

May 9, 2011

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

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Table 1: Average Rankings of the algorithms (Friedman)

Algorithm	Ranking
C45Rules $_G M_t st$	3.690476190476189
OCEC $_G M_t st$	3.5714285714285725
Ripper $_G M_t st$	6.238095238095242
Gassist $_G M_t st$	3.9285714285714284
REGAL $_G M_t st$	6.547619047619051
UCS $_G M_t st$	4.499999999999999
REGALTC $_G M_t st$	5.333333333333335
SIA $_G M_t st$	7.690476190476193
Oblique-DT $_G M_t st$	3.4999999999999996

Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 104.61587301587389. P-value computed by Friedman

Test: 4.784117546563493E-11.

Iman and Davenport statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 18.53735971242785. P-value computed by Iman and Davenport Test: 6.465031182739135E-23.

Table 2: Average Rankings of the algorithms (Aligned Friedman)

Algorithm	Ranking
C45Rules $_G M_t st$	131.6428571428571
OCEC $_G M_t st$	130.23809523809527
Ripper $_G M_t st$	257.71428571428567
GAssist $_G M_t st$	140.19047619047615
REGAL $_G M_t st$	270.45238095238085
UCS $_G M_t st$	144.09523809523807
REGALTC $_G M_t st$	197.35714285714286
SIA $_G M_t st$	306.97619047619054
Oblique-DT $_G M_t st$	126.83333333333333

Aligned Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 37.10961615555757. P-value computed by

Aligned Friedman Test: 1.0986766283416216E-5.

Table 3: Average Rankings of the algorithms (Quade)

Algorithm	Ranking
C45Rules $_G M_{t,st}$	3.15060908084164
OCEC $_G M_{t,st}$	3.3532668881506087
Ripper $_G M_{t,st}$	6.569213732004427
GAssist $_G M_{t,st}$	3.416389811738649
REGAL $_G M_{t,st}$	6.743078626799557
UCS $_G M_{t,st}$	4.650055370985603
REGALTC $_G M_{t,st}$	5.626799557032113
SIA $_G M_{t,st}$	8.20376522702104
Oblique-DT $_G M_{t,st}$	3.2868217054263567

Quade statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 22.299309240612942. P-value computed by Quade Test: 4.0230111534208774E-27.

Table 4: Contrast Estimation

	C45Rules $M_{f, st}$	OCEC $M_{f, st}$	Ripper $M_{f, st}$	GAssist $M_{f, st}$	REGAL $M_{f, st}$	UCS $M_{f, st}$	REGALTC $M_{f, st}$	SIA $M_{f, st}$	Oblique-DT $M_{f, st}$
C45Rules $M_{f, st}$	0.00000000	0.00212833	0.06604000	0.00273833	0.06528556	0.01070556	0.03059278	0.11752167	0.00217778
OCEC $M_{f, st}$	-0.00212833	0.00000000	0.06391167	0.00061000	0.06315722	0.00857722	0.02846444	0.11539333	0.00004944
Ripper $M_{f, st}$	-0.06604000	-0.06391167	0.00000000	-0.06330167	-0.00075444	-0.00553344	-0.03544722	0.05148167	-0.06386222
GAssist $M_{f, st}$	-0.00273833	-0.00061000	0.06330167	0.00000000	0.06254722	0.00796722	0.02785444	0.11478333	-0.00056056
REGAL $M_{f, st}$	-0.06528556	-0.06315722	0.00075444	-0.06254722	0.00000000	-0.05458000	-0.03469278	0.05223611	-0.06310778
UCS $M_{f, st}$	-0.01070556	-0.00857722	0.00553344	-0.00796722	0.05458000	0.00000000	0.01988722	0.10681611	-0.00852778
REGALTC $M_{f, st}$	-0.03059278	-0.02846444	0.03544722	-0.02785444	0.03469278	-0.01988722	0.00000000	0.08692889	-0.02841500
SIA $M_{f, st}$	-0.11752167	-0.11539333	-0.05148167	-0.11478333	-0.05223611	-0.10681611	-0.02841500	0.00000000	-0.11534389
Oblique-DT $M_{f, st}$	-0.00217778	-0.00004944	0.06386222	0.00056056	0.06310778	0.00852778	0.02841500	0.11534389	0.00000000

Table 5: Holm / Hochberg / Holland / Rom / Finner / Li Table for  $\alpha = 0.05$  (FRIEDMAN)

$i$	algorithm	$z = (R_0 - R_i) / SE$	$p$	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	SIA $_G M_t st$	7.012007841428448	2.349220346205159E-12	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.0050073089762
7	REGAL $_G M_t st$	5.09964206649342	3.402963750831781E-7	0.0071428871428871435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.0050073089762
6	Ripper $_G M_t st$	4.581709669115183	4.611898889595084E-6	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.0050073089762
5	REGAL $_{TC} M_t st$	3.067753430624947	0.002156744943439877	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.0050073089762
4	UCS $_G M_t st$	1.6733200530681505	0.09426430684121039	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.0050073089762
3	GAssist $_G M_t st$	0.7171371656006367	0.47328946538008976	0.016666666666666666	0.016952427598441503	0.016666666666666666	0.03773939976903784	0.0050073089762
2	C45Rules $_G M_t st$	0.31872762915583647	0.7499330614600799	0.025	0.025320565519103666	0.025	0.04388935252272508	0.0050073089762
1	OCEC $_G M_t st$	0.11952286093344192	0.904861129450446	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value  $\leq 0.00625$ .

Holm's procedure rejects those hypotheses that have a p-value  $\leq 0.0125$ .

Hochberg's procedure rejects those hypotheses that have a p-value  $\leq 0.01$ .

Hommel's procedure rejects those hypotheses that have a p-value  $\leq 0.0125$ .

Holland's procedure rejects those hypotheses that have a p-value  $\leq 0.012741455098566168$ .

Rom's procedure rejects those hypotheses that have a p-value  $\leq 0.010515350115740741$ .

Finner's procedure rejects those hypotheses that have a p-value  $\leq 0.031549888917161595$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.00500730897629232$ .

Table 6: Holm / Hochberg / Holland / Rom / Finner / Li Table for  $\alpha = 0.05$  (ALIGNED FRIEDMAN)

$i$	algorithm	$z = (R_0 - R_i)/SE$	$p$	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	SIA $_G M_t st$	7.555301711848821	4.1789000665173405E-14	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.005976322333
7	REGAL $_G M_t st$	6.023470780580497	1.7071594135312996E-9	0.0071428571428571435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.005976322333
6	Ripper $_G M_t st$	5.489227268045591	4.036959250465756E-8	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.005976322333
5	REGAL $_{TC} M_t st$	2.9578117460343907	0.003098312790497508	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.005976322333
4	UCS $_G M_t st$	0.7239748534351557	0.46908117336650434	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.005976322333
3	GAssist $_G M_t st$	0.5602067486580987	0.5753384243441271	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.005976322333
2	C45Rules $_G M_t st$	0.20171437295710445	0.8401400255736173	0.025	0.025320565519103666	0.025	0.04388935252272508	0.005976322333
1	OCEC $_G M_t st$	0.1427977986775565	0.8864498756658472	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value  $\leq 0.00625$ .

Holm's procedure rejects those hypotheses that have a p-value  $\leq 0.0125$ .

Hochberg's procedure rejects those hypotheses that have a p-value  $\leq 0.01$ .

Hommel's procedure rejects those hypotheses that have a p-value  $\leq 0.0125$ .

Holland's procedure rejects those hypotheses that have a p-value  $\leq 0.012741455098566168$ .

Rom's procedure rejects those hypotheses that have a p-value  $\leq 0.010515350115740741$ .

Finner's procedure rejects those hypotheses that have a p-value  $\leq 0.031549888917161595$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.005976322333376464$ .

Table 7: Holm / Hochberg / Holland / Rom / Finner / Li Table for  $\alpha = 0.05$  (QUADE)

$i$	algorithm	$z = (R_0 - R_i) / SE$	$p$	Holm/Hochberg/Hommel	Holland	Rom	Finner	Li
8	SIA <sub>G</sub> $M_t.st$	3.682833906830972	2.3065545062633062E-4	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.0041620792777
7	REGAL <sub>G</sub> $M_t.st$	2.618258425106218	0.008837984485351417	0.0071428571428571435	0.0073008331979014655	0.0075128293213784685	0.012741455098566168	0.0041620792777
6	Ripper <sub>G</sub> $M_t.st$	2.491542465568092	0.012718976172764938	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.0041620792777
5	REGAL <sub>T<sub>G</sub></sub> $M_t.st$	1.8046935383901044	0.07112265152484006	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.0041620792777
4	UCS <sub>G</sub> $M_t.st$	1.0928242625135072	0.2744709667178961	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.0041620792777
3	GAssist <sub>G</sub> $M_t.st$	0.19370592540859752	0.8464061519198018	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.0041620792777
2	OCEC <sub>G</sub> $M_t.st$	0.14770076812405522	0.88257892541115	0.025	0.025320565519103666	0.025	0.04388935252272508	0.0041620792777
1	Oblique-DT <sub>G</sub> $M_t.st$	0.09927428677190601	0.9209204937310226	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value  $\leq 0.00625$ .

Holm's procedure rejects those hypotheses that have a p-value  $\leq 0.0071428571428571435$ .

Hochberg's procedure rejects those hypotheses that have a p-value  $\leq 0.00625$ .

Hommel's procedure rejects those hypotheses that have a p-value  $\leq 0.008333333333333333$ .

Holland's procedure rejects those hypotheses that have a p-value  $\leq 0.0073008331979014655$ .

Rom's procedure rejects those hypotheses that have a p-value  $\leq 0.006574125233361166$ .

Finner's procedure rejects those hypotheses that have a p-value  $\leq 0.025320565519103666$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.004162079277314601$ .



Table 8: Adjusted  $p$ -values (FRIEDMAN)

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Homn}$
1	SIA $_G M_t st$	2.349220346205159E-12	1.879376276964127E-11	1.879376276964127E-11	1.879376276964127E-11	1.879376276964127E-11
2	REGAL $_G M_t st$	3.402963750831781E-7	2.7223710006654247E-6	2.3820746255822464E-6	2.3820746255822464E-6	2.3820746255822464E-6
3	Ripper $_G M_t st$	4.611898889595084E-6	3.6895191116760674E-5	2.7671393337570505E-5	2.7671393337570505E-5	2.7671393337570505E-5
4	REGALTC $_G M_t st$	0.002156744943439877	0.017253959547519016	0.010783724717199385	0.010783724717199385	0.010783724717199385
5	UCS $_G M_t st$	0.09426430684121039	0.7541144547296831	0.37705722736484154	0.37705722736484154	0.37705722736484154
6	GAssist $_G M_t st$	0.47328946538008976	3.786315723040718	1.4198683961402692	0.904861129450446	0.904861129450446
7	C45Rules $_G M_t st$	0.7499330614600799	5.999464491680639	1.4998661229201598	0.904861129450446	0.904861129450446
8	OCEC $_G M_t st$	0.904861129450446	7.2388889035603568	1.4998661229201598	0.904861129450446	0.904861129450446

Table 9: Adjusted  $p$ -values (FRIEDMAN)

$i$	algorithm	unadjusted $p$	$p_{Hol}$	$p_{Rom}$	$p_{Finn}$	$p_{Li}$
1	SIA $_G M_t st$	2.349220346205159E-12	1.879385536085465E-11	1.786717063346897E-11	1.879385536085465E-11	2.4692539785024406E-11
2	REGAL $_G M_t st$	3.402963750831781E-7	2.382072193718443E-6	2.2647684415965133E-6	1.361184805372633E-6	3.5768257068503826E-6
3	Ripper $_G M_t st$	4.611898889595084E-6	2.7671074295132492E-5	2.6311121221247185E-5	1.2298349773121053E-5	4.8473093173714514E-5
4	REGALTC $_G M_t st$	0.002156744943439877	0.010737309443593412	0.010255221745833175	0.004308838338128673	0.02216692841205347
5	UCS $_G M_t st$	0.09426430684121039	0.327014153233427	0.359530133633769	0.146502266126196	0.4976912644222982
6	GAssist $_G M_t st$	0.47328946538008976	0.8538778633435791	0.904861129450446	0.5746340983308356	0.8326282056401041
7	C45Rules $_G M_t st$	0.7499330614600799	0.9374665262492718	0.904861129450446	0.7948534031682563	0.8874192042761284
8	OCEC $_G M_t st$	0.904861129450446	0.9374665262492718	0.904861129450446	0.904861129450446	0.904861129450446

Table 10: Adjusted  $p$ -values (ALIGNED FRIEDMAN)

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Hommel}$
1	SIA $_G M_t st$	4.1789000665173405E-14	3.3431200532138724E-13	3.3431200532138724E-13	3.3431200532138724E-13	3.3431200532138724E-13
2	REGAL $_G M_t st$	1.7071594135312996E-9	1.3657275308250397E-8	1.1950115894719097E-8	1.1950115894719097E-8	1.1950115894719097E-8
3	Ripper $_G M_t st$	4.036959250465756E-8	3.2295674003726046E-7	2.4221755502794534E-7	2.4221755502794534E-7	2.4221755502794534E-7
4	REGALTC $_G M_t st$	0.003098312790497508	0.024786502323980063	0.01549156395248754	0.01549156395248754	0.01549156395248754
5	UCS $_G M_t st$	0.46908117336650434	3.7526493869320348	1.8763246934660174	0.8864498756658472	0.8864498756658472
6	GAssist $_G M_t st$	0.5753384243441271	4.602707394753017	1.8763246934660174	0.8864498756658472	0.8864498756658472
7	C45Rules $_G M_t st$	0.8401400255736173	6.721120204588939	1.8763246934660174	0.8864498756658472	0.8864498756658472
8	OCEC $_G M_t st$	0.8864498756658472	7.091599005326778	1.8763246934660174	0.8864498756658472	0.8864498756658472

Table 11: Adjusted  $p$ -values (ALIGNED FRIEDMAN)

$i$	algorithm	unadjusted $p$	$p_{Holl}$	$p_{Rom}$	$p_{Finn}$	$p_{Li}$
1	SIA $_G M_t st$	4.1789000665173405E-14	3.339550858072471E-13	3.1782936270448765E-13	3.339550858072471E-13	3.6802250028526867E-13
2	REGAL $_G M_t st$	1.7071594135312996E-9	1.195011578580818E-8	1.1361627826905475E-8	6.82863765531704E-9	1.503441231681413E-8
3	Ripper $_G M_t st$	4.036959250465756E-8	2.4221753092135145E-7	2.3031060902890983E-7	1.07652243230838E-7	3.5552209554237666E-7
4	REGALTC $_G M_t st$	0.003098312790497508	0.015395865494381766	0.01473233000779266	0.006187026038847354	0.026561117035684374
5	UCS $_G M_t st$	0.46908117336650434	0.9205465968578059	0.8864498756658472	0.6368843212580532	0.8051080936052077
6	GAssist $_G M_t st$	0.5753384243441271	0.9234176127031621	0.8864498756658472	0.6808041111787065	0.8351690929512283
7	C45Rules $_G M_t st$	0.8401400255736173	0.9744447885763963	0.8864498756658472	0.876976444805275	0.8809360416010021
8	OCEC $_G M_t st$	0.8864498756658472	0.9744447885763963	0.8864498756658472	0.8864498756658472	0.8864498756658472

Table 12: Adjusted  $p$ -values (QUADE)

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Hommel}$
1	SIA $_G M_{t,st}$	2.3065545062633062E-4	0.001845243605010645	0.001845243605010645	0.001845243605010645	0.001845243605010645
2	REGAL $_G M_{t,st}$	0.008837984485351417	0.07070387588281134	0.06186589139745992	0.06186589139745992	0.0530279069121085
3	Ripper $_G M_{t,st}$	0.012718976172764938	0.1017518093821195	0.07631385703658963	0.07631385703658963	0.07631385703658963
4	REGALTC $_G M_{t,st}$	0.07112265152484006	0.5689812121987204	0.35561325762420026	0.35561325762420026	0.35561325762420026
5	UCS $_G M_{t,st}$	0.2744709667178961	2.195767733743169	1.0978838668715845	0.9209204937310226	0.9209204937310226
6	GAssist $_G M_{t,st}$	0.8464061519198018	6.771249215358415	2.5392184557594053	0.9209204937310226	0.9209204937310226
7	OCEC $_G M_{t,st}$	0.88257892541115	7.0606314032892	2.5392184557594053	0.9209204937310226	0.9209204937310226
8	Oblique-DT $_G M_{t,st}$	0.9209204937310226	7.367363949848181	2.5392184557594053	0.9209204937310226	0.9209204937310226

Table 13: Adjusted  $p$ -values (QUADE)

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Hommel}$
1	SIA $_G M_{t,st}$	2.3065545062633062E-4	0.0018437546377726433	0.001754267240421909	0.0018437546377726433	0.0029082710919415187
2	REGAL $_G M_{t,st}$	0.008837984485351417	0.06024953133513533	0.05881928170657421	0.034886033360462254	0.10052589546769172
3	Ripper $_G M_{t,st}$	0.012718976172764938	0.07392803272638326	0.07256241559128251	0.034886033360462254	0.13855322914337648
4	REGALTC $_G M_{t,st}$	0.07112265152484006	0.3085005138939103	0.33818489513903316	0.1371868714897564	0.47351284808085226
5	UCS $_G M_{t,st}$	0.2744709667178961	0.7229110642411011	0.9209204937310226	0.40152271184064814	0.7763275336590668
6	GAssist $_G M_{t,st}$	0.8464061519198018	0.9963765567525542	0.9209204937310226	0.917744471915589	0.9145535043473932
7	OCEC $_G M_{t,st}$	0.88257892541115	0.9963765567525542	0.9209204937310226	0.917744471915589	0.9177675735335503
8	Oblique-DT $_G M_{t,st}$	0.9209204937310226	0.9963765567525542	0.9209204937310226	0.9209204937310226	0.9209204937310227