Applicant’s Name: NG, Argens

Proposed Topic: Learning to Play with Deep Learning and Reinforcement Learning

Background:

Recently there has been very successful poker playing AI, namely Claudico and Libratus. According to human experts, one particular strength of computer playing poker is that it is able to play with perfect balance of risk and reward [1] as well as idealistically randomness [1]. Comparatively, Claudico cannot adapt as fast as human against opponents’ strategy [1], whereas Libratus adapt faster [1] due to both its computing power and algorithm.

For Claudico, researchers boost that it uses CFR+ instead of CFR, together with memory compression, enables solving of full game of heads-up Texas Hold’em with limit [2]. However, the no-limit requires abstractions to deal with the 147 orders of magnitude of difference in information set compared with its counterpart which has a betting limit, which leads to depreciated performance.

Libratus on the other hand yields decent result. In 120,000 game played in 20 days, against human pros: Jason Les (934th), Don Kim (19,743rd), Daniel McAulay (18,339th) and Jimmy Chou (24,672nd), had over $1,000,000 in chips more than the human team. It is also worth noting that duplicated matches were played to eliminate the luck factor

According to the official Paper of Libratus, it is constructed from 3 modules. The first module tackles abstraction and offers blueprint strategy for the early stage of the game only. The second module suggests finer solutions that fit into the larger blueprint. Whenever the opponent makes an unexpected move, a subgame is solved with the action included. This is known as nested subgame solving. Lastly, the third module enhances the blueprint and uses opponent’s move to determine which part of the tree is worth expanding.

Methodology:

Outcome and Value:

References:

1. Meet the new AI Challenging Human Poker Pros (Hsu, Jeremy) 2017 Jan 10; IEEE Spectrum; <https://spectrum.ieee.org/automaton/robotics/artificial-intelligence/meet-the-new-ai-challenging-human-poker-pros>
2. Poker Playing AIs Today, Skynet Tomorrow (Hsu, Jeremy) 2015 Feb 20; IEEE Spectrum; <https://spectrum.ieee.org/robotics/artificial-intelligence/pokerplaying-ais-today-skynet-tomorrow>
3. Upping the Ante: Top Poker Pros Face Off vs. Artificial Intelligence; Jan 04, 2017; IEEE; <https://www.cmu.edu/news/stories/archives/2017/january/poker-pros-vs-AI.html>