

Results

May 7, 2024

1 Tables of Friedman, Bonferroni-Dunn, Holm, Hochberg and Hommel Tests

Table 1: Average Rankings of the algorithms

Algorithm	Ranking
LWRK	2.52
MS	4.48
SPT	1.56
WINQ	4.80
—(4) Rainbow—DQN-model-0	9.02
—(4) Rainbow—DDQN-model-1	8.54
—(4) Rainbow—Dueling-model-2	9.10
—(4) Rainbow—3-step-model-3	7.38
—(4) Rainbow—Prioritized-model-4	5.62
—(4) Rainbow—Noisy-model-5	8.48
—(4) Rainbow—All-model-6	8.48
—(4) Rainbow—All not 3-step not Noisy-model-7	8.02

Friedman statistic considering reduction performance (distributed according to chi-square with 11 degrees of freedom: 1756.7682051281963.
P-value computed by Friedman Test: 0.0.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 11 and 3289 degrees of freedom: 340.3725189429273.
P-value computed by Iman and Daveport Test: 2.220446049250313E-16.

Table 2: Holm / Hochberg Table for $\alpha = 0.05$

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
11	—(4) Rainbow—Dueling-model-2	25.612106512350753	1.1183766541873419E-144	0.004545454545454546
10	—(4) Rainbow—DQN-model-0	25.351682794497485	8.610536046729506E-142	0.005
9	—(4) Rainbow—DDQN-model-1	23.698558324646346	3.731237426254632E-124	0.005555555555555556
8	—(4) Rainbow—Noisy-model-5	23.494748458500336	4.615439289321985E-122	0.00625
7	—(4) Rainbow—All-model-6	23.494748458500336	4.615439289321985E-122	0.0071428571428571435
6	—(4) Rainbow—All not 3-step not Noisy-model-7	21.9322061513808	1.2806538929236468E-106	0.008333333333333333
5	—(4) Rainbow—3-step-model-3	19.780879786506066	4.3503391301016165E-87	0.01
4	—(4) Rainbow—Prioritized-model-4	13.802457046222601	2.4631199072927625E-43	0.0125
3	WINQ	11.00573277188544	3.5858875334920987E-28	0.016666666666666666
2	MS	9.918746819106614	3.450612192078705E-23	0.025
1	LWRK	3.2722806286778803	0.0010668362682036418	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.0045454545454546 .
Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.05 .
Hommel's procedure rejects all hypotheses.

Table 3: Holm / Hochberg Table for $\alpha = 0.10$

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
11	—(4) Rainbow—Dueling-model-2	25.612106512350753	1.1183766541873419E-144	0.009090909090909092
10	—(4) Rainbow—DQN-model-0	25.351682794497485	8.610536046729506E-142	0.01
9	—(4) Rainbow—DDQN-model-1	23.698558324646346	3.731237426254632E-124	0.01111111111111112
8	—(4) Rainbow—Noisy-model-5	23.494748458500336	4.615439289321985E-122	0.0125
7	—(4) Rainbow—All-model-6	23.494748458500336	4.615439289321985E-122	0.014285714285714287
6	—(4) Rainbow—All not 3-step not Noisy-model-7	21.9322061513808	1.2806538929236468E-106	0.01666666666666666
5	—(4) Rainbow—3-step-model-3	19.780879786506066	4.3503391301016165E-87	0.02
4	—(4) Rainbow—Prioritized-model-4	13.802457046222601	2.4631199072927625E-43	0.025
3	WINQ	11.00573277188544	3.5858875334920987E-28	0.03333333333333333
2	MS	9.918746819106614	3.450612192078705E-23	0.05
1	LWRK	3.2722806286778803	0.0010668362682036418	0.1

Bonferroni-Dunn’s procedure rejects those hypotheses that have a p-value $\leq 0.009090909090909092$.

Hochberg’s procedure rejects those hypotheses that have a p-value ≤ 0.1 .

Hommel’s procedure rejects all hypotheses.

Table 4: Adjusted p -values

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{Hoch}	p_{Hommel}
1	—(4) Rainbow—Dueling-model-2	1.1183766541873419E-144	1.230214319606076E-143	1.230214319606076E-143	1.230214319606076E-143	1.230214319606076E-143
2	—(4) Rainbow—DQN-model-0	8.610536046729506E-142	9.471589651402456E-141	8.610536046729505E-141	8.610536046729505E-141	8.610536046729505E-141
3	—(4) Rainbow—DDQN-model-1	3.731237426254632E-124	4.104361168880095E-123	3.358113683629169E-123	3.358113683629169E-123	3.358113683629169E-123
4	—(4) Rainbow—Noisy-model-5	4.615439289321985E-122	5.076983218254184E-121	3.692351431457588E-121	3.2308075025253897E-121	3.2308075025253897E-121
5	—(4) Rainbow—All-model-6	4.615439289321985E-122	5.076983218254184E-121	3.692351431457588E-121	3.2308075025253897E-121	3.2308075025253897E-121
6	—(4) Rainbow—All not 3-step not Noisy-model-7	1.2806538929236468E-106	1.4087192822160115E-105	7.68392335754188E-106	7.68392335754188E-106	7.68392335754188E-106
7	—(4) Rainbow—3-step-model-3	4.3503391301016165E-87	4.785373043111778E-86	2.175169565050808E-86	2.175169565050808E-86	2.175169565050808E-86
8	—(4) Rainbow—Prioritized-model-4	2.4631199072927625E-43	2.7094318980220388E-42	9.85247962917105E-43	9.85247962917105E-43	9.85247962917105E-43
9	WINQ	3.5858875334920987E-28	3.944476286841308E-27	1.0757662600476297E-27	1.0757662600476297E-27	1.0757662600476297E-27
10	MS	3.450612192078705E-23	3.795673411286575E-22	6.90122438415741E-23	6.90122438415741E-23	6.90122438415741E-23
11	LWRK	0.0010668362682036418	0.01173519895024006	0.0010668362682036418	0.0010668362682036418	0.0010668362682036418

Nemenyi’s procedure rejects those hypotheses that have a p-value $\leq 7.575757575757576E - 4$.

Holm’s procedure rejects those hypotheses that have a p-value ≤ 0.003125 .

Shaffer’s procedure rejects those hypotheses that have a p-value $\leq 7.575757575757576E - 4$.

Nemenyi’s procedure rejects those hypotheses that have a p-value $\leq 0.0015151515151515152$.

Holm’s procedure rejects those hypotheses that have a p-value $\leq 0.006666666666666667$.

Shaffer’s procedure rejects those hypotheses that have a p-value $\leq 0.0015151515151515152$.

Table 5: Holm / Shaffer Table for $\alpha = 0.05$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
66	SPT vs. —(4) Rainbow—Dueling-model-2	25.612106512350753	1.1183766541873419E-144	7.575757575757576E-4	7.575757575757576E-4
65	SPT vs. —(4) Rainbow—DQN-model-0	25.351682794497485	8.610536046729506E-142	7.692307692307692E-4	9.090909090909091E-4
64	SPT vs. —(4) Rainbow—DDQN-model-1	23.698558324646346	3.731237426254632E-124	7.8125E-4	9.090909090909091E-4
63	SPT vs. —(4) Rainbow—Noisy-model-5	23.494748458500336	4.615439289321985E-122	7.936507936507937E-4	9.090909090909091E-4
62	SPT vs. —(4) Rainbow—All-model-6	23.494748458500336	4.615439289321985E-122	8.064516129032258E-4	9.090909090909091E-4
61	LWRK vs. —(4) Rainbow—Dueling-model-2	22.339825883672873	1.5163313386966887E-110	8.19672131147514E-4	9.090909090909091E-4
60	LWRK vs. —(4) Rainbow—DQN-model-0	22.079402165819605	4.986392377785296E-108	8.33333333333334E-4	9.090909090909091E-4
59	SPT vs. —(4) Rainbow—All not 3-step not Noisy-model-7	21.9322061513808	1.2806538929236468E-106	8.474576271186442E-4	9.090909090909091E-4
58	LWRK vs. —(4) Rainbow—DDQN-model-1	20.426277695968466	9.766979872607756E-93	8.620689655172415E-4	9.090909090909091E-4
57	LWRK vs. —(4) Rainbow—Noisy-model-5	20.222467829822453	6.209775628445206E-91	8.771929824561404E-4	9.090909090909091E-4
56	LWRK vs. —(4) Rainbow—All-model-6	20.222467829822453	6.209775628445206E-91	8.928571428571429E-4	9.090909090909091E-4
55	SPT vs. —(4) Rainbow—3-step-model-3	19.780879786506066	4.350391301016165E-87	9.090909090909091E-4	9.090909090909091E-4
54	LWRK vs. —(4) Rainbow—All not 3-step not Noisy-model-7	18.65992552270292	1.0487727904888201E-77	9.25925925925926E-4	0.0010869565217391304
53	LWRK vs. —(4) Rainbow—3-step-model-3	16.508599157828186	3.181836776644772E-61	9.433962264150943E-4	0.0010869565217391304
52	MS vs. —(4) Rainbow—Dueling-model-2	15.693359693244135	1.679274539693089E-55	9.615384615384616E-4	0.0010869565217391304
51	MS vs. —(4) Rainbow—DQN-model-0	15.432935975390869	9.829498668480796E-54	9.80392156862745E-4	0.0010869565217391304
50	WINQ vs. —(4) Rainbow—Dueling-model-2	14.60637374046531	2.5577415811339688E-48	0.001	0.0010869565217391304
49	WINQ vs. —(4) Rainbow—DQN-model-0	14.345950022612044	1.129429843935294E-46	0.0010204081632653062	0.0010869565217391304
48	SPT vs. —(4) Rainbow—Prioritized-model-4	13.802457046222601	2.46311199072927625E-43	0.0010416666666666667	0.0010869565217391304
47	MS vs. —(4) Rainbow—DDQN-model-1	13.77981150553973	3.3715133216034463E-43	0.0010638297872340426	0.0010869565217391304
46	MS vs. —(4) Rainbow—Noisy-model-5	13.576001639393718	5.557868328152009E-42	0.0010869565217391304	0.0010869565217391304
45	MS vs. —(4) Rainbow—All-model-6	13.576001639393718	5.557868328152009E-42	0.0011111111111111111	0.0011111111111111111
44	WINQ vs. —(4) Rainbow—DDQN-model-1	12.692825552760905	6.480491676365452E-37	0.0011363636363636365	0.001282051282051282
43	WINQ vs. —(4) Rainbow—Noisy-model-5	12.489015686614893	8.570743284737007E-36	0.0011627906976744186	0.001282051282051282
42	WINQ vs. —(4) Rainbow—All-model-6	12.489015686614893	8.570743284737007E-36	0.0011904761904761906	0.001282051282051282
41	MS vs. —(4) Rainbow—All not 3-step not Noisy-model-7	12.013459332274186	3.0194471105160323E-33	0.0012195121951219512	0.001282051282051282
40	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—Prioritized-model-4	11.809649466128151	3.4800912099206565E-32	0.00125	0.001282051282051282
39	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Prioritized-model-4	11.549225748274884	7.448844360170927E-31	0.001282051282051282	0.001282051282051282
38	SPT vs. WINQ	11.00573277188544	3.5858875334920987E-28	0.0013157894736842105	0.0013513513513513514
37	WINQ vs. —(4) Rainbow—All not 3-step not Noisy-model-7	10.926473379495361	8.613105048167928E-28	0.0013513513513513514	0.0013513513513513514
36	LWRK vs. —(4) Rainbow—Prioritized-model-4	10.53017641754472	6.271682930229013E-26	0.0013888888888888889	0.0013888888888888889
35	MS vs. SPT	9.918746819106614	3.450612192078705E-23	0.0014285714285714286	0.0014705882352941176
34	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Prioritized-model-4	9.896101278423744	4.328201026022719E-23	0.0014705882352941176	0.0014705882352941176
33	MS vs. —(4) Rainbow—3-step-model-3	9.86213296739945	6.074503203228581E-23	0.0015151515151515152	0.0016129032258064516
32	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—Noisy-model-5	9.692291412277733	3.2515045344619143E-22	0.0015625	0.0016129032258064516
31	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—All-model-6	9.692291412277733	3.2515045344619143E-22	0.0016129032258064516	0.0016129032258064516
30	WINQ vs. —(4) Rainbow—3-step-model-3	8.775147014620625	1.7068074051457697E-18	0.0016666666666666668	0.0016666666666666668
29	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	8.1297491051582	4.301798679286828E-16	0.001724137931034483	0.001724137931034483
28	LWRK vs. WINQ	7.7334521432075585	1.0466872762314469E-14	0.0017857142857142859	0.0017857142857142859
27	LWRK vs. MS	6.646466190428734	3.002133701448214E-11	0.001851851851851852	0.001851851851851852
26	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—Prioritized-model-4	5.978422740283465	2.2530842454643296E-9	0.0019230769230769232	0.002
25	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—3-step-model-3	5.83126725844687	5.502136327697615E-9	0.002	0.002
24	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—3-step-model-3	5.570803007991419	2.5356790218989204E-8	0.0020833333333333333	0.0020833333333333333
23	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—3-step-model-3	3.91767853814028	8.940582380458241E-5	0.002173913043478261	0.002173913043478261
22	MS vs. —(4) Rainbow—Prioritized-model-4	3.883710227115985	1.0287450331355067E-4	0.0022727272727272723	0.0022727272727272723
21	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—Noisy-model-5	3.7138686719942693	2.0411474723192752E-4	0.002380952380952381	0.002380952380952381
20	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—All-model-6	3.7138686719942693	2.0411474723192752E-4	0.0025	0.0025
19	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	3.67990036096995	2.333251031494939E-4	0.002631578947368421	0.002631578947368421
18	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	3.4194766431166825	6.274171861465427E-4	0.0027777777777777778	0.0027777777777777778
17	LWRK vs. SPT	3.2722806286778803	0.0010668362682036418	0.0029411764705882353	0.0029411764705882353
16	WINQ vs. —(4) Rainbow—Prioritized-model-4	2.7967242743371603	0.00516235681222754	0.003125	0.003125
15	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	2.1513263648747363	0.03145044869191837	0.0033333333333333335	0.0033333333333333335
14	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—Noisy-model-5	2.1173580538504173	0.034229471315782516	0.0035714285714285718	0.0035714285714285718
13	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—All-model-6	2.1173580538504173	0.034229471315782516	0.0038461538461538464	0.0038461538461538464
12	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Dueling-model-2	1.9135481877044063	0.055677910746622684	0.0041666666666666667	0.0041666666666666667
11	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Noisy-model-5	1.8569343359971495	0.06332049678931886	0.004545454545454546	0.004545454545454546
10	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—All-model-6	1.8569343359971495	0.06332049678931886	0.005	0.005
9	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.7663521732655436	0.07733678360610904	0.005555555555555556	0.005555555555555556
8	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—DDQN-model-1	1.653124469851139	0.09830553419311701	0.00625	0.00625
7	—(4) Rainbow—Noisy-model-5 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.5625423071195328	0.11816028735144976	0.0071428571428571435	0.0071428571428571435
6	—(4) Rainbow—All-model-6 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.5625423071195328	0.11816028735144976	0.008333333333333333	0.008333333333333333
5	MS vs. WINQ	1.0869859527788248	0.27704301780334	0.01	0.01
4	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Dueling-model-2	0.26042371785326757	0.7945369497506622	0.0125	0.0125
3	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Noisy-model-5	0.20380986614601082	0.838502082598028	0.016666666666666666	0.016666666666666666
2	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—All-model-6	0.20380986614601082	0.838502082598028	0.025	0.025
1	—(4) Rainbow—Noisy-model-5 vs. —(4) Rainbow—All-model-6	0.0	1.0	0.05	0.05

Table 6: Holm / Shaffer Table for $\alpha = 0.10$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
66	SPT vs. —(4) Rainbow—Dueling-model-2	25.612106512350753	1.1183766541873419E-144	0.0015151515151515152	0.0015151515151515152
65	SPT vs. —(4) Rainbow—DQN-model-0	25.351682794497485	8.610536046729506E-142	0.0015384615384615385	0.0018181818181818182
64	SPT vs. —(4) Rainbow—DDQN-model-1	23.698558324646346	3.731237426254632E-124	0.0015625	0.0018181818181818182
63	SPT vs. —(4) Rainbow—Noisy-model-5	23.494748458500336	4.615439289321985E-122	0.0015873015873015873	0.0018181818181818182
62	SPT vs. —(4) Rainbow—All-model-6	23.494748458500336	4.615439289321985E-122	0.0016129032258064516	0.0018181818181818182
61	LWRK vs. —(4) Rainbow—Dueling-model-2	22.339825883672873	1.5163313386966887E-110	0.001639344262295082	0.0018181818181818182
60	LWRK vs. —(4) Rainbow—DQN-model-0	22.079402165819605	4.986392377785296E-108	0.0016666666666666668	0.0018181818181818182
59	SPT vs. —(4) Rainbow—All not 3-step not Noisy-model-7	21.9322061513808	1.2806538929236468E-106	0.0016949152542372883	0.0018181818181818182
58	LWRK vs. —(4) Rainbow—DDQN-model-1	20.426277695968466	9.766979872607756E-93	0.001724137931034483	0.0018181818181818182
57	LWRK vs. —(4) Rainbow—Noisy-model-5	20.222467829822453	6.209775628445206E-91	0.0017543859649122807	0.0018181818181818182
56	LWRK vs. —(4) Rainbow—All-model-6	20.222467829822453	6.209775628445206E-91	0.0017857142857142859	0.0018181818181818182
55	SPT vs. —(4) Rainbow—3-step-model-3	19.780879786506066	4.350391301016165E-87	0.0018181818181818182	0.0018181818181818182
54	LWRK vs. —(4) Rainbow—All not 3-step not Noisy-model-7	18.65992552270292	1.0487727904888201E-77	0.001851851851851852	0.002173913043478261
53	LWRK vs. —(4) Rainbow—3-step-model-3	16.508599157828186	3.181836776644772E-61	0.0018867924528301887	0.002173913043478261
52	MS vs. —(4) Rainbow—Dueling-model-2	15.693359693244135	1.679274539693089E-55	0.0019230769230769232	0.002173913043478261
51	MS vs. —(4) Rainbow—DQN-model-0	15.432935975390869	9.829498668480796E-54	0.00196078431372549	0.002173913043478261
50	WINQ vs. —(4) Rainbow—Dueling-model-2	14.60637374046531	2.5577415811339688E-48	0.002	0.002173913043478261
49	WINQ vs. —(4) Rainbow—DQN-model-0	14.345950022612044	1.129429843935294E-46	0.0020408163265306124	0.002173913043478261
48	SPT vs. —(4) Rainbow—Prioritized-model-4	13.802457046222601	2.4631199072927625E-43	0.0020833333333333333	0.002173913043478261
47	MS vs. —(4) Rainbow—DDQN-model-1	13.77981150553973	3.3715133216034463E-43	0.002127659574468085	0.002173913043478261
46	MS vs. —(4) Rainbow—Noisy-model-5	13.576001639393718	5.557868328152009E-42	0.002173913043478261	0.002173913043478261
45	MS vs. —(4) Rainbow—All-model-6	13.576001639393718	5.557868328152009E-42	0.0022222222222222222	0.0022222222222222222
44	WINQ vs. —(4) Rainbow—DDQN-model-1	12.692825552760905	6.480491676365452E-37	0.0022727272727272727	0.002564102564102564
43	WINQ vs. —(4) Rainbow—Noisy-model-5	12.489015686614893	8.570743284737007E-36	0.002325581395348837	0.002564102564102564
42	WINQ vs. —(4) Rainbow—All-model-6	12.489015686614893	8.570743284737007E-36	0.002380952380952381	0.002564102564102564
41	MS vs. —(4) Rainbow—All not 3-step not Noisy-model-7	12.013459332274186	3.0194471105160323E-33	0.0024390243902439024	0.002564102564102564
40	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—Prioritized-model-4	11.809649466128151	3.4800912099206565E-32	0.0025	0.002564102564102564
39	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Prioritized-model-4	11.549225748274884	7.448844360170927E-31	0.002564102564102564	0.002564102564102564
38	SPT vs. WINQ	11.00573277188544	3.5858875334920987E-28	0.002631578947368421	0.002702702702702703
37	WINQ vs. —(4) Rainbow—All not 3-step not Noisy-model-7	10.926473379495361	8.613105048167928E-28	0.002702702702702703	0.002702702702702703
36	LWRK vs. —(4) Rainbow—Prioritized-model-4	10.53017641754472	6.271682930229013E-26	0.0027777777777777778	0.0027777777777777778
35	MS vs. SPT	9.918746819106614	3.450612192078705E-23	0.002857142857142857	0.0029411764705882353
34	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Prioritized-model-4	9.896101278423744	4.328201026022719E-23	0.0029411764705882353	0.0029411764705882353
33	MS vs. —(4) Rainbow—3-step-model-3	9.86213296739945	6.074503203228581E-23	0.0030303030303030303	0.0032258064516129032
32	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—Noisy-model-5	9.692291412277733	3.2515045344619143E-22	0.003125	0.0032258064516129032
31	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—All-model-6	9.692291412277733	3.2515045344619143E-22	0.0032258064516129032	0.0032258064516129032
30	WINQ vs. —(4) Rainbow—3-step-model-3	8.775147014620625	1.7068074051457697E-18	0.0033333333333333335	0.0033333333333333335
29	—(4) Rainbow—Prioritized-model-4 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	8.1297491051582	4.301798679286828E-16	0.003448275862068966	0.003448275862068966
28	LWRK vs. WINQ	7.7334521432075585	1.0466872762314469E-14	0.0035714285714285718	0.0035714285714285718
27	LWRK vs. MS	6.646466190428734	3.002133701448214E-11	0.003703703703703704	0.003703703703703704
26	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—Prioritized-model-4	5.978422740283465	2.2530842454643296E-9	0.0038461538461538464	0.004
25	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—3-step-model-3	5.83126725844687	5.502136327697615E-9	0.004	0.004
24	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—3-step-model-3	5.570803007991419	2.5356790218989204E-8	0.004166666666666667	0.004166666666666667
23	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—3-step-model-3	3.91767853814028	8.940582380458241E-5	0.004347826086956522	0.004347826086956522
22	MS vs. —(4) Rainbow—Prioritized-model-4	3.883710227115985	1.0287450331355067E-4	0.004545454545454546	0.004545454545454546
21	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—Noisy-model-5	3.7138686719942693	2.0411474723192752E-4	0.004761904761904762	0.004761904761904762
20	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—All-model-6	3.7138686719942693	2.0411474723192752E-4	0.005	0.005
19	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	3.67990036096995	2.333251031494939E-4	0.005263157894736842	0.005263157894736842
18	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	3.4194766431166825	6.274171861465427E-4	0.005555555555555556	0.005555555555555556
17	LWRK vs. SPT	3.2722806286778803	0.0010668362682036418	0.0058823529411764705	0.0058823529411764705
16	WINQ vs. —(4) Rainbow—Prioritized-model-4	2.7967242743371603	0.00516235681222754	0.00625	0.00625
15	—(4) Rainbow—3-step-model-3 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	2.1513263648747363	0.03145044869191837	0.006666666666666667	0.006666666666666667
14	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—Noisy-model-5	2.1173580538504173	0.034229471315782516	0.0071428571428571435	0.0071428571428571435
13	—(4) Rainbow—Dueling-model-2 vs. —(4) Rainbow—All-model-6	2.1173580538504173	0.034229471315782516	0.007692307692307693	0.007692307692307693
12	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Dueling-model-2	1.9135481877044063	0.055677910746622684	0.0083333333333333333	0.0083333333333333333
11	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Noisy-model-5	1.8569343359971495	0.06332049678931886	0.009090909090909092	0.009090909090909092
10	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—All-model-6	1.8569343359971495	0.06332049678931886	0.01	0.01
9	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.7663521732655436	0.07733678360610904	0.011111111111111112	0.011111111111111112
8	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—DDQN-model-1	1.653124469851139	0.09830553419311701	0.0125	0.0125
7	—(4) Rainbow—Noisy-model-5 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.5625423071195328	0.11816028735144976	0.014285714285714287	0.014285714285714287
6	—(4) Rainbow—All-model-6 vs. —(4) Rainbow—All not 3-step not Noisy-model-7	1.5625423071195328	0.11816028735144976	0.016666666666666666	0.016666666666666666
5	MS vs. WINQ	1.0869859527788248	0.27704301780334	0.02	0.02
4	—(4) Rainbow—DQN-model-0 vs. —(4) Rainbow—Dueling-model-2	0.26042371785326757	0.7945369497506622	0.025	0.025
3	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—Noisy-model-5	0.20380986614601082	0.838502082598028	0.033333333333333333	0.033333333333333333
2	—(4) Rainbow—DDQN-model-1 vs. —(4) Rainbow—All-model-6	0.20380986614601082	0.838502082598028	0.05	0.05
1	—(4) Rainbow—Noisy-model-5 vs. —(4) Rainbow—All-model-6	0.0	1.0	0.1	0.1

Table 7: Adjusted p -values

i	hypothesis	unadjusted p	P_{Neme}	P_{Holm}	P_{Shaf}	P_{Berg}
1	SPT vs .—(4) Rainbow—Dueling-model-2	1.1183766541873419E-144	7.381285917636457E-143	7.381285917636457E-143	7.381285917636457E-143	0.0
2	SPT vs .—(4) Rainbow—DQN-model-0	8.610536046729506E-142	5.682953790841473E-140	5.596848430374178E-140	4.735794825701228E-140	0.0
3	SPT vs .—(4) Rainbow—DDQN-model-1	3.731237426254632E-124	2.462616701328057E-122	2.3879919528029645E-122	2.0521805844400476E-122	0.0
4	SPT vs .—(4) Rainbow—Noisy-model-5	4.615439289321985E-122	3.04618993095251E-120	2.9077267522728504E-120	2.5384916091270918E-120	0.0
5	SPT vs .—(4) Rainbow—All-model-6	4.615439289321985E-122	3.04618993095251E-120	2.9077267522728504E-120	2.5384916091270918E-120	0.0
6	LWRK vs .—(4) Rainbow—Dueling-model-2	1.5163313386966887E-110	1.0007786835398146E-108	9.2496211660498E-109	8.339822362831788E-109	0.0
7	LWRK vs .—(4) Rainbow—DQN-model-0	4.986392377785296E-108	3.291018969338295E-106	2.9918354266711776E-106	2.7425158077819127E-106	0.0
8	SPT vs .—(4) Rainbow—All not 3-step not Noisy-model-7	1.2806538929236468E-106	8.45231569329607E-105	7.555857968249517E-105	7.043596411080057E-105	0.0
9	LWRK vs .—(4) Rainbow—DDQN-model-1	9.766979872607756E-93	6.446206715921119E-91	5.664848326112498E-91	5.371838929934266E-91	0.0
10	LWRK vs .—(4) Rainbow—Noisy-model-5	6.209775628445206E-91	4.098451914773836E-89	3.539572108213768E-89	3.415376595644863E-89	0.0
11	LWRK vs .—(4) Rainbow—All-model-6	6.209775628445206E-91	4.098451914773836E-89	3.539572108213768E-89	3.415376595644863E-89	0.0
12	SPT vs .—(4) Rainbow—3-step-model-3	4.3503391301016165E-87	2.871223825867067E-85	2.392686521555889E-85	2.392686521555889E-85	0.0
13	LWRK vs .—(4) Rainbow—All not 3-step not Noisy-model-7	1.0487727904888201E-77	6.921900417226213E-76	5.663373068639628E-76	4.824354836248573E-76	0.0
14	LWRK vs .—(4) Rainbow—3-step-model-3	3.181836776644772E-61	2.1000122725855495E-59	1.686373491621729E-59	1.463644917256595E-59	0.0
15	MS vs .—(4) Rainbow—Dueling-model-2	1.679274539693089E-55	1.1083211961974388E-53	8.732227606404063E-54	7.724662882588209E-54	0.0
16	MS vs .—(4) Rainbow—DQN-model-0	9.829498668480796E-54	6.487469121197325E-52	5.0130443209252064E-52	4.521569387501167E-52	0.0
17	WINQ vs .—(4) Rainbow—Dueling-model-2	2.5577415811339688E-48	1.6881094435484194E-46	1.2788707905669845E-46	1.1765611273216256E-46	0.0
18	WINQ vs .—(4) Rainbow—DQN-model-0	1.129429843935294E-46	7.45423696997294E-45	5.53420623528294E-45	5.195377282102352E-45	0.0
19	SPT vs .—(4) Rainbow—Prioritized-model-4	2.4631199072927625E-43	1.6256591388132233E-41	1.182297555500526E-41	1.1330351573546708E-41	0.0
20	MS vs .—(4) Rainbow—DDQN-model-1	3.3715133216034463E-43	2.2251987922582746E-41	1.5846112611536199E-41	1.5508961279375854E-41	0.0
21	MS vs .—(4) Rainbow—Noisy-model-5	5.557868328152009E-42	3.668193096580326E-40	2.556619430949924E-40	2.556619430949924E-40	0.0
22	MS vs .—(4) Rainbow—All-model-6	5.557868328152009E-42	3.668193096580326E-40	2.556619430949924E-40	2.556619430949924E-40	0.0
23	WINQ vs .—(4) Rainbow—DDQN-model-1	6.480491676365452E-37	4.2771245064011983E-35	2.851416337600799E-35	2.527391753782526E-35	0.0
24	WINQ vs .—(4) Rainbow—Noisy-model-5	8.570743284737007E-36	5.656690567926425E-34	3.685419612436913E-34	3.3425898810474325E-34	0.0
25	WINQ vs .—(4) Rainbow—All-model-6	8.570743284737007E-36	5.656690567926425E-34	3.685419612436913E-34	3.3425898810474325E-34	0.0
26	MS vs .—(4) Rainbow—All not 3-step not Noisy-model-7	3.0194471105160323E-33	1.9928350929405814E-31	1.2379733153115732E-31	1.1775843731012525E-31	0.0
27	—(4) Rainbow—Dueling-model-2 vs .—(4) Rainbow—Prioritized-model-4	3.4800912099206565E-32	2.2968601985476333E-30	1.3920364839682626E-30	1.357235571869056E-30	0.0
28	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—Prioritized-model-4	7.448844360170927E-31	4.916237277712812E-29	2.905049300466661E-29	2.905049300466661E-29	0.0
29	SPT vs .WINQ	3.585887533492098E-28	2.3666857721047853E-26	1.362677837262769976E-26	1.3267783873920764E-26	0.0
30	WINQ vs .—(4) Rainbow—All not 3-step not Noisy-model-7	8.613105048167928E-26	5.684649331790832E-26	3.1868488678221334E-26	3.1868488678221334E-26	0.0
31	LWRK vs .—(4) Rainbow—Prioritized-model-4	6.2716829830229013E-26	4.139310733951148E-24	2.2578058548824445E-24	2.2578058548824445E-24	0.0
32	MS vs .SPT	3.450612192078705E-23	2.277404046771945E-21	1.2077142672275467E-21	1.1732081453067597E-21	0.0
33	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—Prioritized-model-4	4.328201026022719E-23	2.8566126771749946E-21	1.4715883488477245E-21	1.4715883488477245E-21	0.0
34	MS vs .—(4) Rainbow—3-step-model-3	6.074503203228581E-23	4.009172114130864E-21	2.004586057065432E-21	1.88309599300086E-21	0.0
35	—(4) Rainbow—Prioritized-model-4 vs .—(4) Rainbow—Noisy-model-5	3.2515045344619143E-22	2.1459929927448635E-20	1.0404814510278126E-20	1.0079664056831934E-20	0.0
36	—(4) Rainbow—Prioritized-model-4 vs .—(4) Rainbow—All-model-6	3.2515045344619143E-22	2.1459929927448635E-20	1.0404814510278126E-20	1.0079664056831934E-20	0.0
37	WINQ vs .—(4) Rainbow—3-step-model-3	1.7068074051457697E-18	1.126492887396208E-16	5.120422215437309E-17	5.120422215437309E-17	0.0
38	—(4) Rainbow—Prioritized-model-4 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	4.301798679286828E-16	2.8391871283293065E-14	1.24752161699318E-14	1.24752161699318E-14	0.0
39	LWRK vs .WINQ	1.0466872762314469E-14	6.908136023127549E-13	2.930724373448051E-13	2.930724373448051E-13	0.0
40	LWRK vs .MS	3.002133701448214E-11	1.9814082429558213E-9	8.105760993910179E-10	8.105760993910179E-10	0.0
41	—(4) Rainbow—3-step-model-3 vs .—(4) Rainbow—Prioritized-model-4	2.2530842454643296E-9	1.4870356020064574E-7	5.858019038207257E-8	5.632710613660824E-8	0.0
42	—(4) Rainbow—Dueling-model-2 vs .—(4) Rainbow—3-step-model-3	5.502136327697615E-9	3.631409976280426E-7	1.3755340819244037E-7	1.3755340819244037E-7	0.0
43	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—3-step-model-3	2.5356790218989204E-8	1.6735481544532875E-6	6.085629652557408E-7	6.085629652557408E-7	0.0
44	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—3-step-model-3	8.940582380458241E-5	0.00590078437110244	0.0020563339475053954	0.0020563339475053954	0.0
45	MS vs .—(4) Rainbow—Prioritized-model-4	1.0287450331355067E-4	0.006789717218694346	0.002263239072898115	0.002263239072898115	0.0
46	—(4) Rainbow—3-step-model-3 vs .—(4) Rainbow—Noisy-model-5	2.0411474723192752E-4	0.013471573317307216	0.004286409691870478	0.004286409691870478	0.0
47	—(4) Rainbow—3-step-model-3 vs .—(4) Rainbow—All-model-6	2.0411474723192752E-4	0.013471573317307216	0.004286409691870478	0.004286409691870478	0.0
48	—(4) Rainbow—Dueling-model-2 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	2.333251031494939E-4	0.015399456807866597	0.004433176959840384	0.004433176959840384	0.0
49	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	6.274171861465427E-4	0.041409328285671824	0.011293509350637769	0.011293509350637769	0.0
50	LWRK vs .SPT	0.0010668362682036418	0.07041119370144036	0.01813621655946191	0.01813621655946191	0.0
51	WINQ vs .—(4) Rainbow—Prioritized-model-4	0.00516235681222754	0.34071554960701766	0.08259770899564065	0.08259770899564065	0.0
52	—(4) Rainbow—3-step-model-3 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	0.03145044869191837	2.075729613666612	0.4717567303787755	0.4717567303787755	0.0
53	—(4) Rainbow—Dueling-model-2 vs .—(4) Rainbow—Noisy-model-5	0.034229471315782516	2.259145106841646	0.4792125984209552	0.4792125984209552	0.0
54	—(4) Rainbow—Dueling-model-2 vs .—(4) Rainbow—All-model-6	0.034229471315782516	2.259145106841646	0.4792125984209552	0.4792125984209552	0.0
55	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—Dueling-model-2	0.055677910746622684	3.6747421092770973	0.6681349289594722	0.6681349289594722	0.0
56	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—Noisy-model-5	0.06332049678931886	4.179152788095045	0.6965254646825075	0.6965254646825075	0.0
57	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—All-model-6	0.06332049678931886	4.179152788095045	0.6965254646825075	0.6965254646825075	0.0
58	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	0.07733678360610904	5.104227718003197	0.6965254646825075	0.6965254646825075	0.0
59	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—DDQN-model-1	0.09830553419311701	6.488165256745723	0.7864442735449361	0.7864442735449361	0.0
60	—(4) Rainbow—Noisy-model-5 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	0.11816028735144976	7.798578965195684	0.8271220114601483	0.8271220114601483	0.0
61	—(4) Rainbow—All-model-6 vs .—(4) Rainbow—All not 3-step not Noisy-model-7	0.11816028735144976	7.798578965195684	0.8271220114601483	0.8271220114601483	0.0
62	MS vs .WINQ	0.27704301780334	18.28483917502044	1.3852150890167	1.3852150890167	0.0
63	—(4) Rainbow—DQN-model-0 vs .—(4) Rainbow—Dueling-model-2	0.7945369497506622	52.439438683543706	3.178147799002649	3.178147799002649	0.0
64	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—Noisy-model-5	0.838502082598028	55.34113745146985	3.178147799002649	3.178147799002649	0.0
65	—(4) Rainbow—DDQN-model-1 vs .—(4) Rainbow—All-model-6	0.838502082598028	55.34113745146985	3.178147799002649	3.178147799002649	0.0
66	—(4) Rainbow—Noisy-model-5 vs .—(4) Rainbow—All-model-6	1.0	66.0	3.178147799002649	3.178147799002649	0.0