

The TCEC15 Computer Chess Superfinal: a perspective

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In a time when the pace of life is ever increasing and attention spans are ever decreasing, it seems strange that a chess match played between two machines at a long time control should prove so gripping, but the TCEC, LEELA CHESS ZERO and STOCKFISH managed it! The final score of 53.5-46.5, 14 wins to 7, was I think a fair reflection of the relative strength of both engines in a head-to-head contest: STOCKFISH seemed on the back foot more often than LEELA. Watching STOCKFISH hold the worse side of yet another 100⁺-move draw with a long rear-guard action, I suddenly thought back to one of the key moments of the recent Carlsen-Caruana world championship match.

Carlsen, Magnus (2835) - Caruana, Fabiano (2832), World Ch., London (9), 21.11.2018 [A29]:
1. c4 e5 2. Nc3 Nf6 3. Nf3 Nc6 4. g3 d5 5. cxd5 Nxd5 6. Bg2 Bc5 7. 0-0 0-0 8. d3 Re8 9. Bg5 Nxc3 10. bxc3 f6 11. Bc1 Be6 12. Bb2 Bb6 13. d4 Bd5 14. Qc2, Fig. 1a.



Fig. 1. Carlsen-Caruana, WCC 2018, game 9: positions (a) 14b, (b) 23b and (c) 25w.

It seemed as if Magnus had managed to surprise Fabiano with his opening plan of Bc1-g5-c1-b2 and it felt as if Fabiano was struggling to find good long-term squares for his pieces. In the current position, it's not too difficult to imagine Black's bishops being completely shut out of the game with e2-e3 and then a later c4-c5. Fabiano took a radical decision of real character: clarify the position, accept that he is only playing for a draw at best, and then dig in and achieve the goal. **14. ... exd4 15. cxd4 Be4 16. Qb3+ Bd5 17. Qd1 Bxf3 18. Qb3+ Kh8 19. Bxf3 Nxd4 20. Bxd4 Qxd4 21. e3 Qe5 22. Bxb7 Rad8 23. Rad1**, Fig. 1b.

Following the game with ALPHAZERO at this point, ALPHAZERO's evaluation rocketed from about 55% expected score before this decision to 74-76% expected score (in other words, as close to a draw as to

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a win for White, and very far away from a White loss!).² However, although it looked very nice, it was completely unclear how White could convert this advantage into a win if Black took some crucial decisions on the kingside. **23. ... Qe7** carefully preventing Qf7. **24. h4 g6**, Fig. 1c.

A key moment. The first step to increasing White's advantage would be to add a pressure point on to Black's kingside with h4–h5 (achieving this adds another 5% expected score to ALPHAZERO's evaluation), and it's crucial that Black should prevent this by setting up a kingside pawn structure with ... h5 and ... f5. Judging from his next move, Magnus trusted Fabiano to play this plan and tried to prevent it but it gave Fabiano a concrete way to make White's king as unsafe as Black's and in the end Fabiano made his defensive task look easy. It isn't but both these guys are something special!

25. h5 gxh5 26. Qc4 f5 27. Bf3 h4 28. Rxd8 Rxd8 29. gxh4 Rg8+ 30. Kh1 Qf6 ... ½–½, m57.

This type of defence is extremely difficult for a human to perform for more than just a single game due to the concentration and energy required to hold a cheerless position together for many moves, and the difficulty of judging in advance whether such a passive position is truly holdable. None of these difficulties means anything to STOCKFISH however and it manages to prove the viability of this method of defence in many situations! For example, in game 44 after the very dodgy Black opening sequence **1. e4 e5 2. Nf3 Nc6 3. Bc4 Nf6 4. Ng5 d5 5. exd5 Nxd5**, STOCKFISH steered the game with the modest **6.d4 Be6** to the type of position illustrated in Fig. 2a.

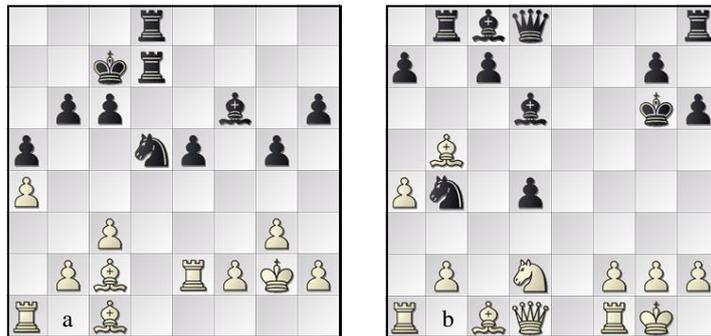


Fig. 2. (a) LCZERO – STOCKFISH game 44, pos. 35b and (b) STOCKFISH – LCZERO, game 43, pos. 15b.

Not much fun for Black, LEELA was happy but STOCKFISH held it together with little difficulty. The contrast with LEELA's style of defence could not be greater: Fig. 2b is what LEELA steered for after 14 moves. You can see why matches between LEELA and STOCKFISH are such fun to watch! Two 3600-strength engines find radically different ways to play an opening position. In this case, STOCKFISH's dogged trench warfare fared better than LEELA's activity but that was certainly not always the case in the match.

Two of the most impressive games in the match arose in the Trompovsky where LEELA managed to score 2-0 from a balanced starting position. In particular, game 61 showed the full range of qualities that make LEELA a difficult opponent for STOCKFISH. The opening was **1. d4 Nf6 2. Bg5 Ne4 3. Bf4 c5 4. f3 Qa5+ 5. c3 Nf6 6. d5 Qb6 7. Bc1 d6 8. e4 e6 9. c4 g6 10. Ne2 Bg7 11. Nec3 0–0 12. Be2 Ne8 13. h4 h6 14. g4 Qd8 15. Be3 f5 16. f4 Qe7 17. h5 g5 18. Qd2 e5 19. fxe5 f4 20. Bf2 hxg5**, Fig. 3a.

² <https://www.youtube.com/watch?v=Pc9WBrkmUEs>. The author's comments on WCC2018 games 11 & 9 (Petroff and English), and on ALPHAZERO's perspective on these games.

STOCKFISH had played the opening in an aggressive and creative fashion. As a White **1. d4** player who favours the Samisch against the King's Indian, I could easily imagine being attracted by the pawn storm that STOCKFISH implemented in the game. However, it was extremely impressive how LEELA steered the game into this pawn structure, correctly evaluating the position as much more promising for Black. Even as late as move 32, STOCKFISH was still evaluating the position as 0.00 while BLUEFISH³ was even on 0.74. White's essential problem is that with the kingside blocked, the major action will take place on the queenside. However, White's kingside structure - particularly the pawn on g4 - is so fragile that White will always need pieces there to defend it, and this reduces the forces that White can commit to either attacking or defending on the queenside. In other words, we have a "total board" situation in which the situation on the kingside affects the situation on the queenside in the middle to long-term. There were many examples in the ALPHAZERO-STOCKFISH match where this situation proved difficult for STOCKFISH to evaluate properly, and we see the same effect here.

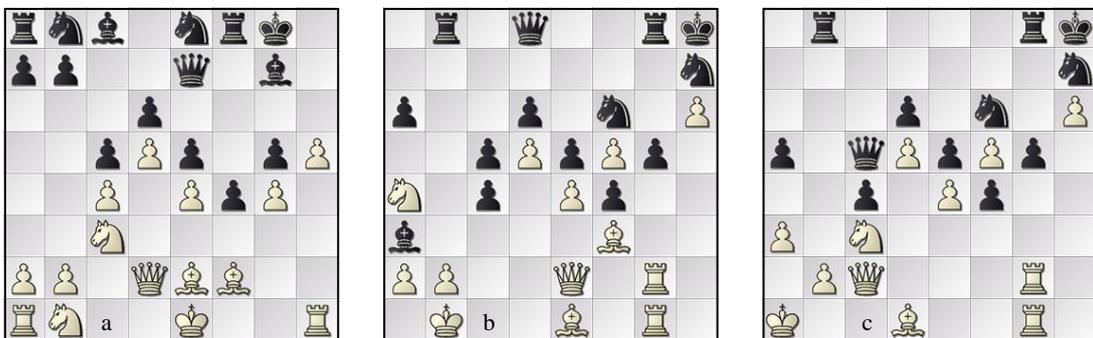


Fig. 3. Game 61, STOCKFISH 19050918 – LCZERO v0.21.1-nT40.T8.610, positions (a) 21w, (b) 43b and (c) 56w.

Forgive me for mentioning ALPHAZERO so often but there was another episode later in the game that really reminded me of its play. In Fig. 3b, White is in a bad way: despite performing miracles on the kingside, STOCKFISH has not managed to generate any threats there while the push ...g5–g4 always hangs over White's position. Black has also made progress on the queenside, but it isn't obvious how Black should proceed. LEELA takes an exceptional decision, showing a complete disregard for materialism, giving back the doubled pawn on c4. The reason only became clear to me after studying LEELA's PV.

43. ... c3 44. Bxc3 Qd7 45. Qd1 Bb4 46. Ka1 Qb7 47. Qc2 a5 48. Qe2 Qd7 49. Qd1 c4 50. a3 Qb5 51. Qc2 Qe8 52. Be2 Qd7 53. Bf3 Qb5 54. Bd1 Bxc3 55. Nxc3 Qc5, Fig. 3c.

LEELA has tiptoed towards revealing the reason for **43. ... c3** after Fig. 3b: it allows Black to follow up with ...c4 which opens the a7–g1 diagonal for the black queen to invade! That's how you get your pieces active! Again, it's one of the things that most struck me in ALPHAZERO's play: mobility and optionality always count more than material.

The impression might arise that STOCKFISH just plays poorly in blocked centre positions, but I don't think that's completely accurate. Game 45 in which, as in Fig. 4, STOCKFISH turned position 11b into positions 85b and 98b, as well as some of the impressive games that STOCKFISH won on the White side of the King's Indian, are not the work of a poor player! However, it seems to me that STOCKFISH does need somewhat more of a flying start in such positions than LEELA. A blocked position in which the

³ BLUEFISH: a kibitzing development version of STOCKFISH - on 176 threads and with 7-man endgame tables!

opponent's king is a potential target gives STOCKFISH something to latch on to and often leads to very forceful play. From an equal start however, LEELA's strategy tends to be more purposeful and impressive. Even when losing, LEELA's King's Indians – with their risky ...f5 breaks looking for maximum counterplay - look very human indeed!

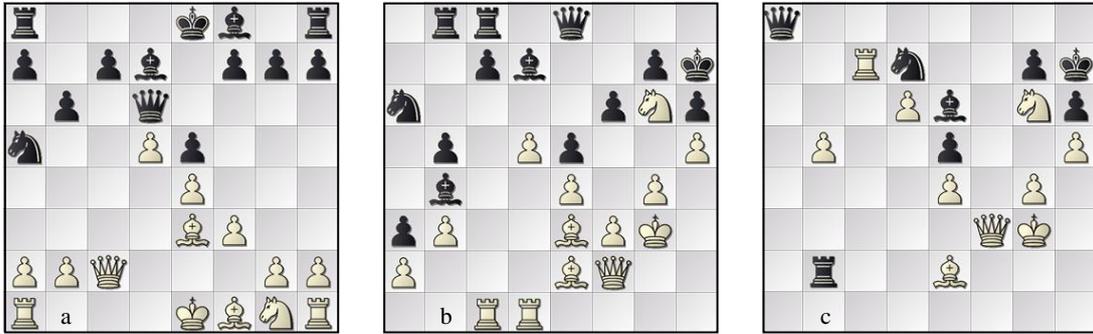


Fig 4. Game 45, STOCKFISH 19050918 – LCZERO v0.21.1-nT40.T8.610, positions (a) 11b, (b) 85b and (c) 98b.



Fig. 5. Game 97, STOCKFISH 19050918 – LCZERO v0.21.1-nT40.T8.610, positions (a) 29b, (b) 30w and (c) 33w.

Speaking of that, I was extremely impressed by LEELA's play and calculation in game 97. On the Black side of a main line Mar del Plata King's Indian, LEELA initiated a combination that STOCKFISH had not considered. From Fig 5a, we move to Fig. 5b with **29. ... g4**, the move every King's Indian player would want to play! After **30. hxg4 hxg4 31. fxg4 f3 32. gxf3 Nh5** (Fig. 5c), we have the brilliant resource that STOCKFISH had underestimated:

33. Ke1 Qf4 34. Bf1 Rf8 35. gxh5 Qg3 36. Nd2 Rgf7 37. Qe2 Nxf3+ 38. Kd1 Bg5 39. Bxd6 Qg1 40. Rxf3 Rxf3 41. Nxf3 Rxf3 42. Qxf3 Qxf1+ 43. Kc2 Qxc1+ 44. Kb3 Qb1+ 45. Kc3 Qc1+ 46. Kb3 Qb1+ 47. Kc3 Qc1+ 48. Kb3 ½-½.

There was so much drama and excitement that you could easily write a whole book about it! It just remains for me to congratulate Jeroen Noomen on the openings he selected for this Superfinal which produced both interesting games and interesting theoretical discussions. I can't wait to see how an improved LEELA and STOCKFISH fight it out in Superfinal 16!