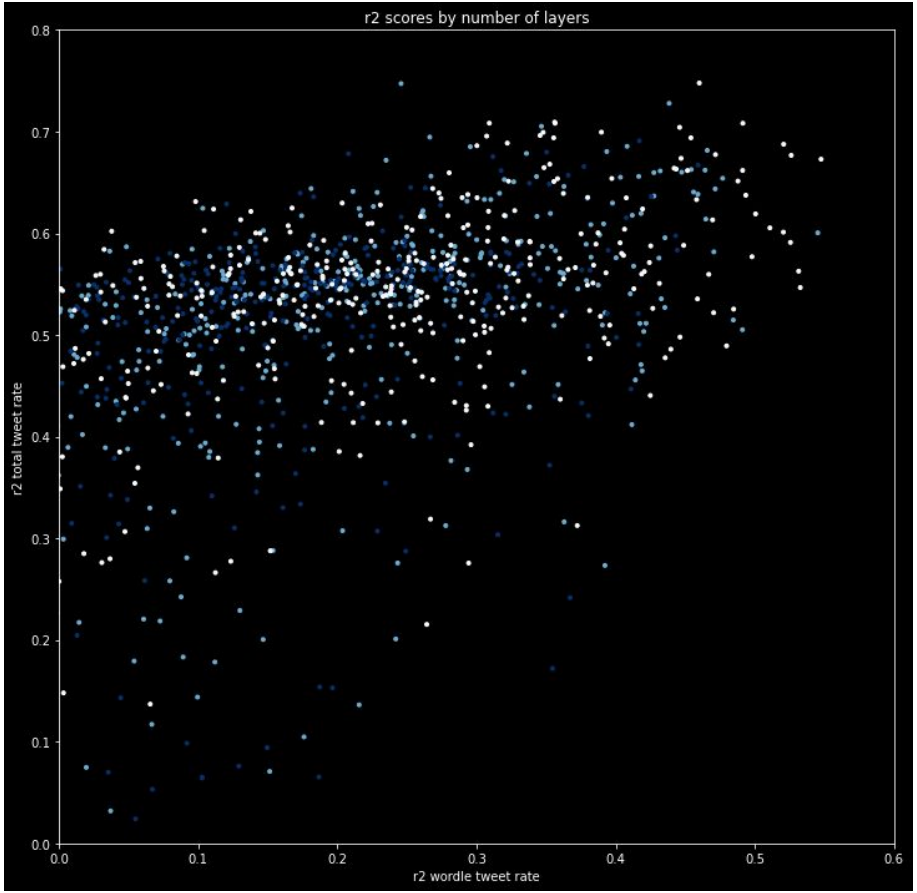
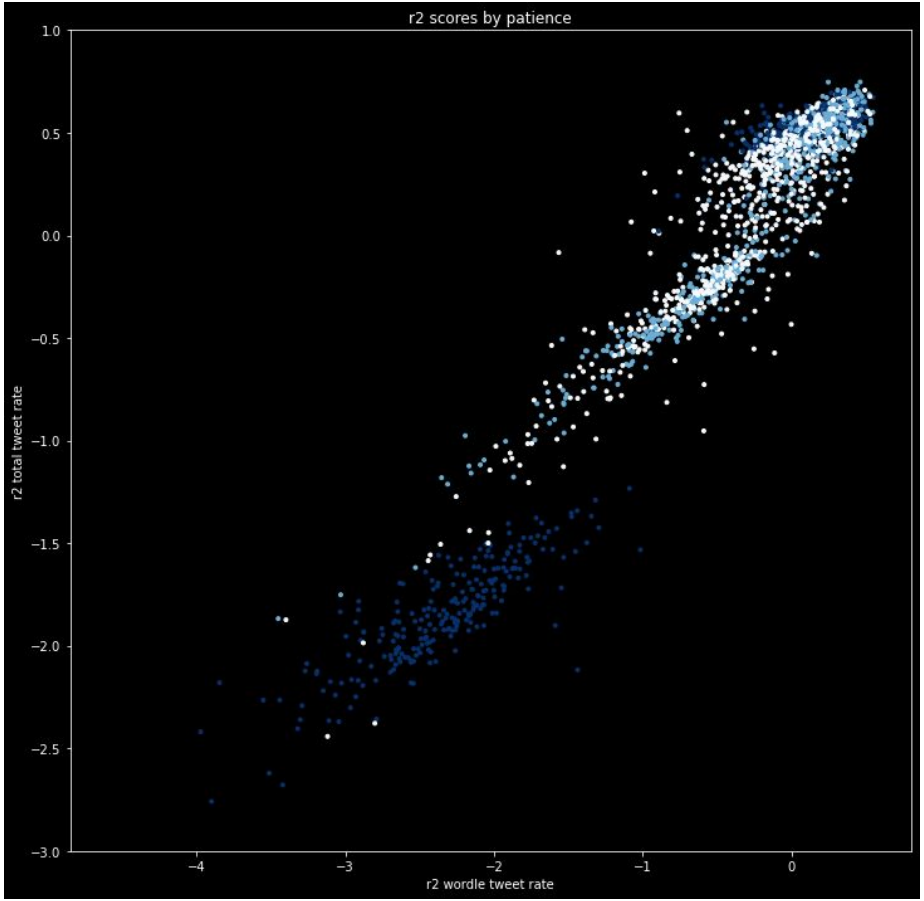
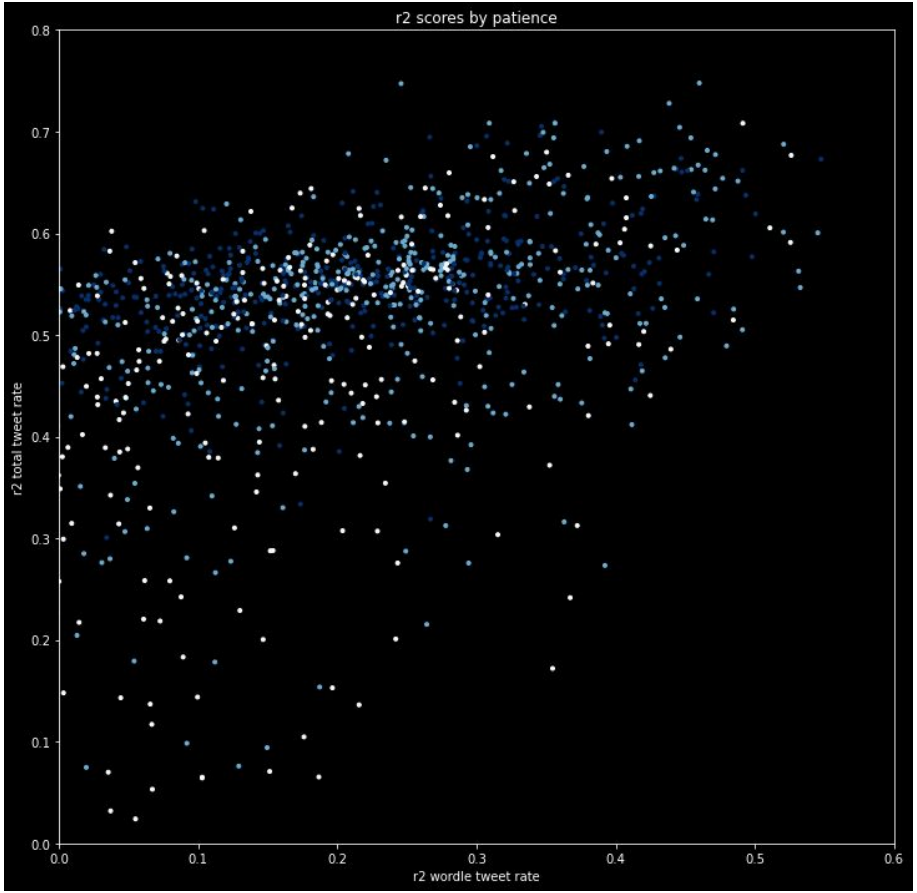


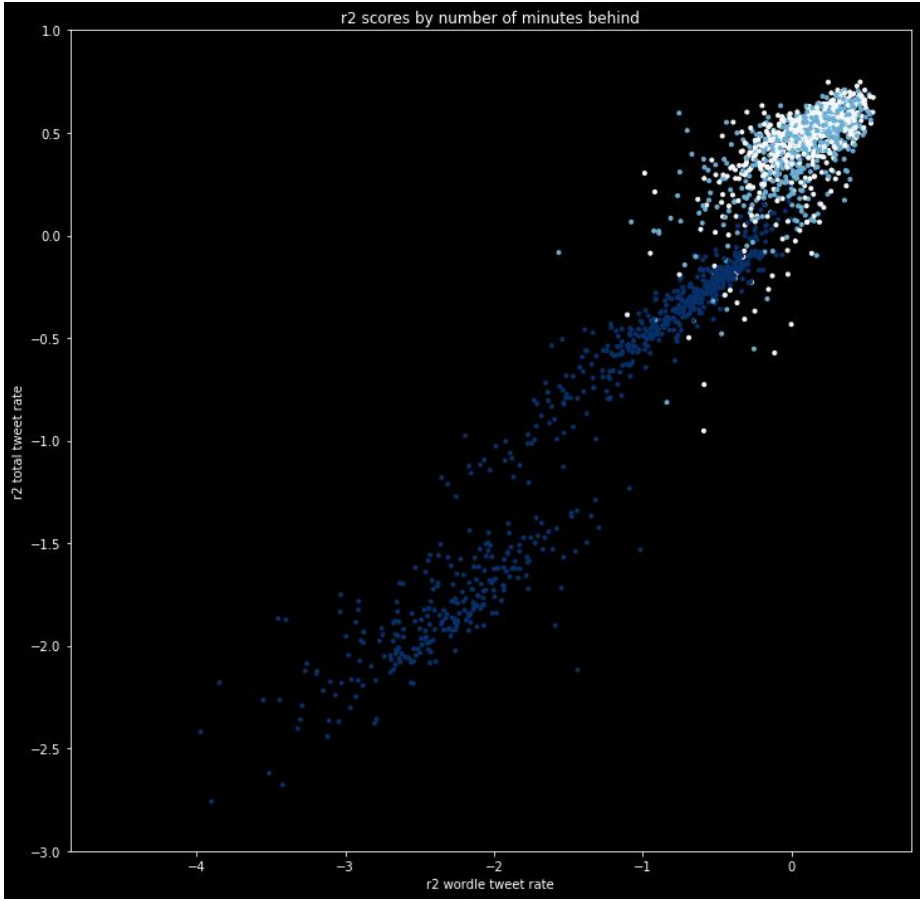


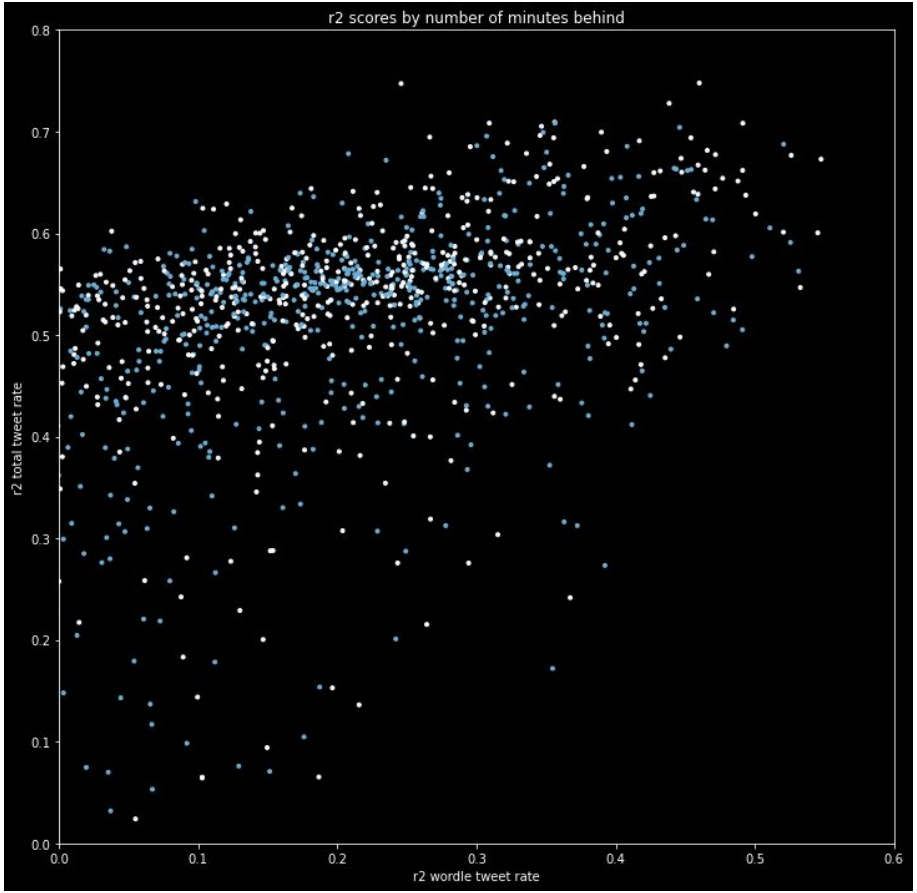
Model Comparisons — Patience



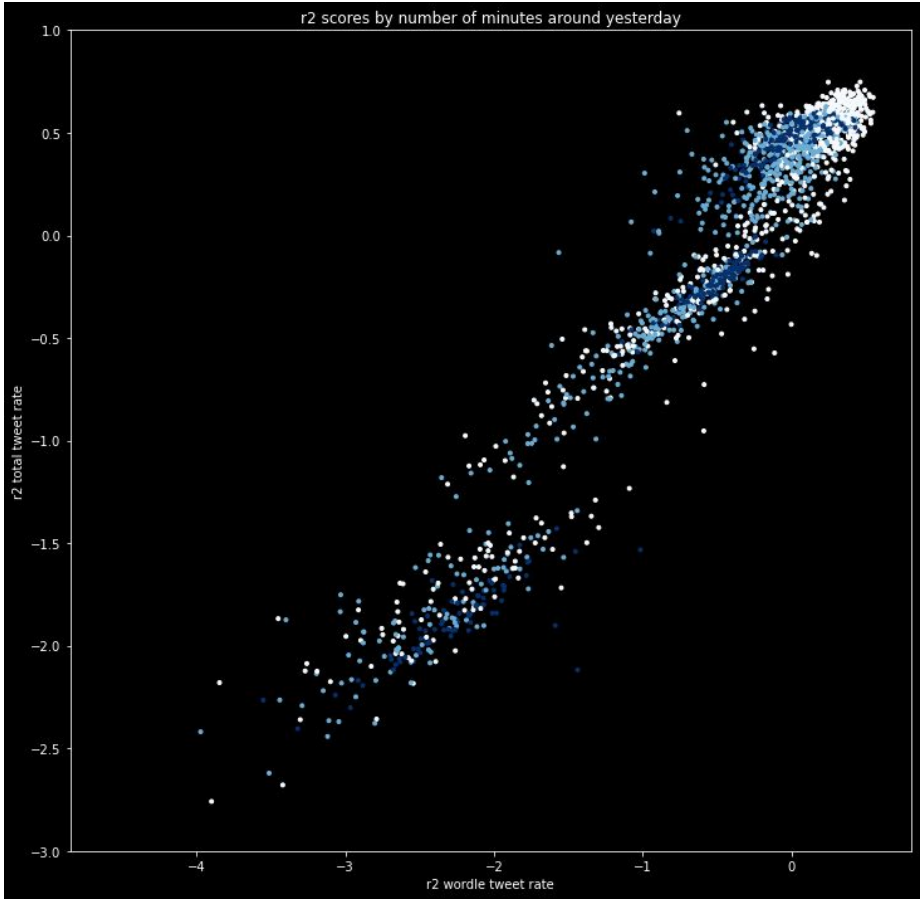


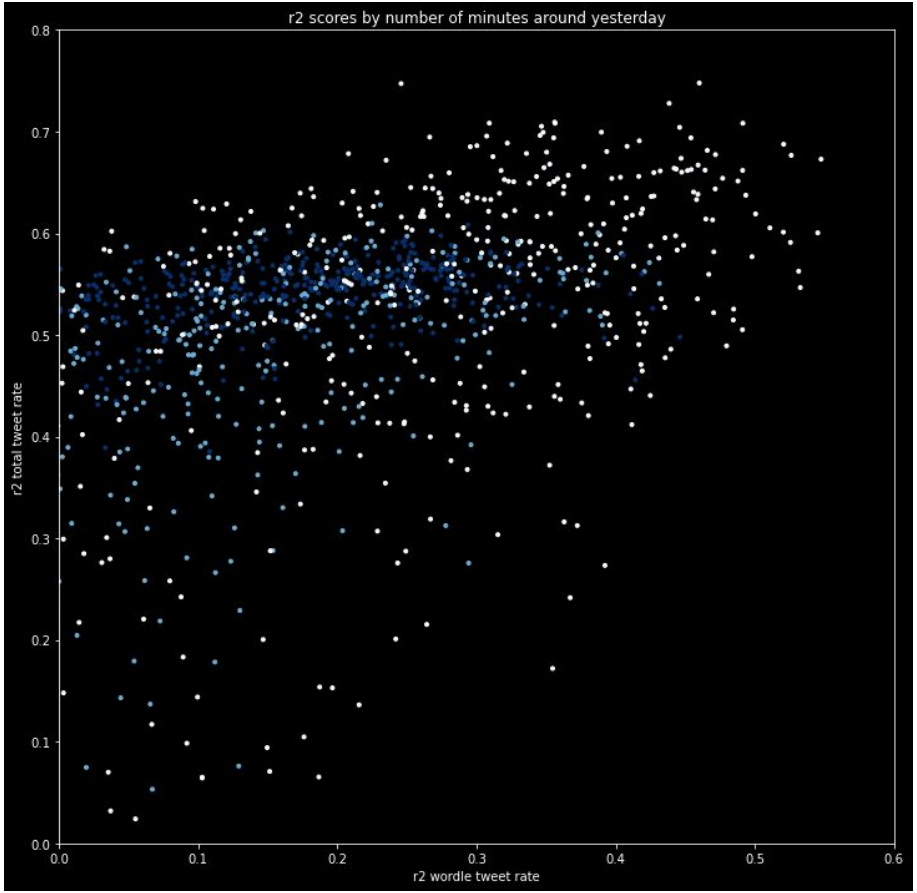
Model Comparisons — Size of recent (10 min) window



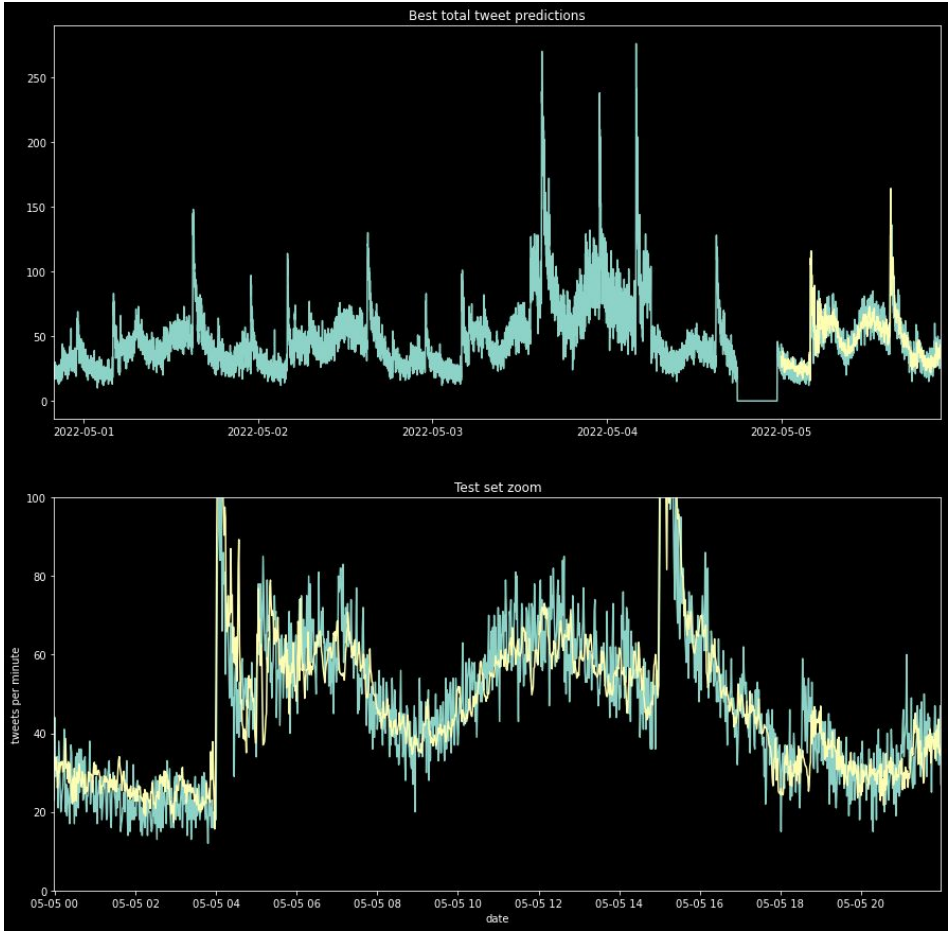


Model Comparisons — Size of 1 day-lagged window





Best model – Go big or go home



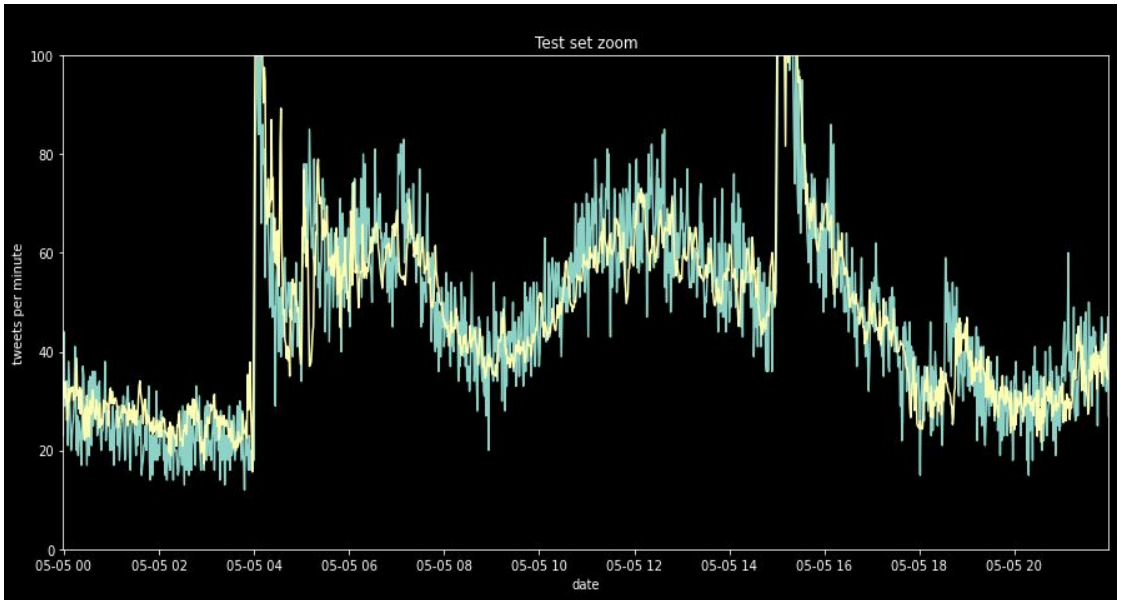
The best model for total tweets had:

- 3 layers
- 10 minute long lag window
- 20 minute wide 1-day lag window
- 20 popular games tracked by hashtag
- 25 broad user-reported locations
- Early stopping patience of 0 or 5

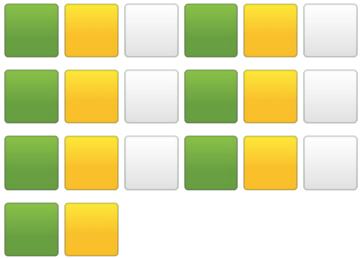
model	Total rate R^2	Wordle fraction R^2
best trained neural network	0.75	0.55
Naive, 10 min lag	0.46	0.21
Naive, 1 min lag	0.75	0.61

Conclusions and next steps

- The best models outperformed the naive model with 1/10 the lead time
- Model takes less than a minute to train on a few days' worth of tweets – it can be rerun daily on new data.



- Robust – continued to deliver even when rate values were missing around the gap
- Future versions could track and reorder popular links, hashtags, languages, etc.
- Basic model can be applied to any kind of tweet result



Thank you!

Questions?