

Mistakes Provoke Further Mistakes: Evidence from Chess

Akash Adhikari* and Dmitry Dagaev†

November 19, 2017

Even the best chess players make mistakes during the game. Each mistake has a direct impact on the further play by worsening the position of player who made the suboptimal move. We suggest that there exists another way in which mistakes influence the outcome. After making the suboptimal move and realizing this, a player experiences psychological pressure on himself. The player's stress results in more mistakes made by the same player. The explanation of this phenomenon could be that the player wastes time and mental resources by rethinking the position where he or she made the mistake.

To test this hypothesis, we analyze several available chess databases. The games are encrypted in PGN format which is a golden standard for chess databases. We analyze the games using Stockfish 8 engine which is widely regarded as one of the strongest computer chess programs. It works in the following way. Basically, Stockfish tries to search the full tree of the game and evaluate each possible position. Given the time limit (which is set to 30 seconds per move by default), Stockfish has to reduce the search because it is not possible to go till the end of each possible game having 30 seconds only. There is a certain set of rules that describes which lines could be analyzed to a lesser extent. For example, if one gives away the rook, there is no need to search for 20 moves in order to understand if there is a compensation for the rook. Thus, Stockfish quickly looks at the best possible position after 5-7 moves, and if it is obviously bad, then Stockfish forgets this line.

One can change the number of lines (between 3 and 9) that must be analyzed by Stockfish more deeply. By raising the number of lines from 3 to 9, one asks Stockfish to analyze deeply more options for the same time of 30 seconds. Thus, the depth of the search will be lower. The evaluations could be different for different sets of search parameters. We fix the search time at 30 seconds per move and the number of lines at 9.

The best move is the move which corresponds to the best possible evaluation. We extract from the Stockfish analysis the best line for every move and the numerical evaluation of the position for the

*Indian Institute of Technology (Indian School of Mines). E-mail: rajaadhikari23@gmail.com

†National Research University Higher School of Economics. E-mail: ddagaev@gmail.com

corresponding best line. Thus, we have a sequence of position scores after each move. Also, we know whether the player chose his or her best move. Let b_t be a dummy variable which takes value 1 if the best move was played at move t and 0 otherwise. We are interested in the internal structure of sequence b_t . That is, does making suboptimal move $t - 1$ influence the probability of making optimal move t ? To answer this question, we use autoregressive model. We start with AR(1) model: $b_t = c + ab_{t-1} + \varepsilon_t$, where a and c are estimated parameters. Under the hypothesis that there is a psychological pressure on the player who realized that he or she made suboptimal move, we would expect that making the best move $t - 1$ increases the probability of making the best move at move t . That is, coefficient a should be significant and positive. This is an ongoing research, and the results are expected to be collected soon.