

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	3.39
MS	4.91
SPT	2.15
WINQ	5.27
—(3) AS—model—AS-model-0	2.68
—(3) AS—model—AS more rules-model-1	2.60

Friedman statistic considering reduction performance (distributed according to chi-square with 5 degrees of freedom: 721.2509523809197.
P-value computed by Friedman Test: 2.3786450586982255E-10.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 5 and 1495 degrees of freedom: 276.9236577832461.
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
5	WINQ	20.381550948041596	2.4380647681055544E-92	0.01
4	MS	18.046619522516483	8.386947965104725E-73	0.0125
3	LWRK	8.084972833243505	6.217805505351816E-16	0.016666666666666666
2	—(3) AS—model—AS-model-0	3.447842665728637	5.650831025027736E-4	0.025
1	—(3) AS—model—AS more rules-model-1	2.935030623674126	0.0033351477078036942	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.01 .
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
5	WINQ	20.381550948041596	2.4380647681055544E-92	0.02
4	MS	18.046619522516483	8.386947965104725E-73	0.025
3	LWRK	8.084972833243505	6.217805505351816E-16	0.033333333333333333
2	—(3) AS—model—AS-model-0	3.447842665728637	5.650831025027736E-4	0.05
1	—(3) AS—model—AS more rules-model-1	2.935030623674126	0.0033351477078036942	0.1

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value ≤ 0.02 .
Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.1 .

Table 4: Adjusted p -values

i	algorithm	unadjusted p	P_{Bonf}	P_{Holm}	P_{Hoch}	P_{Homm}
1	WINQ	2.4380647681055544E-92	1.2190323840527772E-91	1.2190323840527772E-91	1.2190323840527772E-91	1.2190323840527772E-91
2	MS	8.386947965104725E-73	4.1934739825523623E-72	3.35477918604189E-72	3.35477918604189E-72	3.35477918604189E-72
3	LWRK	6.217805505351816E-16	3.108902752675908E-15	1.8653416516055447E-15	1.8653416516055447E-15	1.8653416516055447E-15
4	—(3) AS—model—AS-model-0	5.650831025027736E-4	0.002825415512513868	0.0011301662050055472	0.0011301662050055472	0.0011301662050055472
5	—(3) AS—model—AS more rules-model-1	0.0033351477078036942	0.01667573853901847	0.0033351477078036942	0.0033351477078036942	0.0033351477078036942

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
15	SPT vs. WINQ	20.381550948041596	2.4380647681055544E-92	0.0033333333333333335	0.0033333333333333335
14	MS vs. SPT	18.046619522516483	8.386947965104725E-73	0.0035714285714285718	0.005
13	WINQ vs. —(3) AS—model—AS more rules-model-1	17.44652032436747	3.658525646082898E-68	0.0038461538461538464	0.005
12	WINQ vs. —(3) AS—model—AS-model-0	16.93370828231296	2.5387017706360366E-64	0.004166666666666667	0.005
11	MS vs. —(3) AS—model—AS more rules-model-1	15.111588898842358	1.3582469042495956E-51	0.004545454545454546	0.005
10	MS vs. —(3) AS—model—AS-model-0	14.598776856787847	2.8592924926366497E-48	0.005	0.005
9	LWRK vs. WINQ	12.29657811479809	9.449309303242612E-35	0.005555555555555556	0.0071428571428571435
8	LWRK vs. MS	9.961646689272978	2.2431608137424718E-23	0.00625	0.0071428571428571435
7	LWRK vs. SPT	8.08497283243505	6.217805505351816E-16	0.0071428571428571435	0.0071428571428571435
6	LWRK vs. —(3) AS—model—AS more rules-model-1	5.149942209569379	2.60566732719091E-7	0.008333333333333333	0.008333333333333333
5	LWRK vs. —(3) AS—model—AS-model-0	4.637130167514869	3.532799469025868E-6	0.01	0.0125
4	SPT vs. —(3) AS—model—AS-model-0	3.447842665728637	5.650831025027736E-4	0.0125	0.0125
3	SPT vs. —(3) AS—model—AS more rules-model-1	2.935030623674126	0.0033351477078036942	0.016666666666666666	0.016666666666666666
2	MS vs. WINQ	2.3349314255251112	0.01954700336517042	0.025	0.025
1	—(3) AS—model—AS-model-0 vs. —(3) AS—model—AS more rules-model-1	0.5128120420545111	0.6080828054059082	0.05	0.05

Hommel's procedure rejects all hypotheses.

Nemenyi's procedure rejects those hypotheses that have a p -value $\leq 0.003333333333333335$.

Holm's procedure rejects those hypotheses that have a p -value ≤ 0.05 .

Shaffer's procedure rejects those hypotheses that have a p -value $\leq 0.003333333333333335$.

Bergmann's procedure rejects these hypotheses:

- LWRK vs. MS
- LWRK vs. SPT
- LWRK vs. WINQ
- LWRK vs. —(3) AS—model—AS-model-0
- LWRK vs. —(3) AS—model—AS more rules-model-1
- MS vs. SPT
- MS vs. WINQ
- MS vs. —(3) AS—model—AS-model-0
- MS vs. —(3) AS—model—AS more rules-model-1
- SPT vs. WINQ
- SPT vs. —(3) AS—model—AS-model-0
- SPT vs. —(3) AS—model—AS more rules-model-1
- WINQ vs. —(3) AS—model—AS-model-0
- WINQ vs. —(3) AS—model—AS more rules-model-1

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
15	SPT vs. WINQ	20.381550948041596	2.4380647681055544E-92	0.006666666666666667	0.006666666666666667
14	MS vs. SPT	18.046619522516483	8.386947965104725E-73	0.0071428571428571435	0.01
13	WINQ vs. —(3) AS—model—AS more rules-model-1	17.44652032436747	3.658525646082898E-68	0.007692307692307693	0.01
12	WINQ vs. —(3) AS—model—AS-model-0	16.93370828231296	2.5387017706360366E-64	0.008333333333333333	0.01
11	MS vs. —(3) AS—model—AS more rules-model-1	15.111588898842358	1.3582469042495956E-51	0.009090909090909092	0.01
10	MS vs. —(3) AS—model—AS-model-0	14.598776856787847	2.8592924926366497E-48	0.01	0.01
9	LWRK vs. WINQ	12.29657811479809	9.449309303242612E-35	0.011111111111111112	0.014285714285714287
8	LWRK vs. MS	9.961646689272978	2.2431608137424718E-23	0.0125	0.014285714285714287
7	LWRK vs. SPT	8.084972833243505	6.217805505351816E-16	0.014285714285714287	0.014285714285714287
6	LWRK vs. —(3) AS—model—AS more rules-model-1	5.149942209569379	2.60566732719091E-7	0.016666666666666666	0.016666666666666666
5	LWRK vs. —(3) AS—model—AS-model-0	4.637130167514869	3.532799469025868E-6	0.02	0.025
4	SPT vs. —(3) AS—model—AS-model-0	3.447842665728637	5.650831025027736E-4	0.025	0.025
3	SPT vs. —(3) AS—model—AS more rules-model-1	2.935030623674126	0.0033351477078036942	0.03333333333333333	0.03333333333333333
2	MS vs. WINQ	2.3349314255251112	0.01954700336517042	0.05	0.05
1	—(3) AS—model—AS-model-0 vs. —(3) AS—model—AS more rules-model-1	0.5128120420545111	0.6080828054059082	0.1	0.1

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

Holm's procedure rejects those hypotheses that have a p-value ≤ 0.1 .

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

Bergmann's procedure rejects these hypotheses:

- LWRK vs. MS
- LWRK vs. SPT
- LWRK vs. WINQ
- LWRK vs. —(3) AS—model—AS-model-0
- LWRK vs. —(3) AS—model—AS more rules-model-1
- MS vs. SPT
- MS vs. WINQ
- MS vs. —(3) AS—model—AS-model-0
- MS vs. —(3) AS—model—AS more rules-model-1
- SPT vs. WINQ
- SPT vs. —(3) AS—model—AS-model-0
- SPT vs. —(3) AS—model—AS more rules-model-1
- WINQ vs. —(3) AS—model—AS-model-0
- WINQ vs. —(3) AS—model—AS more rules-model-1

Table 7: Adjusted p -values						
i	hypothesis	unadjusted p	P_{Neme}	P_{Holm}	P_{Shaf}	P_{Berg}
1	SPT vs .WINQ	2.4380647681055544E-92	3.6570971521583314E-91	3.6570971521583314E-91	3.6570971521583314E-91	3.6570971521583314E-91
2	MS vs .SPT	8.386947965104725E-73	1.2580421947657087E-71	1.1741727151146616E-71	8.386947965104725E-72	8.386947965104725E-72
3	WINQ vs .—(3) AS—model—AS more rules-model-1	3.658525646082898E-68	5.487788469124347E-67	4.7560833399077674E-67	3.658525646082898E-67	3.658525646082898E-67
4	WINQ vs .—(3) AS—model—AS-model-0	2.5387017706360366E-64	3.808052655954055E-63	3.046442124763244E-63	2.5387017706360364E-63	1.7770912394452256E-63
5	MS vs .—(3) AS—model—AS more rules-model-1	1.3582469042495956E-51	2.0373703563743935E-50	1.494071594674555E-50	1.3582469042495956E-50	8.149481425497574E-51
6	MS vs .—(3) AS—model—AS-model-0	2.8592924926366497E-48	4.2889387389549744E-47	2.85929249263665E-47	2.85929249263665E-47	1.1437169970546599E-47
7	LWRK vs .WINQ	9.449309303242612E-35	1.4173963954863919E-33	8.504378372918351E-34	6.614516512269828E-34	5.669585581945567E-34
8	LWRK vs .MS	2.2431608137424718E-23	3.3647412206137076E-22	1.7945286509939775E-22	1.5702125696197304E-22	8.972643254969887E-23
9	LWRK vs .SPT	6.217805505351816E-16	9.326708258027724E-15	4.352463853746271E-15	4.352463853746271E-15	4.352463853746271E-15
10	LWRK vs .—(3) AS—model—AS more rules-model-1	2.60566732719091E-7	3.908500990786365E-6	1.563400396314546E-6	1.563400396314546E-6	1.042266930876364E-6
11	LWRK vs .—(3) AS—model—AS-model-0	3.532799469025868E-6	5.299199203538802E-5	1.766399734512934E-5	1.4131197876103472E-5	1.0598398407077603E-5
12	SPT vs .—(3) AS—model—AS-model-0	5.650831025027736E-4	0.008476246537541605	0.0022603324100110944	0.0022603324100110944	0.0022603324100110944
13	SPT vs .—(3) AS—model—AS more rules-model-1	0.0033351477078036942	0.050027215617055414	0.010005443123411083	0.010005443123411083	0.0066702954156073885
14	MS vs .WINQ	0.01954700336517042	0.2932050504775563	0.03909400673034084	0.03909400673034084	0.03909400673034084
15	—(3) AS—model—AS-model-0 vs .—(3) AS—model—AS more rules-model-1	0.6080828054059082	9.121242081088623	0.6080828054059082	0.6080828054059082	0.6080828054059082