

		Player B	
		C	D
Player A	C	(γ_1, γ_1)	(γ_2, γ_3)
	D	(γ_3, γ_2)	(γ_4, γ_4)

Table I. The general form of the payoff function in the prisoner's dilemma, where γ_1 is the payoff to each player for mutual cooperation, γ_2 is the payoff for cooperating when the other player defects, γ_3 is the payoff for defecting when the other player cooperates, and γ_4 is the payoff for mutual defection. An entry (α, β) indicates the payoffs to players A and B, respectively.

		Player B	
		C	D
Player A	C	(3, 3)	(0, 5)
	D	(5, 0)	(1, 1)

Table II. The specific payoff function used in [12].

6-2-1	(a)	(b)	(c)	(d)	(e)
10 Parents	0	0	10	9	0
20 Parents	6	0	19	13	0
30 Parents	4	1	19	11	0
40 Parents	7	0	19	12	0
50 Parents	2	0	10	2	0
6-20-1	(a)	(b)	(c)	(d)	(e)
10 Parents	9	2	13	11	4
20 Parents	16	5	10	3	15
30 Parents	13	2	15	6	13
40 Parents	15	5	14	5	15
50 Parents	15	1	16	2	15

Table III. Tabulated results of the 20 trials in each setting. The columns represent: (a) the number of trials that generated cooperative behavior after the 10th generation, (b) the number of trials that demonstrated a trend toward increasing mean payoffs, (c) the number of trials that demonstrated a trend toward decreasing mean payoffs, (d) the number of trials that generated persistent universal complete defection after the 200th generation, and (e) the number of trials that appeared to consistently generate some level of cooperative behavior (from [26]).

Table IV. The relevant categories of player indicated by the corresponding range of rating score.

Class	Rating
Senior Master	2400+
Master	2200-2399
Expert	2000-2199
Class A	1800-1999
Class B	1600-1799
Class C	1400-1599
Class D	1200-1399
Class E	1000-1199
Class F	800-999
Class G	600-799
Class H	400-599
Class I	200-399
Class J	below 200

Appendix

This appendix contains the complete sequence of moves from two selected games where the best-evolved neural network from generation 230 defeated a human rated 2210 (master level) and also defeated a human rated 2024 (expert level). The notation for each move is given in the form *a-b*, where *a* is the position of the checker that will move and *b* is the destination. Forced moves (mandatory jumps or occasions where only one move is available) are indicated by (f). Accompanying the move sequences are two figures for each game indicating a pivotal position and the ending. The figures are referred to in the annotations.

Game Against Human Rated 2210 (Master)

NN Plays Red, Human Plays White

(f) denotes a forced move

Comments on moves are offered in brackets

Computer	Human	Comments
1.R:9-13	1.W:23-19	
2.R:10-14	2.W:22-17	
3.R:13-22(f)	3.W:25-18-9	
4.R:5-14	4.W:29-25	
5.R:1-5	5.W:25-22	
6.R:7-10	6.W:26-23	
7.R:6-9	7.W:24-20	
8.R:3-7	8.W:28-24	[NN indicates that it is significantly ahead]
9.R:9-13	9.W:22-18	
10.R:5-9	10.W:32-28	[NN avoids a swap and maintains the opportunity to double jump on Move 12 as he sets a trap]
11.R:11-16	11.W:20-11(f)	
12.R:8-15-22	12.W:30-26	[NN is up one piece] (Figure A1)
13.R:7-11	13.W:26-17(f)	
14.R:13-22(f)	14.W:24-20	
15.R:11-15	15.W:27-24	[Human blocks swap]
16.R:4-8	16.W:20-16	[NN swaps out and stops human from getting a king.]
17.R:8-11	17.W:16-7(f)	
18.R:2-11(f)	18.W:24-20	
19.R:15-24(f)	19.W:28-19(f)	
20.R:11-15	20.W:20-16	[Human goes down a second piece but saves the piece on 20 by moving for king.]
21.R:15-24(f)	21.W:16-11	
22.R:24-28	22.W:11-7	
23.R:10-15	23.W:7-2	[Human gets king]
24.R:9-13	24.W:2-7	
25.R:22-25	25.W:7-11	
26.R:15-18	26.W:23-19	
27.R:25-29	27.W:19-15	[NN gets king]
28.R:28-32	28.W:15-10	[NN gets second king]
29.R:18-22	29.W:10-6	
30.R:22-25	30.W:6-1	[Human gets second king]
31.R:25-30	31.W:1-6	[NN gets third king]
32.R:14-18	32.Resign	[Human forfeits the game] (Figure A2)

Game Against Human Rated 2024 (Expert)

Human Plays Red, NN Plays White
(f) denotes a forced move
Comments on moves are offered in brackets

Human	Computer	Comment
1.R:11-15	1.W:24-20	[standard NN response]
2.R:8-11	2.W:23-18	
3.R:4-8	3.W:26-23	[Human plays a standard opening]
4.R:10-14	4.W:27-24	
5.R:7-10	5.W:24-19	
6.R:15-24(f)	6.W:28-19(f)	[Swapping pieces]
7.R:10-15	7.W:19-10(f)	[More swapping]
8.R:6-15(f)	8.W:31-26	
9.R:9-13	9.W:18-9(f)	[Another swap]
10.R:5-14(f)	10.W:23-18	
11.R:14-23(f)	11.W:26-19-10(f)	[NN goes up a piece but not for long]
12.R:2-6	12.W:22-18	
13.R:6-15-2(f)	13.W:25-18(f)	[Human comes back even on pieces]
14.R:3-7	14.W:30-26	
15.R:1-5	15.W:26-23	
16.R:7-10	16.W:23-19	
17.R:10-14	17.W:18-9(f)	[Another swap]
18.R:5-14(f)	18.W:32-27	
19.R:14-18	19.W:29-25	[NN blocks human, about to go up a piece] (Figure A3)
20.R:11-15	20.W:19-10(f)	[Human is forced to give up a piece]
21.R:8-11	21.W:10-7	
22.R:11-15	22.W:27-24	
23.R:18-23	23.W:7-2	[NN gets king]
24.R:23-27	24.W:2-7	
25.R:27-31	25.W:25-22	[Human gets king; NN blocks 31-26 and 15-18]
26.R:31-27	26.W:7-10	[Human about to go down two pieces, resigns] (Figure A4)]