

An experiment to train AlphaZero for Bridge bidding

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First results.

The AlphaZero algorithm is a world champion in Chess and Go. We used an implementation in the quick Julia programming language and complemented it with Bridge machinery (no conventions coded, only a list of allowed bids; we restricted us to pass and +1 to +10 steps for each bidding situation).

AlphaZero uses Deep Reinforcement Learning (DRL) combined with Monte Carlo Tree Search (MCTS). It is supposed to be used on full-information games so stochastic Bridge-bidding without full information is a little bit outside expected use area.

For training we used examples from DealerV2 and concentrated on the offensive situation 1 Spade (5+,11+) – 1 NT (0-2 spades, 8-12). Other datasets can be used; i.e response to 1 spade, best openings or 1NT-bidding etc. Only N-S were bidding but we plan to introduce competitive bidding next month; the AlphaZero-code supports two players and we only used one; N and S alternating decisions for a common result (but they can't see each other's hands).

The state was encoded as shape and hcp combined with bidding sequence up to 6 bids + pass (excluding 1 Spade - 1NT). Bidding sequence was stored as a 6 element array initiated with -1. In future version maybe we can add controls, losers etc but no plan to just use the hands cards yet; it would require a very lot of examples to not over-train (we used 20k hand examples filtered from ca 1 million random samples).

As error to learn from we used the par-score; because E-W was not allowed to bid it sometimes resulted in higher than par results.

From -710 loss at start in was reduced to -70 points/deal after 3 hours of training on a supercomputer (only one Nvidia A100 GPU was used). We plan to rerun longer with a larger training set and imp-scoring next week. And later providing source code.

Log file with some bidding examples is on next pages.

Thanks EuroHPC for allowing me to use MeluXina. Some of these result might be useful for controlling Nuclear Fusion power reactors.

References

<https://jonathan-laurent.github.io/AlphaZero.jl/dev/>

<https://github.com/dealerv2/Dealer-Version-2->

<https://web.stanford.edu/~surag/posts/alphazero.html>

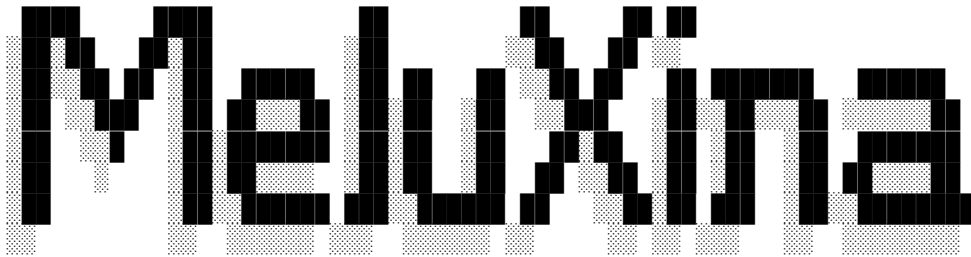
Authenticating with public key "eddsa-key-20230701"

```
• MobaXterm Personal Edition v23.2 •
(SSH client, X server and network tools)

➤ SSH session to u1xxxxx@login.lxp.lu
  • Direct SSH      : ✓
  • SSH compression : ✓
  • SSH-browser     : ✓
  • X11-forwarding  : ✓ (remote display is forwarded through SSH)

➤ For more info, ctrl+click on help or visit our website.
```

Welcome the Luxembourg - EuroHPC supercomputer



You are on a MeluXina login node				
System information: Compute				
Nodes	CPU	RAM	Accelerator	Disk
573N	2x AMD 7H12: 128c @2.6G	512GB	-	-
200N	2x AMD 7452: 64c @2.3G	512GB	4x NVIDIA A100-40	1.92G
20N	2x AMD 7452: 64c @2.3G	512GB	2x Intel Stratix 10MX-16	1.92G
20N	2x AMD 7H12: 128c @2.6G	4096GB	-	1.92G
System information: Data				
Tier	Capacity	Speed	Type	Location on compute/login
Scratch	0.6PB	400GB/s	NVMe	/project/scratch
Home/Project	12.5PB	180GB/s	HDD	/home/users, /project/home
Backup	7.5PB	30GB/s	HDD	-
System information: Interconnect				
Fabric: Infiniband HDR, 200Gbps, DragonFly+ topology				
Links : 1x on CPU nodes, 2x on GPU, FPGA & LargeMemory nodes				
System information: Software				

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Production software stack: 2022.1, default since 15 Jan 2023

Previous software stack: 2021.3 in maintenance mode, use it with:
`module load env/release/2021.3`

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Center information
-----
News & Events      : luxprovide.lu
Documentation       : docs.lxp.lu
System status      : weather.lxp.lu
Support            : servicedesk.lxp.lu, servicedesk@lxp.lu
-----
LinkedIn & Twitter : @luxprovide #meluxina @EuroHPC_JU
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#####
#                               System events, in-progress and upcoming                               #
#-----#
# * No events                                                            #
#####
[u100xxx@mel2041 AlphaZero.jl]$
[u100xxx@mel2041 AlphaZero.jl]$ julia --project -e 'using AlphaZero;
Scripts.explore("bridgebid")'

```

Loading environment from: sessions/bridgebid

Starting interactive exploration

Initial bidding: 1 Spade (11+,5+) - 1 NT (0-2 spades, 6-12, currently forcing)

Exemplenumber North hand South hand Par score State = shape,hcp,max 6 bids
 (-1 = bid is not bidden yet, +1 = one step up; 2 C; +10 = 10 steps up (3NT))

Hands:17934: n AQ6543.JT.AQ4.J2 -s 72.Q852.KT962.K6 (110)no bids yet in state: 6 2 3 2
 14 -1 -1 -1 -1 -1 -1

Nmcts Vnet
 599 -0.53

Recommended bids:

		Pmcts	Pnet	UCT	Qmcts	Qnet	
+4	88.0%	88.0%	22.2%	-0.03	-0.05	-0.53	Most recommended bid is 1NT+4 steps = 2 sp
+2	3.3%	3.3%	5.3%	-0.12	-0.24	-0.53	
+7	3.3%	3.3%	3.4%	-0.19	-0.27	-0.53	
+10	2.2%	2.2%	33.4%	+0.16	-1.01	-0.53	
+3	1.5%	1.5%	12.9%	-0.13	-0.76	-0.53	
+1	0.3%	0.3%	7.6%	-0.58	-1.82	-0.53	
+5	0.3%	0.3%	5.8%	-0.62	-1.57	-0.53	
+6	0.3%	0.3%	3.6%	-1.48	-2.07	-0.53	
+8	0.3%	0.3%	2.5%	-1.41	-1.82	-0.53	
+9	0.3%	0.3%	3.3%	-0.53	-1.07	-0.53	

> do *Select to bid the most recommended*

Hands:2 4 5 2 8 4 2♠ *Now it is south's turn to bid on 2 Sp*

Nmcts Vnet
379,126 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	94.8%	94.8%	43.2%	+0.00	+0.00	+0.00
+3	4.0%	4.0%	7.3%	-0.00	-0.01	-0.53
+1	0.6%	0.6%	4.3%	-0.05	-0.08	-0.53
+2	0.4%	0.4%	3.0%	-0.07	-0.10	-0.53
+4	0.0%	0.0%	12.6%	-0.67	-1.81	-0.53
+5	0.0%	0.0%	3.3%	-1.13	-1.49	-0.53
+6	0.0%	0.0%	2.0%	-1.43	-1.70	-0.53
+10	0.0%	0.0%	19.0%	-1.13	-3.88	-0.53
+9	0.0%	0.0%	1.9%	-2.58	-2.85	-0.53
+7	0.0%	0.0%	1.9%	-1.33	-1.67	-0.53
+8	0.0%	0.0%	1.4%	-3.67	-4.12	-0.53

> do

Hands:2 4 5 2 8 4 0 2♠P> do
> restart *Select another hand*

Hands:4565: n AK962.AQJ63..A85 -s T8.K2.KJ864.K643 (460)no bids yet in state: 5 5 0 3 18
-1 -1 -1 -1 -1 -1 Nmcts Vnet
164,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	97.1%	97.1%	33.4%	-0.11	-0.11	-0.53
+4	0.7%	0.7%	22.2%	-0.15	-0.30	-0.53
+3	0.5%	0.5%	12.9%	-0.22	-0.33	-0.53
+6	0.4%	0.4%	3.6%	-0.24	-0.28	-0.53
+5	0.4%	0.4%	5.8%	-0.20	-0.26	-0.53
+8	0.2%	0.2%	2.5%	-0.34	-0.39	-0.53
+1	0.2%	0.2%	7.6%	-0.35	-0.55	-0.53
+2	0.1%	0.1%	5.3%	-0.39	-0.58	-0.53
+9	0.1%	0.1%	3.3%	-0.53	-0.68	-0.53
+7	0.1%	0.1%	3.4%	-0.50	-0.68	-0.53

> do

Hands:2 2 5 4 10 10 3N Nmcts Vnet
450,705 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	97.6%	97.6%	12.6%	-0.10	-0.10	-0.53
Pass	0.7%	0.7%	43.2%	-0.11	-0.30	-0.30
+3	0.6%	0.6%	7.3%	-0.13	-0.17	-0.53
+8	0.2%	0.2%	1.4%	-0.25	-0.27	-0.53
+9	0.2%	0.2%	1.9%	-0.25	-0.28	-0.53
+7	0.2%	0.2%	1.9%	-0.35	-0.38	-0.53
+2	0.2%	0.2%	3.0%	-0.24	-0.29	-0.53
+1	0.2%	0.2%	4.3%	-0.34	-0.43	-0.53
+5	0.1%	0.1%	3.3%	-0.49	-0.57	-0.53

+6	0.0%	0.0%	2.0%	-0.65	-0.79	-0.53
+10	0.0%	0.0%	19.0%	-2.72	-7.19	-0.53

> do

Hands:5 5 0 3 18 10 4 3N4♠ Nmcts Vnet
924,215 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.0%	99.0%	43.2%	-0.10	-0.10	-0.10
+4	0.6%	0.6%	12.6%	-0.13	-0.17	-0.53
+5	0.2%	0.2%	3.3%	-0.22	-0.25	-0.53
+2	0.1%	0.1%	3.0%	-0.41	-0.48	-0.53
+3	0.1%	0.1%	7.3%	-0.41	-0.62	-0.53
+1	0.1%	0.1%	4.3%	-0.43	-0.57	-0.53
+6	0.0%	0.0%	2.0%	-5.66	-6.53	-0.53
+7	0.0%	0.0%	1.9%	-7.31	-8.39	-0.53
+10	0.0%	0.0%	19.0%	-5.25	-21.11	-0.53
+8	0.0%	0.0%	1.4%	-11.17	-12.40	-0.53
+9	0.0%	0.0%	1.9%	-10.78	-12.40	-0.53

> do

Hands:5 5 0 3 18 10 4 0 3N4♠P> restart

Hands:33: n KQT97.76.A94.QJ2 -s .T53.KJT652.AK53 (400)no bids yet in state: 5 2 3 3 12
-1 -1 -1 -1 -1 -1 Nmcts Vnet
199,799 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+7	96.5%	96.5%	3.4%	-0.01	-0.01	-0.53
+10	1.4%	1.4%	33.4%	-0.04	-0.15	-0.53
+4	0.5%	0.5%	22.2%	-0.03	-0.24	-0.53
+9	0.4%	0.4%	3.3%	-0.12	-0.16	-0.53
+8	0.4%	0.4%	2.5%	-0.14	-0.17	-0.53
+3	0.3%	0.3%	12.9%	-0.09	-0.27	-0.53
+5	0.2%	0.2%	5.8%	-0.25	-0.38	-0.53
+6	0.2%	0.2%	3.6%	-0.36	-0.47	-0.53
+1	0.1%	0.1%	7.6%	-0.36	-0.65	-0.53
+2	0.0%	0.0%	5.3%	-0.88	-1.42	-0.53

> do

Hands:0 3 6 4 11 7 3♦ Nmcts Vnet
484,455 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	98.1%	98.1%	19.0%	-0.00	-0.00	-0.53
+1	0.2%	0.2%	4.3%	-0.20	-0.25	-0.53
+4	0.2%	0.2%	12.6%	-0.18	-0.34	-0.53
+2	0.2%	0.2%	3.0%	-0.20	-0.24	-0.53
+3	0.2%	0.2%	7.3%	-0.15	-0.25	-0.53
+6	0.2%	0.2%	2.0%	-0.21	-0.24	-0.53
+7	0.2%	0.2%	1.9%	-0.22	-0.25	-0.53
+9	0.2%	0.2%	1.9%	-0.14	-0.17	-0.53

+8	0.2%	0.2%	1.4%	-0.15	-0.17	-0.53
+5	0.2%	0.2%	3.3%	-0.25	-0.31	-0.53
Pass	0.0%	0.0%	43.2%	+0.27	-2.50	-2.50

> do

Hands:5 2 3 3 12 7 10 3♦5♦ Nmcts Vnet
969,122 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	100.0%	100.0%	43.2%	+0.00	+0.00	+0.00
+3	0.0%	0.0%	7.3%	-4.82	-7.40	-0.53
+1	0.0%	0.0%	4.3%	-4.84	-6.72	-0.53
+2	0.0%	0.0%	3.0%	-5.43	-6.75	-0.53
+4	0.0%	0.0%	12.6%	-3.46	-8.98	-0.53
+5	0.0%	0.0%	3.3%	-9.75	-12.71	-0.53
+6	0.0%	0.0%	2.0%	-11.03	-12.85	-0.53
+7	0.0%	0.0%	1.9%	-11.35	-13.14	-0.53
+8	0.0%	0.0%	1.4%	-12.06	-13.44	-0.53
+10	0.0%	0.0%	19.0%	-5.00	-23.68	-0.53
+9	0.0%	0.0%	1.9%	-11.87	-13.80	-0.53

> do

Hands:5 2 3 3 12 7 10 0 3♦5♦P> resdty^H^H^Htart
> restart

Hands:7893: n KQ864.KT4.K986.K -s 93.QJ6.A7.QJ9874 (400)no bids yet in state: 5 3 4 1 14
-1 -1 -1 -1 -1 -1 Nmcts Vnet
251,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	93.6%	93.6%	33.4%	-0.00	-0.00	-0.53
+4	2.5%	2.5%	22.2%	-0.01	-0.04	-0.53
+3	1.1%	1.1%	12.9%	-0.02	-0.07	-0.53
+1	0.5%	0.5%	7.6%	-0.06	-0.11	-0.53
+7	0.5%	0.5%	3.4%	-0.10	-0.13	-0.53
+5	0.4%	0.4%	5.8%	-0.08	-0.13	-0.53
+2	0.4%	0.4%	5.3%	-0.08	-0.13	-0.53
+6	0.4%	0.4%	3.6%	-0.09	-0.13	-0.53
+8	0.4%	0.4%	2.5%	-0.10	-0.13	-0.53
+9	0.3%	0.3%	3.3%	-0.10	-0.15	-0.53

> do

Hands:2 3 2 6 10 10 3N Nmcts Vnet
631,336 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.9%	99.9%	43.2%	+0.00	+0.00	+0.00
+4	0.0%	0.0%	12.6%	-1.30	-3.60	-0.53
+2	0.0%	0.0%	3.0%	-3.12	-3.82	-0.53
+3	0.0%	0.0%	7.3%	-2.14	-3.83	-0.53
+10	0.0%	0.0%	19.0%	-1.89	-7.19	-0.53
+1	0.0%	0.0%	4.3%	-2.73	-3.97	-0.53

+9	0.0%	0.0%	1.9%	-3.89	-4.46	-0.53
+5	0.0%	0.0%	3.3%	-3.30	-4.33	-0.53
+6	0.0%	0.0%	2.0%	-3.73	-4.36	-0.53
+8	0.0%	0.0%	1.4%	-3.88	-4.36	-0.53
+7	0.0%	0.0%	1.9%	-4.44	-5.34	-0.53

> do

Hands:2 3 2 6 10 10 0 3NP> restart

Hands:4023: n AKT94.A95.K92.42 -s 5.QT87.Q64.KQJT9 (430)no bids yet in state: 5 3 3 2 14
 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 260,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	94.0%	94.0%	33.4%	-0.00	-0.00	-0.53
+4	2.0%	2.0%	22.2%	-0.00	-0.05	-0.53
+3	1.1%	1.1%	12.9%	-0.03	-0.07	-0.53
+1	0.8%	0.8%	7.6%	-0.05	-0.08	-0.53
+5	0.4%	0.4%	5.8%	-0.16	-0.21	-0.53
+7	0.4%	0.4%	3.4%	-0.10	-0.13	-0.53
+2	0.4%	0.4%	5.3%	-0.07	-0.12	-0.53
+6	0.4%	0.4%	3.6%	-0.09	-0.13	-0.53
+9	0.3%	0.3%	3.3%	-0.11	-0.15	-0.53
+8	0.2%	0.2%	2.5%	-0.17	-0.22	-0.53

> do

Hands:1 4 3 5 10 10 3N Nmcts Vnet
 696,524 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	98.8%	98.8%	43.2%	+0.00	+0.00	+0.00
+5	0.5%	0.5%	3.3%	-0.04	-0.05	-0.53
+2	0.2%	0.2%	3.0%	-0.18	-0.23	-0.53
+3	0.2%	0.2%	7.3%	-0.21	-0.32	-0.53
+4	0.2%	0.2%	12.6%	-0.13	-0.32	-0.53
+1	0.1%	0.1%	4.3%	-0.18	-0.26	-0.53
+10	0.0%	0.0%	19.0%	-1.69	-7.25	-0.53
+6	0.0%	0.0%	2.0%	-3.80	-4.46	-0.53
+8	0.0%	0.0%	1.4%	-4.07	-4.53	-0.53
+9	0.0%	0.0%	1.9%	-3.96	-4.56	-0.53
+7	0.0%	0.0%	1.9%	-3.87	-4.51	-0.53

> do

Hands:1 4 3 5 10 10 0 3NP> restart

Hands:17208: n AQT984.5.K854.QJ -s J5.KT7.T93.AT754 (100)no bids yet in state: 6 1 4 2
 12 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 240,599 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	90.0%	90.0%	22.2%	+0.40	+0.40	-0.53
+9	3.3%	3.3%	3.3%	+0.39	+0.39	-0.53

+3	1.6%	1.6%	12.9%	+0.38	+0.35	-0.53
+1	1.0%	1.0%	7.6%	+0.37	+0.34	-0.53
+2	0.8%	0.8%	5.3%	+0.36	+0.33	-0.53
+6	0.8%	0.8%	3.6%	+0.35	+0.33	-0.53
+8	0.8%	0.8%	2.5%	+0.34	+0.33	-0.53
+5	0.8%	0.8%	5.8%	+0.36	+0.33	-0.53
+7	0.7%	0.7%	3.4%	+0.34	+0.32	-0.53
+10	0.1%	0.1%	33.4%	+0.31	-1.83	-0.53

> do

Hands:2 3 3 5 8 4 2♠ Nmcts Vnet
628,773 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	94.4%	94.4%	43.2%	+0.40	+0.40	+0.40
+5	2.4%	2.4%	3.3%	+0.39	+0.39	-0.53
+4	1.3%	1.3%	12.6%	+0.39	+0.37	-0.53
+1	0.7%	0.7%	4.3%	+0.37	+0.35	-0.53
+3	0.7%	0.7%	7.3%	+0.38	+0.35	-0.53
+2	0.5%	0.5%	3.0%	+0.36	+0.34	-0.53
+10	0.0%	0.0%	19.0%	+0.05	-2.27	-0.53
+6	0.0%	0.0%	2.0%	-1.18	-1.52	-0.53
+9	0.0%	0.0%	1.9%	-1.43	-1.76	-0.53
+7	0.0%	0.0%	1.9%	-2.50	-2.97	-0.53
+8	0.0%	0.0%	1.4%	-2.64	-2.99	-0.53

> do

Hands:2 3 3 5 8 4 0 2♠P> restart

Hands:11783: n JT763.A.A96.K752 -s K8.K76542.K54.94 (110)no bids yet in state: 5 1 3 4
12 -1 -1 -1 -1 -1 -1 Nmcts Vnet
217,799 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+3	97.9%	97.9%	12.9%	-0.00	-0.00	-0.53
+1	1.1%	1.1%	7.6%	-0.04	-0.07	-0.53
+2	0.7%	0.7%	5.3%	-0.05	-0.08	-0.53
+4	0.1%	0.1%	22.2%	-0.27	-1.45	-0.53
+10	0.1%	0.1%	33.4%	-0.01	-1.82	-0.53
+5	0.0%	0.0%	5.8%	-0.85	-1.38	-0.53
+6	0.0%	0.0%	3.6%	-1.08	-1.45	-0.53
+8	0.0%	0.0%	2.5%	-1.07	-1.34	-0.53
+9	0.0%	0.0%	3.3%	-1.28	-1.65	-0.53
+7	0.0%	0.0%	3.4%	-0.97	-1.36	-0.53

> do

Hands:2 6 3 2 9 3 2♥ Nmcts Vnet
633,125 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.8%	99.8%	43.2%	+0.00	+0.00	+0.00
+4	0.0%	0.0%	12.6%	-0.64	-1.67	-0.53

+3	0.0%	0.0%	7.3%	-0.84	-1.59	-0.53
+2	0.0%	0.0%	3.0%	-1.15	-1.46	-0.53
+10	0.0%	0.0%	19.0%	-0.38	-2.34	-0.53
+1	0.0%	0.0%	4.3%	-0.90	-1.37	-0.53
+5	0.0%	0.0%	3.3%	-1.04	-1.43	-0.53
+7	0.0%	0.0%	1.9%	-1.45	-1.69	-0.53
+6	0.0%	0.0%	2.0%	-1.35	-1.63	-0.53
+8	0.0%	0.0%	1.4%	-2.42	-2.69	-0.53
+9	0.0%	0.0%	1.9%	-2.57	-3.00	-0.53

> do

Hands:2 6 3 2 9 3 0 2♥P> resta<^Hrt
> restart

Hands:8760: n AKT982.K9..QT764 -s 76.QJT753.A965.J (100)no bids yet in state: 6 2 0 5 12
-1 -1 -1 -1 -1 -1 Nmcts Vnet
224,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+3	90.4%	90.4%	12.9%	+0.40	+0.40	-0.53
+8	3.4%	3.4%	2.5%	+0.39	+0.39	-0.53
+4	2.7%	2.7%	22.2%	+0.40	+0.36	-0.53
+5	0.9%	0.9%	5.8%	+0.36	+0.33	-0.53
+2	0.9%	0.9%	5.3%	+0.36	+0.33	-0.53
+6	0.7%	0.7%	3.6%	+0.34	+0.32	-0.53
+7	0.6%	0.6%	3.4%	+0.34	+0.32	-0.53
+1	0.3%	0.3%	7.6%	+0.31	+0.20	-0.53
+10	0.1%	0.1%	33.4%	+0.41	-1.90	-0.53
+9	0.0%	0.0%	3.3%	-0.98	-1.41	-0.53

> do

Hands:2 6 4 1 8 3 2♥ Nmcts Vnet
607,232 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	94.4%	94.4%	43.2%	+0.40	+0.40	+0.40
+5	2.5%	2.5%	3.3%	+0.39	+0.39	-0.53
+4	1.1%	1.1%	12.6%	+0.39	+0.36	-0.53
+3	0.8%	0.8%	7.3%	+0.38	+0.35	-0.53
+1	0.7%	0.7%	4.3%	+0.37	+0.35	-0.53
+2	0.5%	0.5%	3.0%	+0.35	+0.34	-0.53
+10	0.0%	0.0%	19.0%	-0.17	-2.17	-0.53
+6	0.0%	0.0%	2.0%	-1.20	-1.50	-0.53
+8	0.0%	0.0%	1.4%	-2.33	-2.55	-0.53
+9	0.0%	0.0%	1.9%	-1.25	-1.59	-0.53
+7	0.0%	0.0%	1.9%	-1.23	-1.59	-0.53

> restart

Hands:14986: n KQT73.AK8.32.943 -s 2.65.AKQJ9854.85 (130)no bids yet in state: 5 3 2 3
12 -1 -1 -1 -1 -1 -1 Nmcts Vnet
226,799 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+2	86.3%	86.3%	5.3%	-0.00	-0.00	-0.53
+7	4.5%	4.5%	3.4%	-0.01	-0.01	-0.53
+4	3.2%	3.2%	22.2%	-0.01	-0.04	-0.53
+10	2.4%	2.4%	33.4%	-0.00	-0.06	-0.53
+3	1.5%	1.5%	12.9%	-0.02	-0.05	-0.53
+1	0.8%	0.8%	7.6%	-0.04	-0.08	-0.53
+6	0.4%	0.4%	3.6%	-0.09	-0.12	-0.53
+5	0.3%	0.3%	5.8%	-0.07	-0.15	-0.53
+9	0.3%	0.3%	3.3%	-0.24	-0.29	-0.53
+8	0.3%	0.3%	2.5%	-0.24	-0.28	-0.53

> do

Hands:1 2 8 2 10 2 2♦ Nmcts Vnet
585,838 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	87.7%	87.7%	43.2%	+0.00	+0.00	+0.00
+10	6.6%	6.6%	19.0%	+0.00	-0.01	-0.53
+5	2.6%	2.6%	3.3%	-0.01	-0.01	-0.53
+4	1.2%	1.2%	12.6%	-0.01	-0.04	-0.53
+2	0.6%	0.6%	3.0%	-0.04	-0.05	-0.53
+1	0.6%	0.6%	4.3%	-0.03	-0.05	-0.53
+3	0.3%	0.3%	7.3%	-0.07	-0.13	-0.53
+7	0.2%	0.2%	1.9%	-0.20	-0.24	-0.53
+8	0.1%	0.1%	1.4%	-0.26	-0.29	-0.53
+9	0.1%	0.1%	1.9%	-0.24	-0.28	-0.53
+6	0.1%	0.1%	2.0%	-0.23	-0.28	-0.53

> do

Hands:1 2 8 2 10 2 0 2♦P> restart

Hands:16230: n AT952.Q6.AKJ74.T -s K4.AJ43.532.J952 (420)no bids yet in state: 5 2 5 1
14 -1 -1 -1 -1 -1 -1 Nmcts Vnet
194,999 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	97.3%	97.3%	33.4%	-0.01	-0.01	-0.53
+4	0.6%	0.6%	22.2%	-0.03	-0.21	-0.53
+5	0.5%	0.5%	5.8%	-0.09	-0.15	-0.53
+6	0.5%	0.5%	3.6%	-0.10	-0.14	-0.53
+7	0.4%	0.4%	3.4%	-0.11	-0.14	-0.53
+9	0.2%	0.2%	3.3%	-0.19	-0.27	-0.53
+1	0.2%	0.2%	7.6%	-0.23	-0.40	-0.53
+3	0.2%	0.2%	12.9%	-0.11	-0.44	-0.53
+2	0.1%	0.1%	5.3%	-0.36	-0.60	-0.53
+8	0.0%	0.0%	2.5%	-0.69	-0.94	-0.53

> do

Hands:2 4 3 4 9 10 3N Nmcts Vnet
493,388 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	98.6%	98.6%	12.6%	-0.00	-0.00	-0.53
Pass	0.6%	0.6%	43.2%	+0.01	-0.20	-0.20
+1	0.2%	0.2%	4.3%	-0.17	-0.22	-0.53
+3	0.2%	0.2%	7.3%	-0.15	-0.26	-0.53
+2	0.2%	0.2%	3.0%	-0.23	-0.28	-0.53
+7	0.1%	0.1%	1.9%	-0.26	-0.32	-0.53
+6	0.1%	0.1%	2.0%	-0.39	-0.46	-0.53
+5	0.1%	0.1%	3.3%	-0.35	-0.46	-0.53
+10	0.0%	0.0%	19.0%	-2.53	-7.20	-0.53
+8	0.0%	0.0%	1.4%	-4.32	-4.84	-0.53
+9	0.0%	0.0%	1.9%	-4.61	-5.38	-0.53

> do

Hands:5 2 5 1 14 10 4 3N4♠ Nmcts Vnet
972,250 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.8%	99.8%	43.2%	+0.00	+0.00	+0.00
+3	0.1%	0.1%	7.3%	-0.22	-0.40	-0.53
+1	0.0%	0.0%	4.3%	-0.49	-0.66	-0.53
+2	0.0%	0.0%	3.0%	-0.54	-0.67	-0.53
+4	0.0%	0.0%	12.6%	-1.88	-4.88	-0.53
+5	0.0%	0.0%	3.3%	-5.07	-6.49	-0.53
+6	0.0%	0.0%	2.0%	-5.67	-6.56	-0.53
+7	0.0%	0.0%	1.9%	-7.32	-8.43	-0.53
+8	0.0%	0.0%	1.4%	-10.89	-12.09	-0.53
+10	0.0%	0.0%	19.0%	-4.82	-21.09	-0.53
+9	0.0%	0.0%	1.9%	-10.78	-12.45	-0.53

> do

Hands:5 2 5 1 14 10 4 0 3N4♠P> restart

Hands:2303: n QJT92.AQ92.QJ9.3 -s 74.754.A6.KQ9842 (-90)no bids yet in state: 5 4 3 1 12
-1 -1 -1 -1 -1 -1 Nmcts Vnet
257,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	77.2%	77.2%	22.2%	+0.40	+0.40	-0.53
+3	13.7%	13.7%	12.9%	+0.39	+0.39	-0.53
+1	7.6%	7.6%	7.6%	+0.40	+0.39	-0.53
+2	0.9%	0.9%	5.3%	+0.36	+0.34	-0.53
+10	0.1%	0.1%	33.4%	+0.38	-0.65	-0.53
+5	0.1%	0.1%	5.8%	+0.06	-0.16	-0.53
+8	0.1%	0.1%	2.5%	-0.07	-0.16	-0.53
+6	0.1%	0.1%	3.6%	-0.02	-0.16	-0.53
+9	0.1%	0.1%	3.3%	-0.00	-0.16	-0.53
+7	0.1%	0.1%	3.4%	-0.16	-0.38	-0.53

> do

Hands:2 3 2 6 9 4 2♠ Nmcts Vnet
655,803 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.6%	99.6%	43.2%	+0.40	+0.40	+0.40
+4	0.1%	0.1%	12.6%	+0.23	-0.14	-0.53
+2	0.1%	0.1%	3.0%	-0.03	-0.15	-0.53
+1	0.1%	0.1%	4.3%	+0.03	-0.15	-0.53
+5	0.1%	0.1%	3.3%	-0.00	-0.15	-0.53
+3	0.1%	0.1%	7.3%	+0.06	-0.28	-0.53
+10	0.0%	0.0%	19.0%	+0.08	-1.00	-0.53
+6	0.0%	0.0%	2.0%	-0.44	-0.65	-0.53
+8	0.0%	0.0%	1.4%	-1.30	-1.45	-0.53
+9	0.0%	0.0%	1.9%	-1.37	-1.67	-0.53
+7	0.0%	0.0%	1.9%	-1.57	-1.99	-0.53

> do

Hands:2 3 2 6 9 4 0 2♠P> restart

Hands:10681: n AKQ9862.972.J2.K -s J.KT5.K9843.AT82 (420)no bids yet in state: 7 3 2 1
 13 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 200,999 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	97.8%	97.8%	33.4%	-0.01	-0.01	-0.53
+4	0.5%	0.5%	22.2%	-0.05	-0.23	-0.53
+8	0.4%	0.4%	2.5%	-0.13	-0.16	-0.53
+5	0.3%	0.3%	5.8%	-0.13	-0.22	-0.53
+3	0.2%	0.2%	12.9%	-0.17	-0.45	-0.53
+9	0.2%	0.2%	3.3%	-0.21	-0.28	-0.53
+7	0.2%	0.2%	3.4%	-0.21	-0.30	-0.53
+6	0.2%	0.2%	3.6%	-0.20	-0.29	-0.53
+1	0.1%	0.1%	7.6%	-0.28	-0.53	-0.53
+2	0.1%	0.1%	5.3%	-0.38	-0.77	-0.53

> do

Hands:1 3 5 4 11 10 3N Nmcts Vnet
 497,752 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	98.7%	98.7%	12.6%	-0.00	-0.00	-0.53
Pass	0.6%	0.6%	43.2%	+0.01	-0.20	-0.20
+1	0.2%	0.2%	4.3%	-0.18	-0.24	-0.53
+3	0.2%	0.2%	7.3%	-0.14	-0.24	-0.53
+2	0.2%	0.2%	3.0%	-0.21	-0.25	-0.53
+7	0.0%	0.0%	1.9%	-3.85	-4.24	-0.53
+6	0.0%	0.0%	2.0%	-2.60	-3.10	-0.53
+10	0.0%	0.0%	19.0%	-2.63	-7.33	-0.53
+8	0.0%	0.0%	1.4%	-2.36	-2.75	-0.53
+5	0.0%	0.0%	3.3%	-3.63	-4.55	-0.53
+9	0.0%	0.0%	1.9%	-4.27	-4.92	-0.53

> do

Hands:7 3 2 1 13 10 4 3N4♠ Nmcts Vnet

983,876 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.9%	99.9%	43.2%	+0.00	+0.00	+0.00
+1	0.0%	0.0%	4.3%	-3.98	-5.02	-0.53
+4	0.0%	0.0%	12.6%	-2.01	-5.10	-0.53
+3	0.0%	0.0%	7.3%	-3.21	-5.04	-0.53
+2	0.0%	0.0%	3.0%	-3.41	-4.28	-0.53
+5	0.0%	0.0%	3.3%	-4.61	-5.63	-0.53
+6	0.0%	0.0%	2.0%	-5.82	-6.72	-0.53
+7	0.0%	0.0%	1.9%	-7.52	-8.64	-0.53
+10	0.0%	0.0%	19.0%	-6.42	-17.49	-0.53
+8	0.0%	0.0%	1.4%	-11.39	-12.66	-0.53
+9	0.0%	0.0%	1.9%	-10.99	-12.66	-0.53

> restart

Hands:890: n AJT85.T5.KQJ76.K -s 32.Q972.AT8.AJT4 (430)no bids yet in state: 5 2 5 1 14
-1 -1 -1 -1 -1 -1 Nmcts Vnet
248,999 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	94.0%	94.0%	33.4%	-0.00	-0.00	-0.53
+4	1.9%	1.9%	22.2%	-0.01	-0.05	-0.53
+3	1.2%	1.2%	12.9%	-0.02	-0.06	-0.53
+7	0.5%	0.5%	3.4%	-0.09	-0.11	-0.53
+5	0.5%	0.5%	5.8%	-0.16	-0.21	-0.53
+1	0.4%	0.4%	7.6%	-0.07	-0.13	-0.53
+2	0.4%	0.4%	5.3%	-0.08	-0.13	-0.53
+6	0.4%	0.4%	3.6%	-0.09	-0.13	-0.53
+8	0.4%	0.4%	2.5%	-0.10	-0.13	-0.53
+9	0.3%	0.3%	3.3%	-0.12	-0.17	-0.53

> do

Hands:2 4 3 4 11 10 3N Nmcts Vnet
714,729 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	98.8%	98.8%	43.2%	+0.00	+0.00	+0.00
+5	0.4%	0.4%	3.3%	-0.04	-0.06	-0.53
+4	0.2%	0.2%	12.6%	-0.08	-0.20	-0.53
+3	0.2%	0.2%	7.3%	-0.21	-0.32	-0.53
+1	0.2%	0.2%	4.3%	-0.16	-0.22	-0.53
+2	0.1%	0.1%	3.0%	-0.20	-0.26	-0.53
+6	0.0%	0.0%	2.0%	-2.22	-2.71	-0.53
+10	0.0%	0.0%	19.0%	-1.60	-7.23	-0.53
+7	0.0%	0.0%	1.9%	-3.82	-4.45	-0.53
+9	0.0%	0.0%	1.9%	-3.88	-4.49	-0.53
+8	0.0%	0.0%	1.4%	-3.92	-4.41	-0.53

> do

Hands:2 4 3 4 11 10 0 3NP> restart

Hands:12314: n AQJ8652.K98.A3.T -s .AJ75.KJ94.Q9732 (450)no bids yet in state: 7 3 2 1
 14 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 179,999 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	97.0%	97.0%	33.4%	-0.01	-0.01	-0.53
+4	0.6%	0.6%	22.2%	-0.03	-0.20	-0.53
+3	0.6%	0.6%	12.9%	-0.09	-0.19	-0.53
+5	0.5%	0.5%	5.8%	-0.08	-0.13	-0.53
+9	0.3%	0.3%	3.3%	-0.16	-0.21	-0.53
+7	0.2%	0.2%	3.4%	-0.16	-0.22	-0.53
+8	0.2%	0.2%	2.5%	-0.20	-0.25	-0.53
+6	0.2%	0.2%	3.6%	-0.18	-0.25	-0.53
+1	0.2%	0.2%	7.6%	-0.23	-0.43	-0.53
+2	0.1%	0.1%	5.3%	-0.31	-0.50	-0.53

> do

Hands:0 4 4 5 11 10 3N Nmcts Vnet
 470,991 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	96.5%	96.5%	12.6%	-0.00	-0.00	-0.53
+3	1.1%	1.1%	7.3%	-0.02	-0.04	-0.53
Pass	0.6%	0.6%	43.2%	+0.01	-0.20	-0.20
+8	0.5%	0.5%	1.4%	-0.11	-0.11	-0.53
+9	0.2%	0.2%	1.9%	-0.13	-0.15	-0.53
+1	0.2%	0.2%	4.3%	-0.26	-0.31	-0.53
+6	0.2%	0.2%	2.0%	-0.21	-0.24	-0.53
+7	0.2%	0.2%	1.9%	-0.23	-0.26	-0.53
+2	0.2%	0.2%	3.0%	-0.22	-0.26	-0.53
+5	0.1%	0.1%	3.3%	-0.21	-0.28	-0.53
+10	0.0%	0.0%	19.0%	-2.59	-7.16	-0.53

> do

Hands:7 3 2 1 14 10 4 3N4♠ Nmcts Vnet
 953,161 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	98.8%	98.8%	43.2%	+0.00	+0.00	+0.00
+4	0.8%	0.8%	12.6%	-0.02	-0.05	-0.53
+5	0.2%	0.2%	3.3%	-0.10	-0.12	-0.53
+1	0.1%	0.1%	4.3%	-0.31	-0.43	-0.53
+2	0.1%	0.1%	3.0%	-0.37	-0.45	-0.53
+3	0.1%	0.1%	7.3%	-0.28	-0.49	-0.53
+6	0.0%	0.0%	2.0%	-5.62	-6.50	-0.53
+7	0.0%	0.0%	1.9%	-7.26	-8.35	-0.53
+10	0.0%	0.0%	19.0%	-4.95	-21.06	-0.53
+8	0.0%	0.0%	1.4%	-11.08	-12.33	-0.53
+9	0.0%	0.0%	1.9%	-10.70	-12.35	-0.53

> do

Hands:7 3 2 1 14 10 4 0 3N4♠P> restart

Hands:15714: n KQT83.KQ63.J.KQ5 -s 7.954.AK742.A983 (400)no bids yet in state: 5 4 1 3
 16 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 255,599 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	94.4%	94.4%	33.4%	-0.00	-0.00	-0.53
+4	2.1%	2.1%	22.2%	-0.01	-0.05	-0.53
+3	1.0%	1.0%	12.9%	-0.03	-0.08	-0.53
+1	0.4%	0.4%	7.6%	-0.06	-0.13	-0.53
+9	0.4%	0.4%	3.3%	-0.11	-0.14	-0.53
+5	0.4%	0.4%	5.8%	-0.08	-0.14	-0.53
+7	0.4%	0.4%	3.4%	-0.10	-0.14	-0.53
+2	0.3%	0.3%	5.3%	-0.08	-0.14	-0.53
+6	0.3%	0.3%	3.6%	-0.10	-0.14	-0.53
+8	0.3%	0.3%	2.5%	-0.11	-0.14	-0.53

> do

Hands:1 3 5 4 11 10 3N Nmcts Vnet
 708,192 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.9%	99.9%	43.2%	+0.00	+0.00	+0.00
+4	0.0%	0.0%	12.6%	-1.21	-3.68	-0.53
+2	0.0%	0.0%	3.0%	-3.11	-3.86	-0.53
+3	0.0%	0.0%	7.3%	-2.06	-3.88	-0.53
+5	0.0%	0.0%	3.3%	-3.03	-3.88	-0.53
+1	0.0%	0.0%	4.3%	-2.65	-3.76	-0.53
+10	0.0%	0.0%	19.0%	-1.62	-7.22	-0.53
+6	0.0%	0.0%	2.0%	-3.81	-4.47	-0.53
+8	0.0%	0.0%	1.4%	-4.09	-4.55	-0.53
+9	0.0%	0.0%	1.9%	-3.97	-4.57	-0.53
+7	0.0%	0.0%	1.9%	-3.86	-4.49	-0.53

> do

Hands:1 3 5 4 11 10 0 3NP> restart

Hands:18305: n AKT843.Q5.A6.865 -s 72.K6.KQT94.JT42 (120)no bids yet in state: 6 2 2 3
 13 -1 -1 -1 -1 -1 -1 Nmcts Vnet
 241,799 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+5	95.3%	95.3%	5.8%	-0.00	-0.00	-0.53
+3	1.6%	1.6%	12.9%	-0.02	-0.05	-0.53
+1	1.1%	1.1%	7.6%	-0.03	-0.06	-0.53
+4	0.9%	0.9%	22.2%	-0.02	-0.13	-0.53
+2	0.3%	0.3%	5.3%	-0.08	-0.14	-0.53
+7	0.3%	0.3%	3.4%	-0.10	-0.15	-0.53
+6	0.2%	0.2%	3.6%	-0.18	-0.24	-0.53
+10	0.1%	0.1%	33.4%	+0.01	-1.57	-0.53
+9	0.0%	0.0%	3.3%	-1.08	-1.40	-0.53
+8	0.0%	0.0%	2.5%	-0.91	-1.18	-0.53

> do

Hands:2 2 5 4 9 5 2N Nmcts Vnet
666,641 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.5%	99.5%	43.2%	+0.00	+0.00	+0.00
+2	0.2%	0.2%	3.0%	-0.10	-0.13	-0.53
+1	0.2%	0.2%	4.3%	-0.14	-0.19	-0.53
+4	0.0%	0.0%	12.6%	-0.59	-1.57	-0.53
+3	0.0%	0.0%	7.3%	-0.69	-1.44	-0.53
+5	0.0%	0.0%	3.3%	-1.05	-1.44	-0.53
+10	0.0%	0.0%	19.0%	-0.71	-3.13	-0.53
+7	0.0%	0.0%	1.9%	-1.98	-2.29	-0.53
+8	0.0%	0.0%	1.4%	-2.19	-2.43	-0.53
+6	0.0%	0.0%	2.0%	-2.06	-2.50	-0.53
+9	0.0%	0.0%	1.9%	-2.65	-3.20	-0.53

> do

Hands:2 2 5 4 9 5 0 2NP> restart

Hands:16946: n AKQJ652.7.AT.765 -s 9.AKT9642.K7.J98 (420)no bids yet in state: 7 1 2 3
14 -1 -1 -1 -1 -1 -1 Nmcts Vnet
197,399 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+10	97.1%	97.1%	33.4%	-0.01	-0.01	-0.53
+4	0.9%	0.9%	22.2%	-0.04	-0.16	-0.53
+6	0.4%	0.4%	3.6%	-0.11	-0.15	-0.53
+9	0.4%	0.4%	3.3%	-0.14	-0.17	-0.53
+5	0.4%	0.4%	5.8%	-0.10	-0.17	-0.53
+7	0.4%	0.4%	3.4%	-0.12	-0.15	-0.53
+3	0.2%	0.2%	12.9%	-0.14	-0.44	-0.53
+1	0.1%	0.1%	7.6%	-0.27	-0.54	-0.53
+2	0.1%	0.1%	5.3%	-0.35	-0.64	-0.53
+8	0.0%	0.0%	2.5%	-0.72	-1.03	-0.53

> do

Hands:1 7 2 3 11 10 3N Nmcts Vnet
512,004 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
+4	98.8%	98.8%	12.6%	-0.00	-0.00	-0.53
Pass	0.6%	0.6%	43.2%	+0.02	-0.20	-0.20
+1	0.2%	0.2%	4.3%	-0.17	-0.23	-0.53
+2	0.2%	0.2%	3.0%	-0.19	-0.23	-0.53
+3	0.2%	0.2%	7.3%	-0.15	-0.26	-0.53
+7	0.0%	0.0%	1.9%	-2.54	-3.02	-0.53
+10	0.0%	0.0%	19.0%	-2.53	-7.29	-0.53
+6	0.0%	0.0%	2.0%	-2.24	-2.78	-0.53
+8	0.0%	0.0%	1.4%	-4.20	-4.59	-0.53
+5	0.0%	0.0%	3.3%	-3.56	-4.49	-0.53
+9	0.0%	0.0%	1.9%	-4.75	-5.53	-0.53

> do

Hands:7 1 2 3 14 10 4 3N4♠ Nmcts Vnet
1,003,707 -0.53

		Pmcts	Pnet	UCT	Qmcts	Qnet
Pass	99.9%	99.9%	43.2%	+0.00	+0.00	+0.00
+3	0.0%	0.0%	7.3%	-3.19	-4.66	-0.53
+2	0.0%	0.0%	3.0%	-3.25	-3.94	-0.53
+4	0.0%	0.0%	12.6%	-1.92	-5.00	-0.53
+1	0.0%	0.0%	4.3%	-2.78	-4.04	-0.53
+5	0.0%	0.0%	3.3%	-5.16	-6.60	-0.53
+6	0.0%	0.0%	2.0%	-5.77	-6.67	-0.53
+7	0.0%	0.0%	1.9%	-7.45	-8.58	-0.53
+10	0.0%	0.0%	19.0%	-4.67	-21.21	-0.53
+8	0.0%	0.0%	1.4%	-11.33	-12.61	-0.53
+9	0.0%	0.0%	1.9%	-10.87	-12.57	-0.53

> do

Hands:7 1 2 3 14 10 4 0 3N4♠P> do
> restart

Hands:15007: n AK8543.KJ6.Q7.65 -s J9.Q98.AT92.A873 (140)no bids yet in state: 6 3 2 2
13 -1 -1 -1 -1 -1 -1 salloc: Job 444683 has exceeded its time limit and its allocation
has been revoked.

error: *** interactive step 444683 CANCELLED DUE TO TIME
LIMIT ***

srun: Job step aborted: Waiting up to 32 seconds for job step to finish.

signal (15): Terminated
in expression starting at none:1
do_apply at
/cache/build/default-amdci4-6/julialang/julia-release-1-dot-8/src/builtins.c:604
#_#232 at /home/users/u100952/.julia/packages/CUDA/BbliS/src/compiler/execution.jl:487
Allocations: 773949935 (Pool: 773872612; Big: 77323); GC: 253

[u100xxx@mel2041 AlphaZero.jl]\$
[u100xxx@mel2041 AlphaZero.jl]\$