The 17th Top Chess Engine Championship: TCEC17

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The TCEC 17 report

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The 17th Top Chess Engine Championship, TCEC17

Guy Haworth[1] and Nelson Hernandez
Reading, UK and Maryland, USA

TCEC Season 17 started on January 1st, 2020 with a radically new structure: classic 'CPU' engines with 'Shannon AB' ancestry and 'GPU, neural network' engines had their separate parallel routes to an enlarged Premier Division and the Superfinal. Figs. 1 and 3 and Table 1 provide the logos and details on the field of 40 engines.

Fig. 1. The logos for the engines originally in the Qualification League and Leagues 1 and 2.

Through the generous sponsorship of 'noobpwnftw', TCEC benefitted from a significant platform upgrade. On the CPU side, 4x Intel (2016) Xeon 4xE5-4669v4 processors enabled 176 threads rather than the previous 43 and the Syzygy 'EGT' endgame tables were promoted from SSD to 1TB RAM. The previous Windows Server 2012 R2 operating system was replaced by CentOS Linux release 7.7.1908 (Core) as the latter eased the administrators' tasks and enabled more nodes/sec in the engine-searches. The move to Linux challenged a number of engine authors who we hope will be back in TCEC18.

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[1] Corresponding author: g.haworth@reading.ac.uk

Table 1. The TCEC17 engines (CPW, 2020).

#	ab	Name	Version	Elo	Tier	CPU thr.	proto-col	Hash Kb	EGTs	Authors	Final Tier	
01	AS	AllieStein	v0.5_timefix-n14.0	3936	P	?	uci	—	Syz.	Adam Treat and Mark Jordan	→	P
02	An	Andscacs	0.95123	3750	1	176	uci	8,192	—	Daniel José Queraltó	→	1
03	Ar	Arasan	22.0_f928f5c	3728	1	176	uci	16,384	Syz.	Jon Dart	→	1
04	At	Asymptote	0.7_dev3	3464	Q	176	uci	65,536	Syz.	Maximillian Lupke	—	—
05	Cs	Cheese	2.1	3353	Q	16	uci	16,384	—	Patrice Duhamel	—	—
06	CF	ChessFighter	3.2	3221	1	?	?	—	—	Alexander Lim	—	—
07	Co	Counter	3.4	3384	Q	176	uci	1,024	—	Vadim Chizhov	—	—
08	De	Defenchess	2.3_dev	3743	Q	176	uci	65,536	Syz.	Can Cetin and Dogac Eldenk	↑↑	1
09	Dm	Demolito	20191229	3573	Q	176	uci	65,536	—	Lucas Braesch	↑	2
10	Et	Ethereal	11.88	3836	1	176	uci	65,536	Syz.	Andrew Grant	↑↑	P
11	Fa	Fabchess	1.13.5_dev	3231	Q	176	uci	65,536	—	Fabian von der Warth	—	—
12	Fi	Fire	021819	3589	2	128	uci	65,536	Syz.	Norman Schmidt	↑↑↑↓	1
13	Fz	Fizbo	2	3728	1	32	uci	16,384	Syz.	Youri Matiounine	↓	2
14	Go	Gogobello	2.1_dev	3552	Q	176	uci	65,536	Syz.	Salvatore Giannotti	—	—
15	Gu	Gull	20170410_256th	3600	2	176	uci	16,384	—	Vadim Demichev	→	2
16	Ho	Houdini	6.03	3854	P	64	uci	65,536	Syz.	Robert Houdart	↓	1
17	iC	iCE	4.0.853	3552	Q	64	uci	8,192	—	Thomas Petzke	↑↓	Q
18	Ig	Igel	2.3.0	3454	Q	176	uci	131,072	Syz.	Volodymyr Shcherbyna	↑↓	Q
19	Ko	Komodo	2503.05	3912	P	176	uci	65,536	Syz.	Don Dailey, Larry Kaufman, Mark Lefler	→	P
20	Km	Komodo MCTS	2484.00	3854	1	128	uci	32,768	Syz.	Mark Lefler	↑↑↓	1
21	La	Laser	1.8_beta_256th	3836	1	176	uci	65,536	Syz.	Jeffrey An, Michael An	→	1
22	Lc	LCZero	v0.24-sv-t60-3010	3958	P	?	uci	—	Syz.	UCT/NN AI Community	→	P
23	Ma	Marvin	3.5.0-a8	3521	Q	176	uci	65,536	Syz.	Martin Danielsson	—	—
24	Mi	Minic	1.26	3456	Q	176	xboard	65,536	Syz.	Vivien Clauzon	↑↓	Q
25	Ne	Nemorino	5.27	3703	2	176	uci	16,384	Syz.	Christian Günther	↑↓	2
26	Pe	Pedone	2.0	3684	2	176	uci	65,536	Syz.	Fabio Gobbato	↑	1
27	PS	PeSTO	2.210	3550	Q	176	uci	65,536	Syz.	Ronald Friederich	↑↑↓	2
28	Pi	Pirarucu	3.2.4	3516	Q	176	uci	2,048	—	Raoni Campos	↑↓	Q
29	rf	rofChade	2.213	3770	1	176	uci	65,536	Syz.	Ronald Friederich	↑↓	1
30	Ru	RubiChess	1.6.1.1	3656	2	176	uci	65,536	Syz.	Andreas Matthies	↑	1
31	Sc	ScorpioNN	3.0.7	3824	1	—	xboard	—	—	Daniel Shawul	↑↓	1
32	St	Stockfish	202003092246	3969	P	176	uci	65,536	Syz.	Tord Romstad, Marco Costalba, Joona Kiiski, Gary Linscott	→	P
33	Sv	Stoofvlees II	a14	3846	P	?	uci	8,192	Syz.	Gian-Carlo Pascutto	→	P
34	Te	Texel	1.08a13	3669	2	176	uci	65,536	Syz.	Peter Österlund	↓	Q
35	To	Topple	0.7.4	3527	Q	176	uci	16,384	Syz.	Vincent Tang	—	—
36	Tu	Tucano	8.07_dev2	3372	Q	176	uci	16,384	Syz.	Alcides Schulz	—	—
37	Va	Vajolet2	2.9.0-TCEC-S17	3691	2	176	uci	65,536	Syz.	Marco Belli	↑	1
38	Wa	Wasp	3.82	3644	2	128	uci	16,384	Syz.	John Stanback	↓	Q
39	Wi	Winter	0.7.4	3530	Q	176	uci	65,536	—	FM Jonathan Rosenthal	↑↑↓	2
40	Xi	Xiphos	0.6.1	3846	1	176	uci	65,536	Syz.	Milos Tatarevic	→	1

1. THE QUALIFICATION LEAGUE: 16 ENGINES, 1 DRR, 240 GAMES @ 30′+5″/m

New to TCEC were COUNTER, FABCHESS, GOGOBELLO, ICE and PESTO. TCEC welcomed back DEFENCHESS and DEMOLITO. The second author here provided 8-ply openings for this league and 12-ply openings for the next.

At the quarter-way point, the leaders were DEFENCHESS, PESTO, WINTER, TOPPLE, DEMOLITO and PIRARUCU. With the sub-7-man endgame tables in RAM, now being consulted some 10 million times per second, forty times the previous rate, those engines not doing so were further disadvantaged: MINIC lost a drawn KRRKRN endgame in game 5.

With all games played, the top six earning a place in the League 2 event were the unbeaten front-runner DEFENCHESS, DEMOLITO, WINTER, PIRARUCU, IGEL and ICE. PESTO had slipped to 8th and TOPPLE to 11th. In fact, as CHESS22K and FRITZ had failed stress-tests on the larger LINUX/WINE platform and been

rated non-starters, MINIC and PESTO also stepped into League 2. Wool (2020), assiduous as ever, touched on some 50 games.[2] Chessdom (2020a) highlighted just two, g49 and g202.

Table 2. The TCEC17 Qualification League cross-table.

#	Engine	Elo	Pts.	X	De	Dm	Wi	Pi	Ig	iC	Mi	Pe	Ma	Go	To	Co	Fa	Tu	At	Ch
01	Defenchess 2.3_dev	3743	24.0	0		==	=1	=1	==	11	1=	==	11	11	=1	11	=1	11	11	=1
02	Demolito 20191229	3573	20.5	0	==		=0	=1	==	1=	==	==	=1	11	==	11	1=	11	1=	=1
03	Winter 0.7.4	3530	20.0	0	=0	=1		01	1=	==	10	0=	=1	==	=1	=1	11	=1	11	11
04	Pirarucu 3.2.4	3516	18.0	0	=0	=0	10		=1	==	==	==	=1	==	01	11	1=	1=	1=	1=
05	Igel 2.3.0	3454	18.0	0	==	==	0=	=0		11	==	11	==	1=	0=	==	01	11	==	11
06	iCE 4.0.853	3552	17.5	0	00	0=	==	==	00		=1	==	==	1=	11	=1	1=	=1	1=	11
07	Minic 1.26	3456	17.5	1	0=	==	01	==	==	=0		01	==	=0	11	1=	==	11	11	1=
08	PeSTO 2.210	3550	16.5	0	==	==	1=	==	00	==	10		=0	=1	=1	=1	==	11	==	10
09	Marvin 3.5.0-a8	3521	16.0	0	00	=0	=0	=0	==	==	==	=1		0=	==	1=	1=	=1	11	11
10	Gogobello 2.1_dev	3552	15.0	2	00	00	==	==	0=	0=	=1	=0	1=		11	1=	1=	=1	=1	0=
11	Topple 0.7.4	3527	14.0	0	=0	==	=0	10	1=	00	00	=0	==	00		1=	1=	1=	1=	11
12	Counter 3.4	3384	10.0	0	00	00	=0	00	==	=0	0=	=0	0=	0=	0=		11	=1	=0	=1
13	FabChess 1.13.5_dev	3231	10.0	0	=0	0=	00	0=	10	0=	==	==	0=	0=	0=	00		0=	1=	1=
14	Tucano 8.07_dev2	3372	08.5	0	00	00	00	0=	00	=0	00	00	00	=0	0=	=0	1=		1=	11
15	Asymptote 0.7_dev3	3464	08.5	0	00	0=	00	0=	==	0=	00	==	00	=0	0=	=1	0=	0=		1=
16	Cheese 2.1	3353	06.0	0	=0	=0	00	0=	00	00	0=	01	00	1=	00	=0	0=	00	0=	

2. LEAGUE 2: 16 ENGINES, 1 DRR, 2RRs, 240 GAMES @ 30′+5″/m

Table 3. The TCEC17 League 2 cross-table of raw results, prior to WASP's disqualification.

#	Engine	Elo	Pts.	SB	X	Fi	De	Ru	Va	Pe	Wi	PS	Ne	Gu	Wa	De	Te	Mi	iC	Ig	Pi
01	Fire 021819	3589	23.0	326.00	0		==	==	11	=1	==	11	==	11	==	11	11	11	==	11	1=
02	Defenchess 2.3_dev	3743	22.0	308.50	0	==		==	=1	==	11	==	==	1=	=1	11	=1	=1	11	11	1=
03	RubiChess 1.6.1.1	3656	18.5	260.25	0	==	==		==	==	11	0=	1=	==	==	==	==	0=	11	11	11
04	Vajolet2 2.9.0-TCEC-S17	3691	17.5	235.75	0	00	=0	==		==	11	11	==	==	==	1=	0=	=1	=1	1=	11
05	Pedone 2.0	3684	16.5	233.50	1	=0	==	==	==		10	==	1=	=1	==	=0	10	==	==	1=	11
06	Winter 0.7.4	3530	15.0	208.75	0	==	00	00	==	01		1=	0=	==	==	1=	1=	==	=1	1=	==
07	PeSTO 2.210	3550	14.5	205.00	0	00	==	1=	00	==	0=		1=	==	01	01	=1	==	==	==	=1
08	Nemorino 5.27	3703	14.5	205.25	0	==	==	0=	00	0=	1=	0=		1=	=0	10	==	1=	=0	1=	11
09	Gull 20170410_256th	3600	14.5	201.25	0	00	0=	==	=1	=0	==	==	0=		==	=1	==	==	1=	==	1=
10	Wasp 3.82	3644	14.5	219.50	3	==	=0	==	==	==	==	10	=1	==		0=	=1	1=	==	1	00
11	Demolito 20191229	3573	13.5	184.25	0	00	00	==	0=	=1	0=	10	01	=0	1=		==	=1	=1	=0	1=
12	Texel 1.08a13	3669	13.5	187.75	0	00	=0	==	1=	01	0=	=0	==	==	=0	==		==	==	==	11
13	Minic 1.32	3456	12.5	177.00	1	00	==	1=	=0	==	==	==	0=	==	0=	=1	==		==	10	=1
14	iCE 4.0.853	3552	11.0	161.25	0	==	00	00	=0	==	=0	==	=1	0=	==	=0	==	==		==	=0
15	Igel 2.3.1	3454	10.5	141.00	0	00	00	00	0=	0=	0=	==	0=	==	10	=1	==	01	==		==
16	Pirarucu 3.2.4	3516	08.5	121.00	1	0=	0=	00	00	00	==	=0	00	0=	11	0=	00	=0	=1	==	

With a quarter of the games played, the favourites for the top four places were, in order, FIRE, RUBICHESS, VAJOLET2 and PEDONE with DEFENCHESS knocking on the door.

Ultimately the TCEC15 'Shannon AB' FIRE, DEFENCHESS, RUBICHESS and VAJOLET2 took the top four promotion spots. As BOOOT, CHESSBASEVB, CHIRON and JONNY were not ready to move to the new Linux platform, the next four – PEDONE, WINTER, PESTO and NEMORINO joined them in moving to League 1. In this event, we saw DEFENCHESS continue unbeaten to earn a second promotion and

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[2] Games 5, 6, 12, 18, 22, 29, 32, 41, 61, 63, 67, 79, 80, 83, 91, 101, 111, 114, 116, 120, 125, 128, 132, 136, 138-9, 142, 146, 150, 166, 171-2, 174, 181, 187-9, 197, 199, 201-2, 215-6, 218, 221, 228, 231, 236-8.

PESTO fill a second empty chair. WASP (after three crashes) and five 'Qualification League' engines relegated.

Wool touched on a considerable number of mainly decisive games[3] while TCEC's 'Notable Games' (Chessdom, 2020a) include games 29 and 97. In game 153, MINIC missed 62. Bxh5 indicated as essential by the endgame tables. In game 206, WINTER let the draw go with **75…Kf7** and, without EGTs, surrendered the game to a grateful DEFENCHESS which had struggled to make any progress.

3. CPU LEAGUE 1: 16 ENGINES, 2 DRRs, 4 RRs, 480 GAMES @ 45′+5″/m

The exclusively 'CPU' engines in this League were competing for four places and the opportunity to fight with the best 'League 1' neural network engines for elevation to an enlarged Premier Division. The Elo strengths posted for this event indicated that KOMODOMCTS, XIPHOS, ETHEREAL and LASER were the leading favourites. With core-time up to 45′ and four round-robins rather than two, this event was to see the engines improving their game over an extended period. Nelson provided 16-ply openings, making a judgement as to how opening bias would affect the draw-rate.

From Round Robin 1, spectators (Chessdom, 2020a) picked out ETHEREAL–KOMODOMCTS, their first meeting, game 18. In g46, KOMODOMCTS failed to progress a 7-man win for 34 moves. WINTER had a difficult win in game 53 but, still without EGTs, could not close out. The splendid 71-game unbeaten run by DEFENCHESS in TCEC17 was ended in game 93 by no less than ETHEREAL. Wool picked out some RR1 games[4] including 'endgame' games 46 and 53 above. After the 120 games, the top order was ETHEREAL, XIPHOS, KMCTS, promotee ROFCHADE, LASER, FIRE and ANDSCACS.

Tailing away from the leaders were FIZBO, hampered by comparatively fewer threads, PESTO, WINTER, NEMORINO, PEDONE and VAJOLET2. DEFENCHESS also lagged in the early going but rallied as the contest wore on.

Wool touched on quite a few RR2 games.[5] TCEC fans (Chessdom, 2020a) picked out game 138 in which KOMODOMCTS notably beat ETHEREAL, and game 146 in which the slow-starting FIRE beat RUBICHESS. In RR3, WINTER beat ROFCHADE in short game 285. Wool continued to note a few games[6] and fans picked out game 302 (Chessdom, 2020a) in which LASER beat ROFCHADE. DEFENCHESS continued to move up the standings.

ETHEREAL, FIRE and KOMODOMCTS were scarcely threatened in the last quarter of this event: their promotion was never in doubt. They had only one loss, game 138 as mentioned above. The residual excitement was that ROFCHADE made a late move with five victories to move up from 7th to 4th, edging out XIPHOS on 'number of wins' and making its inferior Sonneborn-Berger score irrelevant. DEFENCHESS, having rejoined TCEC in the Qualification League, had very creditably been competing for 4th place but slipped with a loss to XIPHOS in round 58. LASER, having also gone undefeated in RR1-3, sustained four losses here and fell away to 9th: fatigue cannot be considered a factor. Wool touched briefly on a number of games[7]. Game 380 was picked out as notable by TCEC fans (Chessdom, 2020a).

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[3] Games 5, 12, 17, 50, 64, 81, 86, 93, 102, 109-10, 138, 149, 152. 157, 159, 180, 184, 197-8, 213-4, 220, 225, 227, 229.
[4] L1 RR1 games 22, 44, 46, 50, 53, 64, 78, 86, 93, 108 and 116.
[5] L1 RR2 games 133, 146, 159, 162, 173, 194, 197, 218, 22 and 227.
[6] L1 RR3 games 247, 263, 282, 284-5, 294, 301-2, 318, 339 and 340.
[7] L1 RR4 games 370, 380, 383, 392, 394, 426, 436-7, 445, 454 and 460.

FIZBO had not found a way to exploit the greatly increased number of cores and, maybe for that reason, was never in touch with the rest of the field. NEMORINO, WINTER and PESTO – only pulled off the bench as substitutes – were also clearly headed for relegation and duly returned to League 2. The remaining stand-in, PEDONE, was safely in 12th place and continued to compete for the 11th spot.

Table 4. The TCEC17 League 1 cross-table.

#	Engine	Elo	Pts.	SB	X	Et	Fi	Km	rf	Xi	De	Ru	An	La	Ar	Va	Pe	Ne	Wi	PS	Fz
01	Ethereal 11.88	3836	40.0	1127.50	0		====	=0==	====	====	1===	====	1===	===1	1=11	1=11	11=1	=11=	11==	111=	==11
02	Fire 021819	3589	39.0	1105.25	0	====		====	===1	====	=1==	==1=	==1=	====	=111	1=1=	1=1=	=11=	=111	=111	1==1
03	KomodoMCTS 2484.00	3854	36.5	1047.75	0	=1==	====		====	====	=1==	====	==11	====	11==	1===	1===	=111	1=11	1=11	==1=
04	rofChade 2.213	3770	35.0	992.75	0	====	====	====		====	==0=	====	==0=	=1==	1=1=	1==1	==11	==01	1==1	11=1	
05	Xiphos 0.6.1	3846	35.0	1010.50	0	====	==0	====	====		===1	====	==1=	=1=1	1==1	1===	1=1=	1===	1===	1===	
06	Defenchess 2.3_dev	3743	34.0	958.25	0	0===	====	====	==1=	===0		====	===1	===0	=00=	=1=1	=111	==11	==1=	11=1	
07	RubiChess 1.7-dev_20200	3656	33.0	928.75	0	====	=0==	0===	====	====	====		0===	====	==01	====	===1	1==1	===1	=11=	11=1
08	Andscacs 0.95123	3750	32.5	937.75	0	0===	==0=	====	====	1===		====		====	===1	11=0	=1=1	=1=1	=1=1		
09	Laser 1.8_beta_256th	3836	31.0	891.00	1	===0	===0	====	==1=	===0	===0		1===		====	1===	1===	=1=1		
10	Arasan 22.0_f928f5c	3728	30.5	842.00	0	0=00	====	=00=	=0==	=0=0	===1	==10	====		==1=	====	110=	=0=1	=11=	1111
11	Vajolet2 2.9.0-TCEC-S17	3691	28.0	789.25	0	0=00	0=00	====	0=0=	====	=11=	====	0===	==0=		====	=0=1	1=10	===1	1=1=
12	Pedone 20200125	3684	27.5	737.50	0	00=0	=0=0	0===	0==0	0=0=	=0=0	===0	===0	====	====		11=1	=1=1	=1=1	11=1
13	Nemorino 5.28	3703	22.0	628.00	0	=00=	0=0=	0===	==0=	0===	=000	0==0	00=1	====	001=	=1=0	00=0		11==	==0=	1===
14	Winter 0.7.4	3530	21.0	602.25	0	00==	==0=	=000	==10	0=0=	==00	===0	=0=0	0===	=1=0	0=01	=0=0	00==		==10	=11=
15	PeSTO 2.211	3550	20.0	556.50	0	000=	=000	0=00	0==0	0===	==0=	==00	=0=0	0===	==0=	===0	=0==	==1=	==01		=1==
16	Fizbo 2	3728	15.0	459.00	0	==00	0==0	==0=	00=0	0===	00=0	00=0	====	=0=0	0	0=0=	00=0	0===	==00=	=0==	

Table 5. The TCEC17 League 1 progress table.

#	Engine	Scores in RR …				Scores in DRR …		progress after RR …				position after RR …			
		1	2	3	4	1	2	1	2	3	4	1	2	3	4
01	Ethereal 11.88	11.0	9.0	10.0	10.0	20.0	20.0	11.0	20.0	30.0	40.0	01	01	01	01
02	Fire 021819	8.5	10.0	10.0	10.5	18.5	20.5	8.5	18.5	28.5	39.0	06	03	02	02
03	Komodo MCTS 2484.00	9.5	9.0	9.5	8.5	18.5	18.0	9.5	18.5	28.0	36.5	03	02	03	03
04	rofchade 2.213	9.5	8.5	7.0	10.0	18.0	17.0	9.5	18.0	25.0	35.0	04	05	07	04
05	Xiphos 0.6.1	10.0	8.0	8.0	9.0	18.0	17.0	10.0	18.0	26.0	35.0	02	04	04	05
06	Defenchess 2.3_dev	7.5	8.5	9.0	9.0	16.0	18.0	7.5	16.0	25.0	34.0	10	08	05	06
07	RubiChess 1.7-dev_20200124193649	7.5	8.0	7.5	10.0	15.5	17.5	7.5	15.5	23.0	33.0	09	09	10	07
08	Andscacs 0.95123	8.0	9.0	7.0	8.5	17.0	15.5	8.0	17.0	24.0	32.5	07	06	08	08
09	Laser 1.8_beta_256th	9.0	8.0	8.0	6.0	17.0	14.0	9.0	17.0	25.0	31.0	05	07	06	09
10	Arasan 22.0_f928f5c	8.0	7.0	8.0	7.5	15.0	15.5	8.0	15.0	23.0	30.5	08	10	09	10
11	Vajolet2 2.9.0-TCEC-S17	7.0	7.0	7.0	7.0	14.0	14.0	7.0	14.0	21.0	28.0	11	12	12	11
12	Pedone 20200125	6.5	8.0	7.5	5.5	14.5	13.0	6.5	14.5	22.0	27.5	12	11	11	12
13	Nemorino 5.28	5.0	6.0	5.5	5.5	11.0	11.0	5.0	11.0	16.5	22.0	13	13	14	13
14	Winter 0.7.4	5.0	5.5	6.5	4.0	10.5	10.5	5.0	10.5	17.0	21.0	14	14	13	14
15	PeSTO 2.211	5.0	5.0	4.5	5.5	10.0	10.0	5.0	10.0	14.5	20.0	15	15	15	15
16	Fizbo 2	3.0	3.5	5.0	3.5	6.5	8.5	3.0	6.5	11.5	15.0	16	16	16	16

Legend: Ethereal, Fire, KomodoMCTS, rofChade, Xiphos, Defenchess, Rubichess, Andscacs

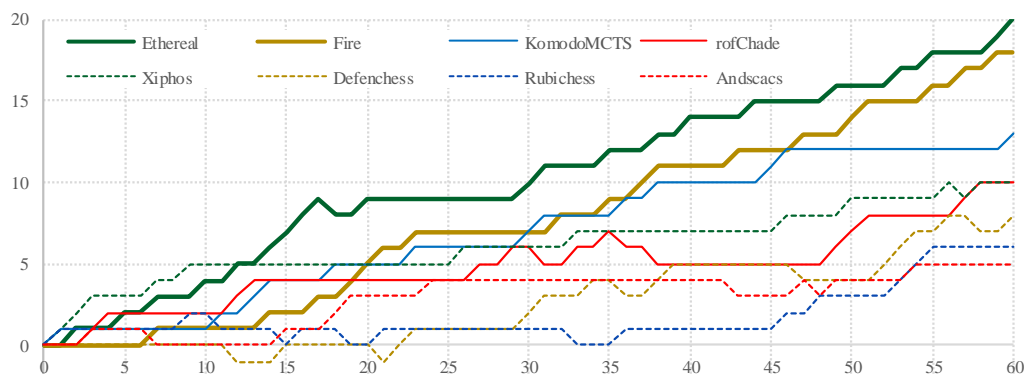Fig. 2. Net wins, round by round, for the top eight in the TCEC17 League 1.

4 THE LEAGUE 1 PLAY-OFF: 6 ENGINES, 2 DRRs, 4 RRs, 60 GAMES @ 60′+5″/m

At last, the neural network engines appeared on stage. Although several were expected, there were in fact only two that were not already in the Premier Division and so they automatically took the promotion places of what became a 'null' L1-NN event. After a complex conversion to LINUX, CHESSFIGHTER (Lim, 2020) joined SCORPIONN and the four promotees above in a five-day play-off event. Nelson stayed with 16-ply openings but the time budget was extended once again to determine the four best engines. GPU firepower was increased by a factor of 2.38 with the use of four 2080Ti GPUs (Nvidia, 2018) not quite the factor of four on the CPU side.
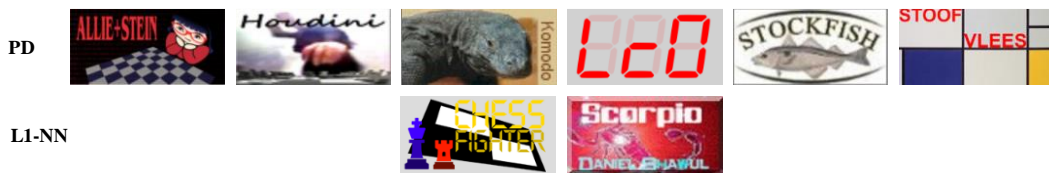
Fig. 3. The logos for the engines originally in League 1-NN and in the Premier Division.

Round Robin 1 kicked off with three wins. ETHEREAL made the most of its opening advantage and actually mated CHESSFIGHTER (Chessdom, 2020a). After their four draws in the previous event, FIRE notably beat ROFCHADE with a 7-man finale 30 moves closer to mate than both knew. In the first MCTS battle, KOMODOMCTS mated SCORPIONN. If NNs are blind to mate, that's a fairly basic weakness but things turned up for them in games 5-6. CHESSFIGHTER was on the best end of a KQPPkq draw and SCORPIONN beat ROFCHADE. The sting in the tail came when ETHEREAL lost to ROFCHADE after incorrectly choosing to exchange rooks into a knight endgame thicket. A zugzwang at position 49b may have been its undoing: FINALGEN (Romero, 2012) said 'btm, 1-0 in 42 moves; wtm, draw'. Already, FIRE and KOMODOMCTS looked good for a return to the Premier Division while CHESSFIGHTER was alone in last place. Round Robin 2 only confirmed these standings but with ETHEREAL again losing, this time to FIRE, the contest for 3rd and 4th remained close.

Round Robin 3 was 'moving day' for SCORPIONN and ROFCHADE. There was good news (+2) for the former which beat KOMODOMCTS and went favourite for 3rd, bad news (-2) for the latter which sustained losses to the two leaders. The remaining battle for fourth was only resolved in the last game of the event where ETHEREAL was in fact never threatened by ROFCHADE and remained in 4th place. In the penultimate game, KOMODOMCTS notably lost to FIRE in what looked like a clear OCB draw. FIRE was the only engine to go undefeated in this event: CHESSFIGHTER was the only engine not to win a game but even so, performed better than Elo forecast. Wool usefully picked out several games.[8]

Table 6. The TCEC17 League 1 play-off cross-table and net scores after each round robin.

#	Engine	Elo	Pts.	SB	X	Fi	Km	Sc	Et	rC	CF	RR	1..	2..	3..	4..
1	Fire 021819	3734	14	121.00	0		===1	====	=1==	1=1=	111=		+2	+4	+6	+7
2	KomodoMCTS 2499.00	3816	12	109.00	0	===0		1=01	====	1=1=	=11=		+2	+3	+4	+4
3	ScorpioNN 3.0.7	3824	11	100.25	0	====	0=10		====	1===	==1=		0	0	+2	+1
4	Ethereal 12.00	3825	9.5	92.50	0	=0==	====	====		0===	1===		0	-1	-1	-1
5	rofChade 2.214	3768	9	81.50	0	0=0=	0=0=	0===	1===		1==1		-1	-1	-3	-2
6	ChessFighter 3.2	3221	5.5	57.75	0	000=	=00=	==0=	0===	0==0			-3	-5	-8	-9

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[8] L1 playoff games: 3, 10, 15, 21,

5 THE PREMIER DIVISION: 10 ENGINES, 2 DRRs, 4 RRs, 180 GAMES @ 90′+5″/m

'Aloril' fortified inter-server comms with timestamping to combat the sometimes extreme delays imposed by internet firewalls. TCEC promoted all the CPU-CPU games to the top of the bill in order to defer the need for the GPUs that had only been used lightly in the previous event. The Premier Division, now 60+120 games, paralleled the FIDE Candidates Tournament in Yekaterinburg - both hoping to survive the Covid-19 crisis and with a grateful audience wishing them well.

STOCKFISH started hot with wins against ETHEREAL and KOMODO. At the halfway point, the unbeaten STOCKFISH and FIRE were the only engines in positive territory, +3 and +1 respectively. Wool (2020)[9] like the fans (Chessdom, 2020a) focused on g9, FIRE-KOMODOMCTS. The last three had no wins and HOUDINI, running at a disadvantage via WINE on only 64 threads, assumed the role of principal donor with -2. The second double round-robin started in the same way: STOCKFISH 1, ETHEREAL 0. Just as the wins were drying up, three came along at once in games 39-41, KOMODOMCTS taking a double hit and STOCKFISH beating its main rival, FIRE. Round Robin 3 was akin to 'moving day' at a Golf Open with KOMODOMCTS falling away to -3 while STOCKFISH went out to +5. Wool and 'TCEC' focussed on game 41, STOCKFISH–FIRE which, played out, would have featured three pawn promotions and White winning despite not getting the first check in the QP-endgame. With phase 1 finished, the clear leader in the clubhouse was STOCKFISH with an impressive +6, so the question was "Will FIRE's +1 be enough?" ETHEREAL edged third with one more win than KOMODO. The various video-commentaries (Chessdom, 2020b; 'Gmthechesspuzzler', 2020; 'Jozarov', 2020; 'Kingscrusher', 2020; Sadler and Regan, 2020) between them covered games 6, 12, 23, 31, 33, 39, 31, and 58. Haworth and Hernandez (2020) include a finer-grain index to the TCEC17 video-commentaries.

With just one third of the event over, the second phase began with those strange, mystical beasts, the GPUs, present in every game. While it was difficult to predict the Superfinal line-up, this was best done by percentage score and Aloril's (2020) Bayeselo calculations. Around game 74, TCEC became the only game in town as the FIDE Candidates tournament was halted by Covid-19 on March 26th. Every thirty games, a round-robin belatedly completed. Table 7 and Fig. 3 give the net scores as they evolved and after each round-robin as reconstructed post hoc.

Table 7. The TCEC17 Premier League cross-table and net scores after each round robin.

#	Engine	ELO	Pts.	SB	X	Lc	St	AS	Ko	Sv	Et	Fi	Km	Ho	Sc	1	2	3	4
1	LCZero v0.24-sv-t60-3010	3958	22.0	381.50	0		====	===1	==10	1=1=	==10	==1=	===1	====	=111	+1	+2	+7	+8
2	Stockfish 202003092246	3969	21.5	377.00	0	====		====	1===	=1==	1=1=	==1=	====	=1=1	====	+2	+4	+6	+7
3	AllieStein v0.5_timefix-	3936	19.5	342.00	0	===0	====		==0=	=1==	=101	=1==	====	==1=	1===	+1	+4	+3	+3
4	Komodo 2503.05	3912	18.5	327.50	0	==01	0===	==1=		=0==	====	====	1===	1===	=1==	0	0	0	+1
5	Stoofvlees II a14	3846	18.0	314.25	0	0=0=	=0==	=0==	=1==		=1==	====	====	==1=	===1	-1	-1	-1	0
6	Ethereal 12.01	3810	18.0	313.25	0	==01	0=0=	=010	====	=0==		====	==1=	===1	=1=1	-1	-2	-2	0
7	Fire 021819	3752	17.5	309.50	0	==0=	==0=	=0==	====	====	====		1=1=	====	====	+1	0	-1	-1
8	KomodoMCTS 2503.05	3809	16.0	290.50	0	===0	====	====	====	====	==0=	0=0=		====	10==	0	-1	-3	-4
9	Houdini 6.03	3854	15.0	271.50	0	====	=0=0	==0=	0===	=0==	===0	====	====		====	-1	-2	-4	-6
10	ScorpioNN 3.0.7.1	3812	14.0	253.00	0	=000	====	0===	=0==	===0	=0=0	====	01==	====		-2	-4	-5	-8

At the end of round-robin 1, ALLIESTEIN and LEELA were unsurprisingly competing with STOCKFISH for a place in the Superfinal: LEELA beat STOOFVLEES, game 83. At the half-way point, ALLIESTEIN and LEELA had lifted clear of their competition: STOOFVLEES had succumbed in games 110 and 120 to both ALLIESTEIN and STOCKFISH. Round robin 3 saw an extraordinary string of wins by LEELA while

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[9] Premier Phase 1 games 1, 6, 9, 12, 23, 31, 39-41, 53, 58

ALLIESTEIN went backwards with losses to KOMODO and ETHEREAL. Round robin 4 saw LEELA even pass STOCKFISH despite losing to the KOMODO/ETHEREAL duo. ETHEREAL took the notional TCEC combativity award for the least draws. Sadler and Regan (2020) contributed a fine string of commentaries on games 79, 94, 102, 107, 132, 146, 149 and 169: others added their insights on some of these games and on games 83, 120, 139, 143, 164 and 168.
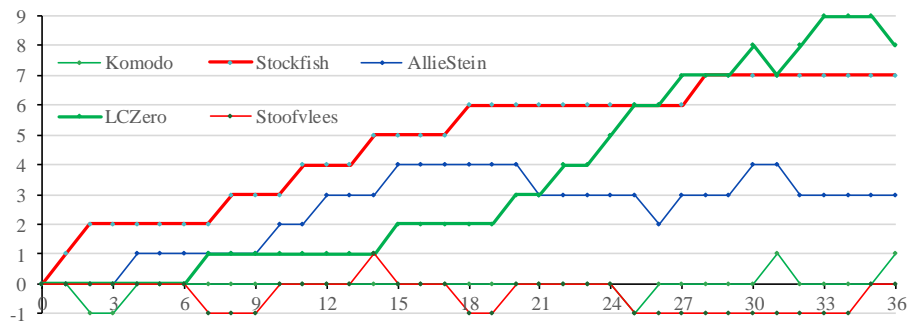

Fig. 3. Net wins, round by round, for the top five in the TCEC17 Premier Division.

And so the Superfinalists were STOCKFISH and LEELA CHESS ZERO, the former unbeaten once more in the Premier Division and the latter intriguingly and simultaneously sharper and more fallible with more wins but those two late losses. Game on!

6   THE SUPERFINAL: STOCKFISH VS LEELA CHESS ZERO

For so many of the audience, this was the Superfinal they wanted. This is not to discount the clear excellence of the other engines which are well respected but many had, after all, been seriously investing in the 'cloud evolution' of one engine or the other – or both. The chat audience swelled in number[10] and was extremely lively throughout, exchanging ideas in everything from the Queen's Gambit Declined to the post-Covid-19 Shopping Gambit Accepted.

It was not easy to sense a favourite but LEELA had shown more cutting edge in the Premier Division – without which it would have taken third place to ALLIESTEIN again. GM Matthew Sadler (2020) thought LEELA had shown enough to be rated the favourite: his 'Perspective' on the Superfinal is totally recommended and enables us to be relatively brief here[11]. Other commentators, including longtime TCEC supporters 'Gmthechesspuzzler' (2020), 'Assaf Wool' (2020) and 'Kingscrusher' (2020)[12] remained at their desks with minds keenly honed. The increased popularity of TCEC, probably combined with the constraints of Covid-19, saw other commentators in the stands (Chessdom, 2020a/b) including 'agadmator' (2020), 'Jozarov' (2020) and the *Game Changer* team of GM Sadler and WIM Regan (2019, 2020) who continue to produce their videos as we write. Our thanks to them all for their insightful commentaries on the chess itself, all of which complement this less chessic account of the match.

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[10] The meter clicked over 3,000 which may not rival FIDE's World Chess Championship numbers where there is live GM commentary but it was a record for TCEC.
[11] Sadler covered wins and draws alike – games 1, 3-4, 6, 1-12, 14, 16, 18, 21-22, 25, 27, 33-38, 40, 50, 61, 66, 83-84, 89-90, 91-94 and 95-96. The Sadler/Regan videos covered games 6, 18, 21, 33-4, 40, 61, 64, 95 & 98.
[12] 'Kingscrusher' contributed at least 27 video-commentaries – on games 3, 4, 7, 12, 14, 16, 26-8, 33-4, 36, 38, 43-4, 66, 77, 83-4, 87-8, 92-6 and 98 – a huge contribution.

Fig. 4 and Table 8 show the progress of the event. Jeroen Noomen (2020) infused the character of the mini-matches with his choice of openings which certainly added to the excitement by reducing the draw-rate: 'kudos' to JN here. Seven times, White won both games of the pair while Black, which was admittedly not competing under its own colours, fared badly with only two wins – games 16 and 95. LEELA eventually won ten mini-matches to STOCKFISH's five though this was largely due to an unexplained final sprint in the last ten games. Until then, either engine could have triumphed and one statistic clearly shows how close it was. The average game-length was over 100 moves, thanks also to Leela's cautious and often unnerving approach to pressing home its winning advantage.

STOCKFISH opened its account in game 3 but Leela replied immediately. Undeterred, STOCKFISH won game 7 – this time without reply – but LEELA came back in games 12 and 14 to lead. STOCKFISH won with Black in game 16 to level the scores and after an exchange of handbags in games 26-29, went ahead again in game 33. However, LEELA replied immediately by winning the same opening in game 34 and was never headed thereafter. Games 36 and 38 opened the lead to two for the first time but STOCKFISH stayed in touch until and with its win in game 87 when the lead was only 1. The suspense was palpable but the run of play changed at this point. Surely LEELA had no idea that its time had come but it rattled off wins in games 88, 92, 94, 95 (with Black), 96 and 98 while STOCKFISH scored in only games 93 – and 99 by which time it was all over.
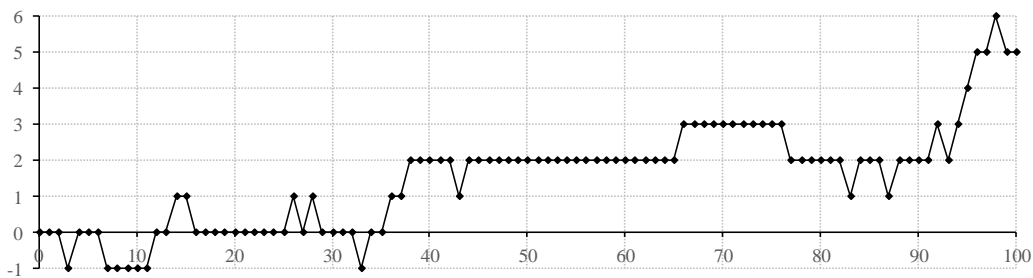

Fig. 4. The TCEC17 Superfinal: LEELA CHESS ZERO's lead as the match progressed.

Table 8. The TCEC17 Superfinal statistics and decisive games.

#	Superfinal	Elo	Pts	P%	Elo ±	(No. of) wins, matched and unmatched		Corresponding Openings	
1	Stockfish 20200407DC	3851	47½	47.5%	-82	7+5	03, 27, 33, 43, 83, 87, 93	07, 16, 29, 77, 99	B81, B00, E69, B01, E94/B06, D02	C27, B06, E12, D07, B90
2	Leela Chess Zero v0.24-sv-t60-3010	3840	52½	52.5%	+82	7+10	04, 28, 34, 44, 84, 88, 94	12, 14, 26, 36, 38, 66, 92, 95, 96, 98	B40, E94/B06, D02	C16, A61, D16, B79, A10, E94, C57, C02, C02, E98

7   Summary

There were two winners in the TCEC17 Championship, LEELA CHESS ZERO and chess itself. Has there been a more hard-fought match? Has chess ever been played at a higher level? Your authors here have to say 'no': these games were outstanding and everyone is encouraged to look past the result to the play itself. While it is difficult to see this Superfinal being bettered, Markov theory says 'never say never' so we have to assume that there will be more great engine contests. Both 'AB' engines and 'NN' engines are still improving even if it is difficult to see STOCKFISH being easily displaced by another pure AB-engine at the moment.

Presumably, there is an opportunity for an engine that combines the separate merits of 'Shannon AB' and 'Neural' engines while avoiding their weaknesses. Maybe such an engine cannot come through while TCEC's CPU- and GPU-servers remain physically apart.

As ever, our thanks and congratulations to 'TCEC operations' and all the participating engine-authors (particularly given the platform changes they had to manage), to the members of 'the cloud' who are improving these engines, to the audience and to the leading chess commentators without whom much of the strategic genius in the play would go unnoticed. This championship is also reported in Wikipedia (2020).

For the first time, all the decisive games (Haworth and Hernandez, 2020) have been played out with varying difficulty using FRITZ17 at a search-depth of 24 ply to provide reference solutions to potential training material. All the game entries to 7-man chess have been given 'DTM' Depth to Mate (Lomonosov, 2012) and 'DTZ' Depth to Zeroing of the ply count (de Man et al, 2018) depths. In Tables 9 and 10, we supply the usual statistics and data on the games.

Table 9. Generic statistics for each phase of TCEC17: results, terminations and average game-length.

	TCEC 17	Qualification #	%	League 2 #	%	League 1 #	%	L 1 Playoff #	%	Division P #	%	Superfinal #	%	Overall #	%
	# games	240		240		480		60		180		100		1300	
Results	Draws	109	45.4	135	56.3	323	67.3	40	66.7	139	77.2	71	71.0	817	62.8
	Wins	131	54.6	105	43.8	157	32.7	20	33.3	41	22.8	29	29.0	483	37.2
	1-0	74	30.8	69	28.8	98	20.4	15	25.0	38	21.1	27	27.0	321	24.7
	0-1	57	23.8	36	15.0	59	12.3	5	8.3	3	1.7	2	2.0	162	12.5
	White performance	128.5	53.5	136.5	56.9	259.5	54.1	35.0	58.3	107.5	59.7	62.5	62.5	730	56.1
	Black performance	111.5	46.5	103.5	43.1	220.5	45.9	25.0	41.7	72.5	40.3	37.5	37.5	571	43.9
Terminations	TCEC draw	45	18.8	72	30.0	187	39.0	14	23.3	67	37.2	35	35.0	420	32.3
	3x repetition	16	6.7	26	10.8	61	12.7	5	8.3	11	6.1	7	7.0	126	9.7
	50-move rule	5	2.1	2	0.8	2	0.4	1	1.7	6	3.3	4	4.0	20	1.5
	Stalemate	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	1	0.1
	EGT adj., 'draw'	43	17.9	35	14.6	73	15.2	20	33.3	53	29.4	25	25.0	249	19.2
	EGT adjudication	72	30.0	52	21.7	88	18.3	23	38.3	56	31.1	35	35.0	326	25.1
	TCEC win	94	39.2	82	34.2	140	29.2	8	13.3	28	15.6	12	12.0	364	28.0
	EGT adj., 'win'	29	12.1	17	7.1	15	3.1	3	5.0	3	1.7	10	10.0	77	5.9
	Tech. default	3	1.3	6	2.5	1	0.2	0	0.0	0	0.0	0	0.0	10	0.8
	Manual adj.	0	0.0	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	1	0.1
	Mate	5	2.1	0	0.0	0	0.0	8	13.3	10	5.6	7	7.0	30	2.3
	Loss on time	0	0.0	0	0.0	1	0.2	0	0.0	0	0.0	0	0.0	1	0.1
	Resignation	0	0.0	0	0.0	0	0.0	1	1.7	0	0.0	0	0.0	1	0.1
Length	Moves	68.6		63.8		63.2		74.7		74.6		101.7		69.4	
	Time-budget (h)	1.19		1.18		1.68		2.21		3.21		3.28		1.85	
	Clock-time used (h)	1.06	88.7	1.02	86.3	1.43	85.1	1.94	87.7	2.80	87.2	3.09	94.2	1.62	87.6
	C-time not used (h)	0.13	11.3	0.16	13.7	0.25	14.9	0.27	12.3	0.41	12.8	0.19	5.8	0.23	12.4

Table 10. The shortest and longest 1-0, drawn and 0-1 games in each phase of TCEC17.

	1-0						½-½						0-1					
	Shortest			Longest			Shortest			Longest			Shortest			Longest		
Tier	Game		#mv	Game		#mv	Game		#mv	Game		#mv	Game		#mv	Game		#mv
Q	187/24.3	iC-To	36	49/7.1	Go-Fa	121	139/18.3	Cs-Go	13	147/19.3	Ma-Mi	227	74/10.2	Tu-Mi	33	201/26.1	Fa-Wi	225
2	149/19.1	Ru-Pi	22	213/27.5	Fi-Va	128	5/1.5	Te-PS	13	201/26.1	Mi-Ru	141	121/16.1	Mi-De	39	220/28.4	Pe-Fi	117
1-CPU	285/36.5	Wi-rf	39	238/30.6	Et-Pe	146	133/17.5	An-Pe	18	100/13.4	De-Xi	281	423/53.7	Fz-Et	40	162/21.2	De-Va	174
1po	48/16.3	Km-Sc	46	55/19.1	ro-CF	99	47/16.2	ro-Fi	30	27/9.3	Sc-Fi	148	34/12.1	CF-Km	66	3/1.3	Sc-Km	145
P	146/30.1	Ko-AS	34	179/36.4	Ko-Lc0	129	59/12.4	Ko-Fi	35	104/21.4	Et-Lc0	194	99/20.4	Sc-Ko	53	139/28.4	Sc-Lc0	76
SF	93	St-Lc	42	84	Lc-St	187	62	Lc-St	34	58	Lc-St	211	95	St-Lc	93	16	Lc-St	196
O'all	2, 149	Ru-Pi	22	SF, 84	Lc-St	187	Q, 139	Cs-Go	13	Q, 147	Ma-Mi	227	Q, 74	Tu-Mi	33	Q, 201	Fa-Wi	225

REFERENCES

'agadmator' (2020). https://youtu.be/K0gBybDFcMg. Example commentary, Sufi game 7.

'Aloril' (2020). https://tcecbayeselo.chessdom.org/. Bayeselo simulation forecasts.

Chessdom (2020a). https://wiki.chessdom.org/Category:Notable_game. Notable TCEC games.

Chessdom (2020b). https://wiki.chessdom.org/TCEC_Season_17_Game_coverage.

CPW (2020). https://tinyurl.com/icga046. Biographies of chess engines, authors and developers.

de Man, R., Fiekas, N. and Guo, B. (2018). https://tinyurl.com/icga007. Fiekas' interface to 'Syzygy formatted' de Man sub-7-man and Guo 7-man DTZ_{50}'' EGTs.

'Gmthechesspuzzler' (2020). https://www.youtube.com/watch?v=vjp6k7MpBDg. Sufi game 90, an example Gmtcp video commentary.

Haworth, G. M^{c}C and Hernandez, N. (2020). The 17th TCEC event: TCEC 17. This report plus pgn files, data and statistics. *ICGA Journal*, 42(2-3), 181-191. http://centaur.reading.ac.uk/89999/.

Intel (2016). https://tinyurl.com/icga059. Intel's specification of the XEON® E5-4669v4 processor.

'Jozarov' (2020). https://youtu.be/1roczfJuteY. Example commentary, Sufi game 14.

'Kingscrusher' (2020). https://youtu.be/yKvtigUSv88. Example Sufi commentary, game 3.

Lim, A. (2020). http://www.talkchess.com/forum3/viewtopic.php?t=71163. On CHESSFIGHTER.

Lomonosov (2012). http://tb7.chessok.com/. Facility for querying sub-8-man DTM EGTs.

Noomen, J. (2020). http://tinyurl.com/icga0622. Discussion of TCEC17 Sufi openings.

Nvidia (2018). https://www.nvidia.com/en-gb/geforce/graphics-cards/rtx-2080-ti/ GEFORCE GTX 2080 TI GPU specification and benchmark performance data.

Romero, P.P. (2012). https://tinyurl.com/icga013. FINALGEN: Tutorial, download and forum.

Sadler, GM M. (2020). The TCEC17 Computer Chess Superfinal: a perspective. Submitted to the *ICGA Journal*.

Sadler, M. and Regan, N. (2019). *Game Changer*: *AlphaZero's Groundbreaking Chess Strategies and the Promise of AI*. New in Chess.

Sadler, GM M. and Regan, WIM N. (2020). https://tinyurl.com/icga060. Some twenty 'Chess Giant' videos on TCEC17 Premier League and Superfinal games.

Wikipedia (2020). https://en.wikipedia.org/wiki/TCEC_Season_17. TCEC17 report.

Wool, A. (2019) http://mytcecexperience.blogspot.co.uk/. AW's 'TCEC Experience' blog.