
Applying Reinforcement Learning to Wordle

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1 Introduction

Wordle, created by Josh Wardle, is a game in which the player has 6 guesses to attempt to guess a random 5 letter word. Every guess, each letter either returns as green, yellow, or gray. If its green, the letter is where it belongs in the word. If it's yellow, the letter is in the word, but in a different position. If its gray, the word doesn't contain the letter [7]. Because it already has a built in reward structure our team thought it would be an interesting game to try to solve.

Applying reinforcement learning techniques to solve games is something that the team at Deep Mind has done multiple times [3] [6] [5]. Reinforcement learning has also been applied to solve Scrabble [4] — a game fundamentally similar to Wordle. There are existing programatic solutions to Wordle, the most prominent of which being the 3 blue 1 brown solution that is based on entropy minimization [1]. There is also a Reinforcement Learning version that exists that uses DQN and A2C [2]. This reinforcement learning solver was trained by continually increasing the vocabulary that the bot “knew” until it had an entire dictionary in it.

We intend to develop an OpenAI gym environment to train the agent in, and then create multiple agents to compare performance of different algorithms on this problem. If time allows, we will compare not only our own implementations, but some of the solutions using traditional NLP methods.

2 Project timeline

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- 1 April - Literature Review and algorithm selection
 - 3 April - Proposal Due
 - 5 April - Environment Completed
 - 15 April - Algorithms Completed
 - 17 April - Checkpoint due: benchmarks completed
 - 1 May - Improvements completed
 - 6 May - Demo days results due

References

References

- [1] 3 Blue one Brown. Solving wordle using information theory, 2022.
- [2] Andrew Ho. Solving wordle with reinforcement learning, 2022.
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- [5] David Silver, Aja Huang, Christopher Maddison, Arthur Guez, Laurent Sifre, George Driessche, Julian Schrittwieser, Ioannis Antonoglou, Veda Panneershelvam, Marc Lanctot, Sander Dieleman, Dominik Grewe, John Nham, Nal Kalchbrenner, Ilya Sutskever, Timothy Lillicrap, Madeleine Leach, Koray Kavukcuoglu, Thore Graepel, and Demis Hassabis. Mastering the game of go with deep neural networks and tree search, 01 2016.
- [6] David Silver Alexander Graves Ioannix Antonoglou Daan Wierstra Martin Riedmiller Vlad Mnih, Koray Kavucuoglu. Playing atari with deep reinforcement learning, 2013.
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