Probabilistic Graphical Models

Bayesian Poker Agent

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Approach for PredictWin function

- Based on the stage of the game, we call our appropriate post-stage predict win function –

  (We made three different functions to keep our code modular and more readable)

  - Post Flop
  - Post Turn
  - Post River
- Each of the functions sets the base parameters accordingly, for e.g. the number of board cards based on the stage of the game.
- Then we make a set of seven cards for each player (Self and the opponents). This is done by using the board cards, hole cards for self, and sampled cards for the unknown cards at this stage.
- For the unknown cards, we do random sampling using randperm() MATLAB function which excludes any card repetition in one sample.

Approach for PredictWin function

- Based on the open cards, we map the samples to the actual cards in the deck (1-52).
- Then at every sample run, we calculate the winner of the game. After multiple sample runs, we calculate the probability of our agent winning the game.
- This probability is then returned as the result.

Approach for PredictWin function

Issues and Improvements Implemented:

- For very large samples, the time taken by the agent for deciding a betting strategy was slow, so we optimized the code in the following ways-
  - At every sample run, the rejection sampler will have to check for repetitions which will considerably increase the running time since number of samples are huge.
  - To deal with that, we use the MATLAB function randperm() which from a given set directly generates distinct random samples.
  - We generate the mapping only once before sampling, since the mapping function is not going to change.

Approach for MakeDecisionPostFlop function

- Based on the winning probability from PredictWin, we decide our betting strategy.
- We calculate our RAISE and CALL thresholds using the formula given in Eq.2 in the pdf. (which uses the parameters – current bet value, current pot value, number of active players, and a threshold T)
- If our winning probability from PredictWin is more than our RAISE threshold, we RAISE or if its greater than CALL threshold, we CALL. Otherwise we FOLD.

Evaluation and Testing

Shown below are some of the results of the test runs against all the other agents. Such behavior was observed regularly in our experiments.

Our agent came at position-1 with earnings 12745

Our agent came at position-2 with earnings 7460

Our agent came at position-2 with earnings 7455

Our agent came at position-3 with earnings 7101

Our agent came at position-2 with earnings 7927

Our agent came at position-1 with earnings 9105

Our agent came at position-1 with earnings 7587

We profiled our agent to check the winning probability each round and observed that the win_prob PostFlop stage would be ~ 1/(active_opponents + 1). We kept a tab and checked the value of our win_prob, and on an average it always came higher than the above stated value.

Evaluation and Testing

- We also confirmed our results by cross-validating that our win_prob became higher with better hands.

- We ran multiple experiments for different values of T (bet-threshold)

The most consistent results came with T=0.0, with profits around 7000 on an average. Log shown below –

Our agent came at position-1 with earnings 10175

Our agent came at position-1 with earnings 7330

Our agent came at position-2 with earnings 8010

Our agent came at position-1 with earnings 10643

Our agent came at position-1 with earnings 6660

Team Members:

- Both worked together on the project.


Thank you