Results

May 6, 2024

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

Table 1: Average Rankings of the algorithms

Algorithm	Ranking
LWRK	2.73
MS	4.72
SPT	1.76
WINQ	5.10
—(1) Optimizer—model—SQD-model-0	6.48
—(1) Optimizer—model—Adam-model-1	7.64
—(1) Optimizer—model—AdamW-model-2	6.54
—(1) Optimizer—model—AdaMax-model-3	7.62
—(1) Optimizer—model—RMSProp-model-4	8.89
—(1) Optimizer—model—RAdam-model-5	7.69
—(1) Optimizer—model—Adam (Non-stationary)-model-6	6.85

Friedman statistic considering reduction performance (distributed according to chi-square with 10 degrees of freedom: 1334.3180303030242.
P-value computed by Friedman Test: 0.0.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 10 and 2990 degrees of freedom: 239.5181663239016.
P-value computed by Iman and Daveport Test: 0.0.

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
10	—(1) Optimizer—model—RMSProp-model-4	26.335424495028253	7.53896232643923E-153	0.005
9	—(1) Optimizer—model—RAdam-model-5	21.92874911796806	1.3817380766024994E-106	0.005555555555555556
8	—(1) Optimizer—model—Adam-model-1	21.71949358330324	1.3425068805330288E-104	0.00625
7	—(1) Optimizer—model—AdaMax-model-3	21.64563868871564	6.68117694546613E-104	0.0071428571428571435
6	—(1) Optimizer—model—Adam (Non-stationary)-model-6	18.81453439619095	5.741059398190534E-79	0.008333333333333333
5	—(1) Optimizer—model—AdamW-model-2	17.682092679181096	5.7617356963550946E-70	0.01
4	—(1) Optimizer—model—SQD-model-0	17.429755122673495	4.905560324580388E-68	0.0125
3	WINQ	12.339921970678073	5.520936166111044E-35	0.016666666666666666
2	MS	10.94898812261161	6.719402902085199E-28	0.025
1	LWRK	3.5881169620475326	3.3307487452882706E-4	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.005.
Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.05.
Hommel's procedure rejects all hypotheses.
Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.01.

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
10	—(1) Optimizer—model—RMSProp-model-4	26.335424495028253	7.53896232643923E-153	0.01
9	—(1) Optimizer—model—RAdam-model-5	21.92874911796806	1.3817380766024994E-106	0.011111111111111112
8	—(1) Optimizer—model—Adam-model-1	21.71949358330324	1.3425068805330288E-104	0.0125
7	—(1) Optimizer—model—AdaMax-model-3	21.64563868871564	6.68117694546613E-104	0.014285714285714287
6	—(1) Optimizer—model—Adam (Non-stationary)-model-6	18.81453439619095	5.741059398190534E-79	0.016666666666666666
5	—(1) Optimizer—model—AdamW-model-2	17.682092679181096	5.7617356963550946E-70	0.02
4	—(1) Optimizer—model—SQD-model-0	17.429755122673495	4.905560324580388E-68	0.025
3	WINQ	12.339921970678073	5.520936166111044E-35	0.03333333333333333
2	MS	10.94898812261161	6.719402902085199E-28	0.05
1	LWRK	3.5881169620475326	3.3307487452882706E-4	0.1

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_{Homm}
1	—(1) Optimizer—model—RMSProp-model-4	7.53896232643923E-153	7.53896232643923E-152	7.53896232643923E-152	7.53896232643923E-152	7.53896232643923E-152
2	—(1) Optimizer—model—RAdam-model-5	1.3817380766024994E-106	1.3817380766024995E-105	1.2435642689422495E-105	1.2435642689422495E-105	1.2435642689422495E-105
3	—(1) Optimizer—model—Adam-model-1	1.3425068805330288E-104	1.342506880533029E-103	1.074005504426423E-103	1.074005504426423E-103	1.074005504426423E-103
4	—(1) Optimizer—model—AdaMax-model-3	6.68117694546613E-104	6.681176945466131E-103	4.676823861826291E-103	4.676823861826291E-103	4.676823861826291E-103
5	—(1) Optimizer—model—Adam (Non-stationary)-model-6	5.741059398190534E-79	5.741059398190534E-78	3.44463563891432E-78	3.44463563891432E-78	3.44463563891432E-78
6	—(1) Optimizer—model—AdamW-model-2	5.7617356963550946E-70	5.761735696355095E-69	2.8808678481775475E-69	2.8808678481775475E-69	2.8808678481775475E-69
7	—(1) Optimizer—model—SQD-model-0	4.905560324580388E-68	4.905560324580388E-67	1.9622241298321552E-67	1.9622241298321552E-67	1.9622241298321552E-67
8	WINQ	5.520936166111044E-35	5.520936166111044E-34	1.6562808498333134E-34	1.6562808498333134E-34	1.6562808498333134E-34
9	MS	6.719402902085199E-28	6.7194029020852E-27	1.3438805804170398E-27	1.3438805804170398E-27	1.3438805804170398E-27
10	LWRK	3.3307487452882706E-4	0.0033307487452882705	3.3307487452882706E-4	3.3307487452882706E-4	3.3307487452882706E-4

Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 9.090909090909091E-4$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.007142857142857143$.
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 9.090909090909091E-4$.
Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 0.0018181818181818182$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.014285714285714287$.
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.0018181818181818182$.

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
55	SPT vs. —(1) Optimizer—model—RMSProp-model-4	26.335424495028253	7.53896232643923E-153	9.090909090909091E-4	9.090909090909091E-4
54	LWRK vs. —(1) Optimizer—model—RMSProp-model-4	22.74730753298072	1.525830906982060 4E-114	9.25925925925926E-4	0.0011111111111111111
53	SPT vs. —(1) Optimizer—model—RAdam-model-5	21.92874911796806	1.3817380766024994E-106	9.433962264150943E-4	0.0011111111111111111
52	SPT vs. —(1) Optimizer—model—Adam-model-1	21.71949358330324	1.3425068805330288E-104	9.615384615384616E-4	0.0011111111111111111
51	SPT vs. —(1) Optimizer—model—AdaMax-model-3	21.64563868871564	6.68117694546613E-104	9.803921568627 45E-4	0.0011111111111111111
50	SPT vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	18.81453439619095	5.741059398190534E-79	0.001	0.0011111111111111111
49	LWRK vs. —(1) Optimizer—model—RAdam-model-5	18.340632155920527	3.922097885773615E-75	0.0010204081632653062	0.0011111111111111111
48	LWRK vs. —(1) Optimizer—model—Adam-model-1	18.131376621255708	1.8019120126692287E-73	0.0010416666666666667	0.0011111111111111111
47	LWRK vs. —(1) Optimizer—model—AdaMax-model-3	18.057521726668107	6.884476155242451E-73	0.0010638297872340426	0.0011111111111111111
46	SPT vs. —(1) Optimizer—model—AdamW-model-2	17.682092679181096	5.761735696355094 6E-70	0.0010869565217391304	0.0011111111111111111
45	SPT vs. —(1) Optimizer—model—SQD-model-0	17.429755122673495	4.905560324580388E-68	0.0011111111111111111	0.0011111111111111111
44	MS vs. —(1) Optimizer—model—RMSProp-model-4	15.386436372416645	2.0184699852550628E-53	0.0011363636363636365	0.0013513513513513514
43	LWRK vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	15.226417434143418	2.3618375431499166E-52	0.0011627906976744186	0.0013513513513513514
42	LWRK vs. —(1) Optimizer—model—AdamW-model-2	14.093975717133564	4.1360541628806936E-45	0.0011904761904761906	0.0013513513513513514
41	WINQ vs. —(1) Optimizer—model—RMSProp-model-4	13.99550252435018	1.660517848961813E-44	0.0012195121951219512	0.0013513513513513514
40	LWRK vs. —(1) Optimizer—model—SQD-model-0	13.84163816062596	1.4291213512972886E-43	0.00125	0.0013513513513513514
39	SPT vs. WINQ	12.339921970678073	5.520936166111044E-35	0.001282051282051282	0.0013513513513513514
38	MS vs. —(1) Optimizer—model—RAdam-model-5	10.97976099535645	4.781872612533453E-28	0.0013157894736842105	0.0013513513513513514
37	MS vs. SPT	10.94898812261161	6.719402902085199E-28	0.0013513513513513514	0.0013513513513513514
36	MS vs. —(1) Optimizer—model—Adam-model-1	10.77050546069163	4.743895891249844 5E-27	0.001388888888888889	0.001388888888888889
35	MS vs. —(1) Optimizer—model—AdaMax-model-3	10.69665056610403	1.055238790664860 2E-26	0.0014285714285714286	0.0016129032258064516
34	WINQ vs. —(1) Optimizer—model—RAdam-model-5	9.588827147289987	8.909196491084633E-22	0.0014705882352941176	0.0016129032258064516
33	WINQ vs. —(1) Optimizer—model—Adam-model-1	9.379571612625167	6.624131197974802E-21	0.0015151515151515152	0.0016129032258064516
32	WINQ vs. —(1) Optimizer—model—AdaMax-model-3	9.305716718037566	1.330916432813574 7E-20	0.0015625	0.0016129032258064516
31	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—RMSProp-model-4	8.90566937235476	5.306486624309031E-19	0.0016129032258064516	0.0016129032258064516
30	LWRK vs. WINQ	8.75180500863054	2.0996696874033755E-18	0.0016666666666666668	0.0017241379310344 83
29	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—RMSProp-model-4	8.653331815847157	5.001733003789809E-18	0.0017241379310344 83	0.0017241379310344 83
28	MS vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	7.865546273579341	3.6749022759484524E-15	0.0017857142857142859	0.0017857142857142859
27	—(1) Optimizer—model—RMSProp-model-4 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	7.520890098837303	5.440456770273330 4E-14	0.0018518518518518 52	0.0018518518518518 52
26	LWRK vs. MS	7.360871160564077	1.827135200851746-13	0.0019230769230769232	0.002
25	MS vs. —(1) Optimizer—model—AdamW-model-2	6.7331045565694865	1.6608062571044065E-11	0.002	0.002
24	MS vs. —(1) Optimizer—model—SQD-model-0	6.480767000061884	9.125750694043495E-11	0.0020833333333333333	0.0020833333333333333
23	WINQ vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	6.474612425512877	9.505561384018154E-11	0.0021739130434782 61	0.0021739130434782 61
22	WINQ vs. —(1) Optimizer—model—AdamW-model-2	5.342170708503023	9.184010369011194E-8	0.0022727272727272 73	0.0022727272727272 73
21	WINQ vs. —(1) Optimizer—model—SQD-model-0	5.08983315199542	3.583787049857 1105E-7	0.0023809523809523 81	0.0023809523809523 81
20	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—RMSProp-model-4	4.6897858063126145	2.734911848954210 6E-6	0.0025	0.0025
19	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—RMSProp-model-4	4.615930911725013	3.913371290079433E-6	0.0026315789473684 21	0.0026315789473684 21
18	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—RAdam-model-5	4.498993995294566	6.827578584784996E-6	0.0027777777777777 78	0.0027777777777777 78
17	—(1) Optimizer—model—RMSProp-model-4 vs. —(1) Optimizer—model—RAdam-model-5	4.406675377060194	1.049693229623226 2E-5	0.0029411764705882353	0.0029411764705882353
16	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—Adam-model-1	4.289738460629747	1.788836517788781E-5	0.003125	0.003125
15	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—RAdam-model-5	4.246656438786964	2.169842932064951E-5	0.0033333333333333335	0.0033333333333333335
14	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—AdaMax-model-3	4.215883566042145	2.488021127681077 3E-5	0.0035714285714285718	0.0035714285714285718
13	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—AdamW-model-2	4.037400904122144	5.404666279268763E-5	0.0038461538461538464	0.0038461538461538464
12	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—AdaMax-model-3	3.963546009534543	7.384462357247929E-5	0.0041666666666666667	0.0041666666666666667
11	LWRK vs. SPT	3.5881169620475326	3.330748745288270 6E-4	0.0045454545454545 46	0.0045454545454545 46
10	—(1) Optimizer—model—RAdam-model-5 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	3.1142147217771097	0.001844352148584291	0.005	0.005
9	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	2.90495918711229	0.003673009910232057	0.005555555555555556	0.005555555555555556
8	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	2.8311042925246883	0.004638759277235854	0.00625	0.00625
7	MS vs. WINQ	1.390933848066464	0.16424548756439603	0.007142857142857143 5	0.007142857142857143 5
6	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	1.384779273517457	0.16611997044959864	0.008333333333333333	0.008333333333333333
5	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	1.1324417170098544	0.25744877460183146	0.01	0.01
4	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—RAdam-model-5	0.28311042925242097	0.7770921871318933	0.0125	0.0125
3	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—AdamW-model-2	0.25233755650760264	0.8007801612365236	0.016666666666666666	0.016666666666666666
2	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—RAdam-model-5	0.20925553466481964	0.8342487615036542	0.025	0.025
1	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—AdaMax-model-3	0.07385489458760133	0.9411258466850714	0.05	0.05

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
55	SPT vs. —(1) Optimizer—model—RMSProp-model-4	26.335424495028253	7.53896232643923E-153	0.0018181818181818182	0.0018181818181818182
54	LWRK vs. —(1) Optimizer—model—RMSProp-model-4	22.74730753298072	1.5258309069820604E-114	0.001851851851851852	0.0022222222222222222
53	SPT vs. —(1) Optimizer—model—RAdam-model-5	21.92874911796806	1.3817380766024994E-106	0.0018867924528301887	0.0022222222222222222
52	SPT vs. —(1) Optimizer—model—Adam-model-1	21.71949358330324	1.3425068805330288E-104	0.0019230769230769232	0.0022222222222222222
51	SPT vs. —(1) Optimizer—model—AdaMax-model-3	21.64563868871564	6.68117694546613E-104	0.00196078431372549	0.0022222222222222222
50	SPT vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	18.81453439619095	5.741059398190534E-79	0.002	0.0022222222222222222
49	LWRK vs. —(1) Optimizer—model—RAdam-model-5	18.340632155920527	3.922097885773615E-75	0.0020408163265306124	0.0022222222222222222
48	LWRK vs. —(1) Optimizer—model—Adam-model-1	18.131376621255708	1.8019120126692287E-73	0.0020833333333333333	0.0022222222222222222
47	LWRK vs. —(1) Optimizer—model—AdaMax-model-3	18.057521726668107	6.884476155242451E-73	0.002127659574468085	0.0022222222222222222
46	SPT vs. —(1) Optimizer—model—AdamW-model-2	17.682092679181096	5.761735696355094 6E-70	0.002173913043478261	0.0022222222222222222
45	SPT vs. —(1) Optimizer—model—SQD-model-0	17.429755122673495	4.905560324580388E-68	0.0022222222222222222	0.0022222222222222222
44	MS vs. —(1) Optimizer—model—RMSProp-model-4	15.386436372416645	2.0184699852550628E-53	0.002272727272727273	0.00270270270270270 3
43	LWRK vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	15.226417434143418	2.3618375431499166E-52	0.002325581395348837	0.00270270270270270 3
42	LWRK vs. —(1) Optimizer—model—AdamW-model-2	14.093975717133564	4.1360541628806936E-45	0.002380952380952381	0.00270270270270270 3
41	WINQ vs. —(1) Optimizer—model—RMSProp-model-4	13.99550252435018	1.660517848961813E-44	0.0024390243902439024	0.00270270270270270 3
40	LWRK vs. —(1) Optimizer—model—SQD-model-0	13.84163816062596	1.4291213512972886E-43	0.0025	0.00270270270270270 3
39	SPT vs. WINQ	12.339921970678073	5.520936166111044E-35	0.002564102564102564	0.00270270270270270 3
38	MS vs. —(1) Optimizer—model—RAdam-model-5	10.97976099535645	4.781872612533453E-28	0.002631578947368421	0.00270270270270270 3
37	MS vs. SPT	10.94898812261161	6.719402902085199E-28	0.002702702702702703	0.00270270270270270 3
36	MS vs. —(1) Optimizer—model—Adam-model-1	10.77050546069163	4.7438958912498445E-27	0.002777777777777778	0.00277777777777778
35	MS vs. —(1) Optimizer—model—AdaMax-model-3	10.69665056610403	1.0552387906648602E-26	0.002857142857142857	0.0032258064516129032
34	WINQ vs. —(1) Optimizer—model—RAdam-model-5	9.588827147289987	8.909196491084633E-22	0.0029411764705882353	0.0032258064516129032
33	WINQ vs. —(1) Optimizer—model—Adam-model-1	9.379571612625167	6.624131197974802E-21	0.0030303030303030303	0.0032258064516129032
32	WINQ vs. —(1) Optimizer—model—AdaMax-model-3	9.305716718037566	1.3309164328135747E-20	0.003125	0.0032258064516129032
31	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—RMSProp-model-4	8.90566937235476	5.306486624309031E-19	0.0032258064516129032	0.0032258064516129032
30	LWRK vs. WINQ	8.75180500863054	2.0996696874033755E-18	0.0033333333333333335	0.003448275862068966
29	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—RMSProp-model-4	8.653331815847157	5.001733003789809E-18	0.003448275862068966	0.003448275862068966
28	MS vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	7.865546273579341	3.6749022759484524E-15	0.0035714285714285718	0.0035714285714285718
27	—(1) Optimizer—model—RMSProp-model-4 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	7.520890098837303	5.4404567702733304E-14	0.003703703703703704	0.003703703703703704
26	LWRK vs. MS	7.360871160564077	1.827135200851 74E-13	0.0038461538461538464	0.004
25	MS vs. —(1) Optimizer—model—AdamW-model-2	6.7331045565694865	1.6608062571044065E-11	0.004	0.004
24	MS vs. —(1) Optimizer—model—SQD-model-0	6.480767000061884	9.125750694043495E-11	0.004166666666666667	0.004166666666666667
23	WINQ vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	6.474612425512877	9.505561384018154E-11	0.004347826086956522	0.004347826086956522
22	WINQ vs. —(1) Optimizer—model—AdamW-model-2	5.342170708503023	9.184010369011194E-8	0.004545454545454546	0.004545454545454546
21	WINQ vs. —(1) Optimizer—model—SQD-model-0	5.08983315199542	3.5837870498571105E-7	0.004761904761904762	0.004761904761904762
20	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—RMSProp-model-4	4.6897858063126145	2.7349118489542106E-6	0.005	0.005
19	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—RMSProp-model-4	4.615930911725013	3.913371290079433E-6	0.005263157894736842	0.005263157894736842
18	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—RAdam-model-5	4.498993995294566	6.827578584784996E-6	0.005555555555555556	0.005555555555555556
17	—(1) Optimizer—model—RMSProp-model-4 vs. —(1) Optimizer—model—RAdam-model-5	4.406675377060194	1.0496932296232262E-5	0.005882352941176 4705	0.005882352941176 4705
16	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—Adam-model-1	4.289738460629747	1.788836517788781E-5	0.00625	0.00625
15	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—RAdam-model-5	4.246656438786964	2.169842932064951E-5	0.006666666666666667	0.006666666666666667
14	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—AdaMax-model-3	4.215883566042145	2.488021127681077 3E-5	0.007142857142857143	0.007142857142857143
13	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—AdamW-model-2	4.037400904122144	5.404666279268763E-5	0.007692307692307693	0.007692307692307693
12	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—AdaMax-model-3	3.963546009534543	7.384462357247929E-5	0.008333333333333333	0.008333333333333333
11	LWRK vs. SPT	3.5881169620475326	3.3307487452882706E-4	0.009090909090909092	0.009090909090909092
10	—(1) Optimizer—model—RAdam-model-5 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	3.1142147217771097	0.00184435214858429 1	0.01	0.01
9	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	2.90495918711229	0.003673009910232057	0.011111111111111112	0.011111111111111112
8	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	2.8311042925246883	0.004638759277235854	0.0125	0.0125
7	MS vs. WINQ	1.390933848066464	0.16424548756439603	0.014285714285714287	0.014285714285714287
6	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	1.384779273517457	0.16611997044959864	0.016666666666666666	0.016666666666666666
5	—(1) Optimizer—model—AdamW-model-2 vs. —(1) Optimizer—model—Adam (Non-stationary)-model-6	1.1324417170098544	0.25744877460183146	0.02	0.02
4	—(1) Optimizer—model—AdaMax-model-3 vs. —(1) Optimizer—model—RAdam-model-5	0.28311042925242097	0.7770921871318933	0.025	0.025
3	—(1) Optimizer—model—SQD-model-0 vs. —(1) Optimizer—model—AdamW-model-2	0.25233755650760264	0.8007801612365236	0.03333333333333333	0.03333333333333333
2	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—RAdam-model-5	0.20925553466481964	0.8342487615036542	0.05	0.05
1	—(1) Optimizer—model—Adam-model-1 vs. —(1) Optimizer—model—AdaMax-model-3	0.07385489458760133	0.9411258466850714	0.1	0.1

Table 7: Adjusted p-values

i	hypothesis	unadjusted p	p_{Neme}	p_{Holm}	p_{Shaf}	p_{Berg}
1	SPT vs .—(1) Optimizer—model—RMSProp-model-4	7.53896232643923E-153	4.146429279541576E-151	4.146429279541576E-151	4.146429279541576E-151	0.0
2	LWRK vs .—(1) Optimizer—model—RMSProp-model-4	1.5258309069820604E-114	8.392069988401333E-113	8.239486897703126E-113	6.866239081419272E-113	0.0
3	SPT vs .—(1) Optimizer—model—RAdam-model-5	1.3817380766024994E-106	7.599559421313747E-105	7.323211805993247E-105	6.217821344711247E-105	0.0
4	SPT vs .—(1) Optimizer—model—Adam-model-1	1.3425068805330288E-104	7.383787842931658E-103	6.98103577877175E-103	6.04128096239863E-103	0.0
5	SPT vs .—(1) Optimizer—model—AdaMax-model-3	6.68117694546613E-104	3.674647320006372E-102	3.4074002421877264E-102	3.0065296254597587E-102	0.0
6	SPT vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	5.741059398190534E-79	3.1575826690047935E-77	2.870529699095267E-77	2.5834767291857403E-77	0.0
7	LWRK vs .—(1) Optimizer—model—RAdam-model-5	3.922097885773615E-75	2.1571538371754883E-73	1.9218279640290716E-73	1.7649440485981268E-73	0.0
8	LWRK vs .—(1) Optimizer—model—Adam-model-1	1.8019120126692287E-73	9.910516069680758E-72	8.649177660812298E-72	8.10860405701153E-72	0.0
9	LWRK vs .—(1) Optimizer—model—AdaMax-model-3	6.884476155242451E-73	3.786461885383348E-71	3.235703792963952E-71	3.098014269859103E-71	0.0
10	SPT vs .—(1) Optimizer—model—AdamW-model-2	5.761735963550946E-70	3.168954632995302E-68	2.6503984203233435E-68	2.592781063359792 5E-68	0.0
11	SPT vs .—(1) Optimizer—model—SQD-model-0	4.905560324580388E-68	2.6980581785192136E-66	2.2075021460611745E-66	2.2075021460611745E-66	0.0
12	MS vs .—(1) Optimizer—model—RMSProp-model-4	2.0184699852550628E-53	1.1101584918902845E-51	8.881267935122276E-52	7.468338945443733E-52	0.0
13	LWRK vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	2.3618375431499166E-52	1.2990106487324542E-50	1.0155901435544641E-50	8.738798909654691E-51	0.0
14	LWRK vs .—(1) Optimizer—model—AdamW-model-2	4.1360541628806936E-45	2.2748297895843817E-43	1.7371427484098914E-43	1.5303400402658566E-43	0.0
15	WINQ vs .—(1) Optimizer—model—RMSProp-model-4	1.660517848961813E-44	9.132848169289971E-43	6.8081231807434335E-43	6.143916041158708E-43	0.0
16	LWRK vs .—(1) Optimizer—model—SQD-model-0	1.4291213512972886E-43	7.860167432135088E-42	5.716485405189155E-42	5.287748999799968E-42	0.0
17	SPT vs .WINQ	5.520936166111044E-35	3.0365148913610744E-33	2.153165104783307E-33	2.0427463814610864E-33	0.0
18	MS vs .—(1) Optimizer—model—RAdam-model-5	4.781872612533453E-28	2.6300299368933986E-26	1.817111592762712E-26	1.7692928666373775E-26	0.0
19	MS vs .SPT	6.719402902085199E-28	3.6956715961468594E-26	2.4861790737715237E-26	2.4861790737715237E-26	0.0
20	MS vs .—(1) Optimizer—model—Adam-model-1	4.7438958912498445E-27	2.6091427401874144E-25	1.707802520849944E-25	1.707802520849944E-25	0.0
21	MS vs .—(1) Optimizer—model—AdaMax-model-3	1.0552387906648602E-26	5.803813348656731E-25	3.6933357673270106E-25	3.2712402510610665E-25	0.0
22	WINQ vs .—(1) Optimizer—model—RAdam-model-5	8.909196491084633E-22	4.900058070096548E-20	3.0291268069687755E-20	2.7618509122362366E-20	0.0
23	WINQ vs .—(1) Optimizer—model—Adam-model-1	6.624131197974802E-21	3.643272158886141E-19	2.1859632953316845E-19	2.0534806713721886E-19	0.0
24	WINQ vs .—(1) Optimizer—model—AdaMax-model-3	1.3309164328135747E-20	7.320040380474661E-19	4.258932585003439E-19	4.125840941722082E-19	0.0
25	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—RMSProp-model-4	5.306486624309031E-19	2.9185676433699674E-17	1.6450108535357998E-17	1.6450108535357998E-17	0.0
26	LWRK vs .WINQ	2.0996696874033755E-18	1.1548183280718566E-16	6.299009062210127E-17	6.089042093469789E-17	0.0
27	—(1) Optimizer—model—AdamW-model-2 vs .—(1) Optimizer—model—RMSProp-model-4	5.001733003789809E-18	2.750953152084395E-16	1.4505025710990445E-16	1.450502571099044 5E-16	0.0
28	MS vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	3.6749022759484524E-15	2.0211962517716 49E-13	1.0289726372655666E-13	1.0289726372655666E-13	0.0
29	—(1) Optimizer—model—RMSProp-model-4 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	5.440456770273330 4E-14	2.992251223650332E-12	1.4689233279737992E-12	1.4689233279737992E-12	0.0
30	LWRK vs .MS	1.827138520085174E-13	1.0049261860468458E-11	4.7505601522214525E-12	4.567846300212935E-12	0.0
31	MS vs .—(1) Optimizer—model—AdamW-model-2	1.6608062571044065E-11	9.134434414074236E-10	4.1520156427610164E-10	4.1520156427610164E-10	0.0
32	MS vs .—(1) Optimizer—model—SQD-model-0	9.125750694043495E-11	5.019192881723922 4E-9	2.190180166570439E-9	2.190180166570439E-9	0.0
33	WINQ vs .—(1) Optimizer—model—RAdam-model-6	9.505561384018154E-11	5.228058761209985E-9	2.190180166570439E-9	2.190180166570439E-9	0.0
34	WINQ vs .—(1) Optimizer—model—AdamW-model-2	9.184010369011194E-8	5.051205702956157E-6	2.0204822811824627E-6	2.0204822811824627E-6	0.0
35	WINQ vs .—(1) Optimizer—model—SQD-model-0	3.5837870498571105E-7	1.971082877421411E-5	7.525952804699932E-6	7.525952804699932E-6	0.0
36	—(1) Optimizer—model—AdaMax-model-3 vs .—(1) Optimizer—model—RMSProp-model-4	2.7349118489542106E-6	1.504201516924816E-4	5.469823697908421 4E-5	5.469823697908421 4E-5	0.0
37	—(1) Optimizer—model—Adam-model-1 vs .—(1) Optimizer—model—RMSProp-model-4	3.913371290079433E-6	2.1523542095436884E-4	7.435405451150924E-5	7.435405451150924E-5	0.0
38	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—RAdam-model-5	6.827578584784996E-6	3.755168221631748E-4	1.2289641452612994E-4	1.2289641452612994E-4	0.0
39	—(1) Optimizer—model—RMSProp-model-4 vs .—(1) Optimizer—model—RAdam-model-5	1.0496932296232262E-5	5.773312762927744E-4	1.7844784903594846E-4	1.7844784903594846E-4	0.0
40	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—Adam-model-1	1.788836517788781E-5	9.838600847838295E-4	2.8621384284620494E-4	2.8621384284620494E-4	0.0
41	—(1) Optimizer—model—AdamW-model-2 vs .—(1) Optimizer—model—RAdam-model-5	2.169842932064951E-5	0.0011934136126357231	3.2547643980974266E-4	3.2547643980974266E-4	0.0
42	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—AdaMax-model-3	2.4880211276810773E-5	0.0013684116202245925	3.4832295787535085E-4	3.4832295787535085E-4	0.0
43	—(1) Optimizer—model—Adam-model-1 vs .—(1) Optimizer—model—AdamW-model-2	5.404666279268763E-5	0.0029725664535978197	7.026066163049392E-4	7.026066163049392E-4	0.0
44	—(1) Optimizer—model—AdamW-model-2 vs .—(1) Optimizer—model—AdaMax-model-3	7.384462357247929E-5	0.004061454296486361	8.861354828697515E-4	8.861354828697515E-4	0.0
45	LWRK vs .SPT	3.3307487452882706E-4	0.018319118099085 49	0.0036638236198170975	0.0036638236198170975	0.0
46	—(1) Optimizer—model—RAdam-model-5 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	0.001844352148584291	0.101439368172136	0.01844352148584291	0.01844352148584291	0.0
47	—(1) Optimizer—model—Adam-model-1 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	0.003673009910232057	0.20201554506276312	0.03305708919208851	0.03305708919208851	0.0
48	—(1) Optimizer—model—AdaMax-model-3 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	0.004638759277235854	0.25513176024797196	0.03711007421788683	0.03711007421788683	0.0
49	MS vs .WINQ	0.16424548756439603	9.033501816041781	1.1497184129507723	1.1497184129507723	0.0
50	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	0.16611997044959864	9.136593874727924	1.1497184129507723	1.1497184129507723	0.0
51	—(1) Optimizer—model—AdamW-model-2 vs .—(1) Optimizer—model—Adam (Non-stationary)-model-6	0.25744877460183146	14.15968260310073	1.2872438730091573	1.2872438730091573	0.0
52	—(1) Optimizer—model—AdaMax-model-3 vs .—(1) Optimizer—model—RAdam-model-5	0.7770921871318933	42.74007029225413	3.1083687485275733	3.1083687485275733	0.0
53	—(1) Optimizer—model—SQD-model-0 vs .—(1) Optimizer—model—AdamW-model-2	0.8007801612365236	44.0429088680088	3.1083687485275733	3.1083687485275733	0.0
54	—(1) Optimizer—model—Adam-model-1 vs .—(1) Optimizer—model—RAdam-model-5	0.8342487615036542	45.883681882700984	3.1083687485275733	3.1083687485275733	0.0
55	—(1) Optimizer—model—Adam-model-1 vs .—(1) Optimizer—model—AdaMax-model-3	0.9411258466850714	51.761921567678925	3.1083687485275733	3.1083687485275733	0.0