Solving N-dle using Information Entropy

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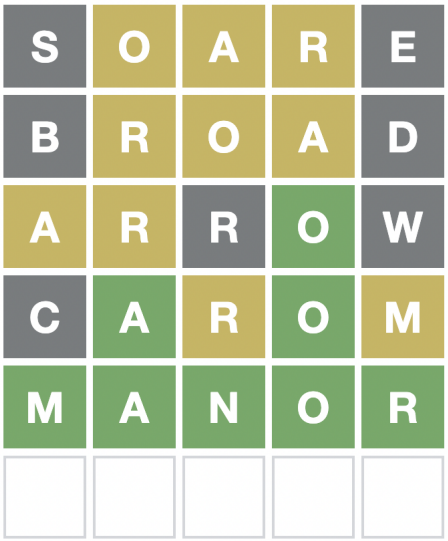
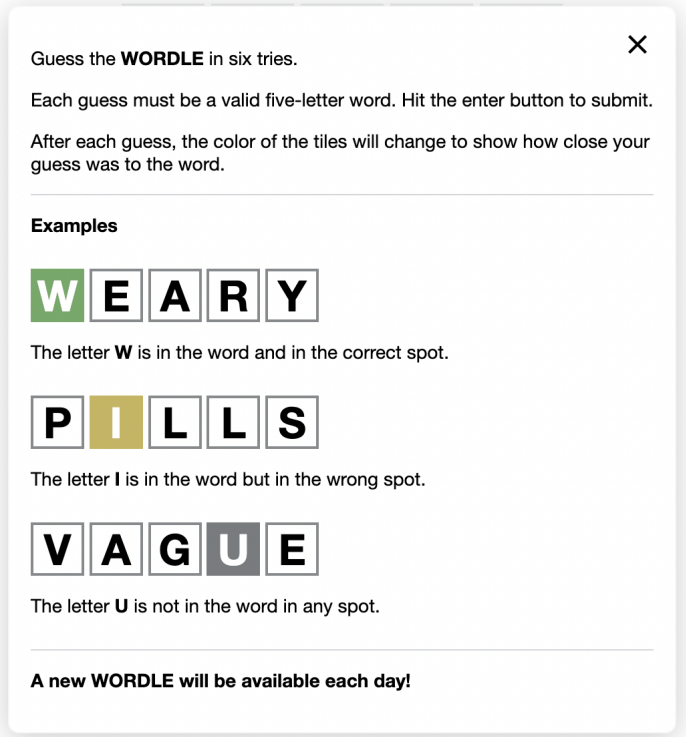
1 Introduction

- Introduce Entropy and Alex's paper.
- Reducing 2309 possibilities to one within five moves requires eliminating large portions of the dictionary with each move.
- TODO: Summarize algorithm.



For the likely reader, Wordle needs no introduction. As Mastermind with a restricted solution set (an English dictionary restricted to a reduced set of five-letter words), the sharing and scarcity aspects of the game led to its viral spread, various knockoffs, and ultimate purchase by the New York Times.

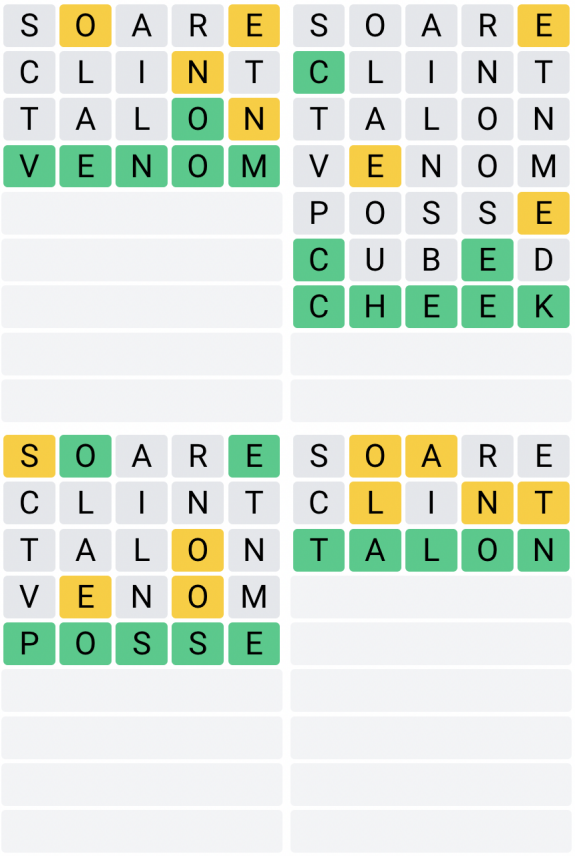
- With six guesses to determine the mystery word, each turn yields information in the form of Green, Yellow, and Black squares. At any given slot of five: - A green square indicates the guess has the correct letter in that slot. - A yellow square indicates the guessed letter does not match the solution in this slot, but exists elsewhere in the solution. - A black square indicates the guessed letter does not match the solution in this slot, and there are no more instances of this letter in the solution. - If the solution has five unique letters, the above rules are straightforward to interpret. - If the solution has repeated letters, note that, for any letter: - All yellow squares appear before all black squares. - The number of green and yellow squares don't exceed the number of instances of the letter in the soluton. - In the current dictionary, triple lettes include bobby, daddy, eerie, emcee, geese, melee, tepee, fluff, mamma, mammy, mummy, nanny, ninny, pappy, puppy, error, rarer, sassy, sissy, and tatty (20 words). - Starting with a well-known dictionary of 2309 words (link), the player has six guesses to enter the correct word (that is, receive all greens as a response). - Again, this is just like Mastermind, except that TWO dictionaries play a large role: - All answers come from the answers dictionary (TODO github link), with 2309 entires. - All allowed guesses come from the guesses dictionary (TODO github link), with 129



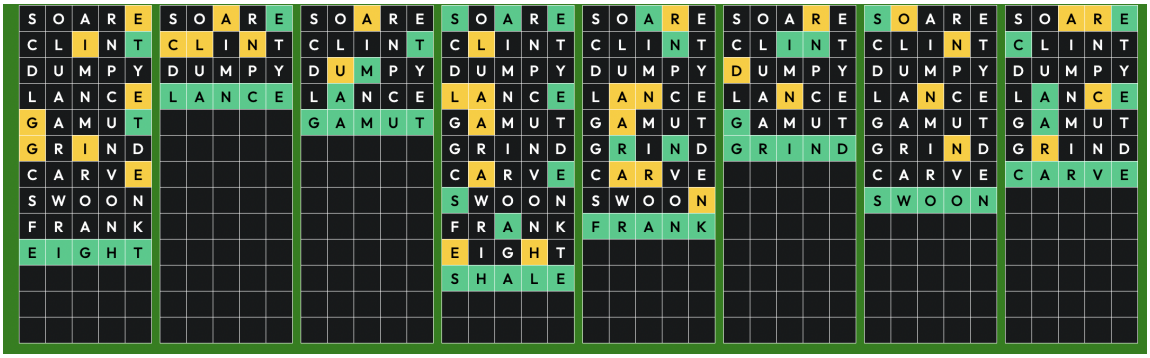
2 Considering Entropy

- - Entropy negatives: heuristic, greedy, may miss EV.
- Entropy positive: scales across independent events.
- Define independent events in n-dle

3 N-dle using entropy



TEXT



- - Entropy negatives: heuristic, greedy, may miss EV.
- Entropy positive: scales across independent events.
- Define independent events in n-dle
- Greedy on solve - moot in wordle, but always take the solution; you'll have to spend anyway and you're receiving less info later.
- Sum across all

4 Experimental Results

- Necesasrily trends to N+0
- Starts at about N+3
- How effective is starting with the same two words?

5 Caveats

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- Ties are arbitrary but likely not uniformly random
- Doesn't play "endgames" well.
- What's the link between reducing entropy as

6 Remaining Questions

- TODO

7 First section

Items that are cited: *The LaTeX Companion* book [**latexcompanion**] together with Einstein's journal paper [**einstein**] and Dirac's book [**dirac**]—which are physics-related items. Next, citing two of Knuth's books: *Fundamental Algorithms* [**knuth-fa**] and *The Art of Computer Programming* [**knuth-acp**].

[**lamport94**] is a set of macros built atop TeX [**1**].

References

[1] Claude Shannon (1948) *A Mathematical Theory of Communication.* Bell System Technical Journal 27, 379-423.

[2] Alex Healy *On Optimal Strategies for Wordle*, `http://www.alexhealy.net/papers/wordle.pdf`.

[3] Thomas M. Cover; Joy A. Thomas (1991). *Elements of Information Theory*, retrieved from `https://en.wikipedia.org/wiki/Entropy_(information_theory`