

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 $_G M_t st$	6.6904761904761925
OCEC $_G M_t st$	4.57142857142857
Ripper $_G M_t st$	4.904761904761904
Gassist $_G M_t st$	6.095238095238096
REGAL $_G M_t st$	7.047619047619049
UCS $_G M_t st$	3.3571428571428563
REGALTC $_G M_t st$	6.476190476190477
SIA $_G M_t st$	4.142857142857143
Oblique-DT $_G M_t st$	1.7142857142857144

Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 139.1682539682543. P-value computed by Friedman

Test: 6.61628529741165E-11.

Iman and Davenport statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 28.988710041611682. P-value computed by Iman and Davenport Test: 4.538748921245879E-34.

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

Algorithm	Ranking
C45Rules <sub>G</sub> M <sub>t</sub> st	270.0238095238095
OCEC <sub>G</sub> M <sub>t</sub> st	171.99999999999997
Ripper <sub>G</sub> M <sub>t</sub> st	178.16666666666666
GAssist <sub>G</sub> M <sub>t</sub> st	242.42857142857142
REGAL <sub>G</sub> M <sub>t</sub> st	269.0238095238095
UCS <sub>G</sub> M <sub>t</sub> st	116.45238095238095
REGALTC <sub>G</sub> M <sub>t</sub> st	249.4047619047619
SIA <sub>G</sub> M <sub>t</sub> st	152.42857142857144
Oblique-DT <sub>G</sub> M <sub>t</sub> st	55.571428571428584

Aligned Friedman statistic (distributed according to chi-square with 8 degrees of freedom: 38.0134053290792. P-value computed by

Aligned Friedman Test: 7.485523837336139E-6.

Table 3: Average Rankings of the algorithms (Quade)

Algorithm	Ranking
C45Rules $_G M_{t,st}$	7.287929125138427
OCEC $_G M_{t,st}$	4.172757475083056
Ripper $_G M_{t,st}$	5.161683277962348
GAssist $_G M_{t,st}$	6.347729789590256
REGAL $_G M_{t,st}$	6.713178294573645
UCS $_G M_{t,st}$	2.6600221483942414
REGALTC $_G M_{t,st}$	6.427464008859358
SIA $_G M_{t,st}$	4.452934662236987
Oblique-DT $_G M_{t,st}$	1.7763012181616828

Quade statistic (distributed according to F-distribution with 8 and 328 degrees of freedom: 23.619240248857107. P-value computed by Quade Test: 1.5200390000759654E-28.

Table 4: Contrast Estimation

C45Rules $G_{Mf, st}$	0.00000000	C45Rules $G_{Mf, st}$	0.00000000	OCBEG $Mf, st$	0.08317611	Ripper $G_{Mf, st}$	-0.058781278	GAssist $G_{Mf, st}$	-0.03713444	REGAL $G_{Mf, st}$	-0.00957111	UCS $G_{Mf, st}$	-0.13649111	REGALTCG $Mf, st$	-0.02928833	SIA $G_{Mf, st}$	-0.10789111	Oblique-DTG $Mf, st$	-0.19306000
OCBEG $Mf, st$	0.08317611	OCBEG $Mf, st$	-0.08317611	Ripper $G_{Mf, st}$	0.00000000	Ripper $G_{Mf, st}$	-0.00463667	GAssist $G_{Mf, st}$	0.04604167	REGAL $G_{Mf, st}$	0.07360500	UCS $G_{Mf, st}$	-0.05331500	REGALTCG $Mf, st$	0.05388778	SIA $G_{Mf, st}$	-0.02471500	Oblique-DTG $Mf, st$	-0.10988389
Ripper $G_{Mf, st}$	0.08781278	Ripper $G_{Mf, st}$	0.00463667	Ripper $G_{Mf, st}$	0.00000000	Ripper $G_{Mf, st}$	-0.05067833	GAssist $G_{Mf, st}$	0.05067833	REGAL $G_{Mf, st}$	0.07824167	UCS $G_{Mf, st}$	-0.04867833	REGALTCG $Mf, st$	0.05852444	SIA $G_{Mf, st}$	-0.02007833	Oblique-DTG $Mf, st$	-0.10524722
GAssist $G_{Mf, st}$	0.03713444	GAssist $G_{Mf, st}$	-0.04604167	Ripper $G_{Mf, st}$	-0.04604167	Ripper $G_{Mf, st}$	-0.05067833	GAssist $G_{Mf, st}$	0.00000000	REGAL $G_{Mf, st}$	0.02756333	UCS $G_{Mf, st}$	-0.09935667	REGALTCG $Mf, st$	0.00784611	SIA $G_{Mf, st}$	-0.07075667	Oblique-DTG $Mf, st$	-0.15592556
REGAL $G_{Mf, st}$	0.00957111	REGAL $G_{Mf, st}$	-0.07360500	Ripper $G_{Mf, st}$	-0.07824167	Ripper $G_{Mf, st}$	-0.07824167	GAssist $G_{Mf, st}$	-0.02756333	REGAL $G_{Mf, st}$	0.00000000	UCS $G_{Mf, st}$	-0.12692000	REGALTCG $Mf, st$	-0.01971722	SIA $G_{Mf, st}$	-0.09832000	Oblique-DTG $Mf, st$	-0.18348889
UCS $G_{Mf, st}$	0.13649111	UCS $G_{Mf, st}$	0.05331500	Ripper $G_{Mf, st}$	0.04867833	Ripper $G_{Mf, st}$	0.04867833	GAssist $G_{Mf, st}$	0.09935667	REGAL $G_{Mf, st}$	0.12692000	UCS $G_{Mf, st}$	0.00000000	REGALTCG $Mf, st$	0.10720278	SIA $G_{Mf, st}$	0.02860000	Oblique-DTG $Mf, st$	-0.05656889
REGALTCG $Mf, st$	0.02928833	REGALTCG $Mf, st$	-0.05388778	Ripper $G_{Mf, st}$	-0.058781278	Ripper $G_{Mf, st}$	-0.058781278	GAssist $G_{Mf, st}$	-0.00784611	REGAL $G_{Mf, st}$	0.01971722	UCS $G_{Mf, st}$	-0.10720278	REGALTCG $Mf, st$	0.00000000	SIA $G_{Mf, st}$	-0.07860278	Oblique-DTG $Mf, st$	-0.16377167
SIA $G_{Mf, st}$	0.10789111	SIA $G_{Mf, st}$	0.02471500	Ripper $G_{Mf, st}$	0.02007833	Ripper $G_{Mf, st}$	0.02007833	GAssist $G_{Mf, st}$	0.07075667	REGAL $G_{Mf, st}$	0.09832000	UCS $G_{Mf, st}$	-0.02860000	REGALTCG $Mf, st$	0.07860278	SIA $G_{Mf, st}$	0.00000000	Oblique-DTG $Mf, st$	-0.08516889
Oblique-DTG $Mf, st$	0.19306000	Oblique-DTG $Mf, st$	0.10988389	Ripper $G_{Mf, st}$	0.10524722	Ripper $G_{Mf, st}$	0.10524722	GAssist $G_{Mf, st}$	0.15592556	REGAL $G_{Mf, st}$	0.18348889	UCS $G_{Mf, st}$	0.05656889	REGALTCG $Mf, st$	0.16377167	SIA $G_{Mf, st}$	0.08516889	Oblique-DTG $Mf, st$	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	REGAL $_G M_t st$	8.924373616363475	4.482284806287803E-19	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.05231698588989898
7	C45Rules $_G M_t st$	8.326759311696279	8.308542729923667E-17	0.0071428871428871435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.05231698588989898
6	REGAL $_T CG M_t st$	7.9681907288959595	1.6101422946034682E-15	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.05231698588989898
5	GAssist $_G M_t st$	7.330735470584282	2.2889307173162826E-13	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.05231698588989898
4	Ripper $_G M_t st$	5.338687788360291	9.36217038023869E-8	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.05231698588989898
3	OCEC $_G M_t st$	4.7809144373375725	1.7449962509110769E-6	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.05231698588989898
2	SIA $_G M_t st$	4.06377271736939	4.828490292616826E-5	0.025	0.025320565519103666	0.025	0.04388935252272508	0.05231698588989898
1	UCS $_G M_t st$	2.749025801469104	0.005977268092463451	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

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

Hochberg's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

Hommel's procedure rejects all hypotheses.

Rom's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

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	C45Rules $_G M_t st$	8.994264144676487	2.378199618500324E-19	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.0520700964166
7	REGAL $_G M_t st$	8.952323532477484	3.480770375768895E-19	0.0071428871428871435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.0520700964166
6	REGAL $_T C_G M_t st$	8.129488664573252	4.31105066648068706E-16	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.0520700964166
5	GAssist $_G M_t st$	7.836902965184974	4.617946297566786E-15	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.0520700964166
4	Ripper $_G M_t st$	5.141719338396714	2.7223558682498646E-7	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.0520700964166
3	OCEC $_G M_t st$	4.883085563169535	1.0443852443476058E-6	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.0520700964166
2	SIA $_G M_t st$	4.062247867274781	4.86024301522163E-5	0.025	0.025320565519103666	0.025	0.043888935252272508	0.0520700964166
1	UCS $_G M_t st$	2.5533844141154405	0.010668168084206958	0.05	0.050000000000000044	0.05	0.050000000000000044	0.05

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

Hochberg's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

Hommel's procedure rejects all hypotheses.

Rom's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.05$ .

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	C45Rules $_G M_t st$	4.016976628160805	5.8949568014888543E-5	0.00625	0.006391150954545011	0.006574125233361166	0.006391150954545011	0.025287967621616
7	REGAL $_G M_t st$	3.598087564464713	3.2056570010664717E-4	0.0071428571428571435	0.007300831979014655	0.0075128293213784685	0.012741455098566168	0.025287967621616
6	REGAL $_T C_G M_t st$	3.389853694650469	6.992993408969091E-4	0.008333333333333333	0.008512444610847103	0.008764162596519848	0.019051173490195694	0.025287967621616
5	GAssist $_G M_t st$	3.33174191702789	8.630425232002396E-4	0.01	0.010206218313011495	0.010515350115740741	0.025320565519103666	0.025287967621616
4	Ripper $_G M_t st$	2.4673292248920204	0.013612513607356415	0.0125	0.012741455098566168	0.013109375000000001	0.031549888917161595	0.025287967621616
3	SLA $_G M_t st$	1.9507800904690908	0.05108321121079611	0.016666666666666666	0.016952427508441503	0.016666666666666666	0.03773939976903784	0.025287967621616
2	OCEC $_G M_t st$	1.7465817607675274	0.08070991329558146	0.025	0.025320565519103666	0.025	0.04388935252272508	0.025287967621616
1	UCS $_G M_t st$	0.6440722019835894	0.519528615189382	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  $\leq 0.03773939976903784$ .

Li's procedure rejects those hypotheses that have a p-value  $\leq 0.02528796762161476$ .



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

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Hommel}$
1	REGAL $_G M_t st$	4.482284806287803E-19	3.585827845030243E-18	3.585827845030243E-18	3.585827845030243E-18	3.585827845030243E-18
2	C45Rules $_G M_t st$	8.308542729923667E-17	6.646834183938934E-16	5.815979910946567E-16	5.815979910946567E-16	5.815979910946567E-16
3	REGALTC $_G M_t st$	1.6101422946034682E-15	1.2881138356827745E-14	9.660853767620809E-15	9.660853767620809E-15	9.660853767620809E-15
4	GAssist $_G M_t st$	2.2889307173162826E-13	1.831144573853026E-12	1.1444653586581413E-12	1.1444653586581413E-12	1.1444653586581413E-12
5	Ripper $_G M_t st$	9.36217038023869E-8	7.489736304190952E-7	3.744868152095476E-7	3.744868152095476E-7	3.744868152095476E-7
6	OCEC $_G M_t st$	1.7449962509110769E-6	1.3959970007288615E-5	5.23498875273323E-6	5.23498875273323E-6	5.23498875273323E-6
7	SIA $_G M_t st$	4.828490292616826E-5	3.862792234093461E-4	9.656980585233652E-5	9.656980585233652E-5	9.656980585233652E-5
8	UCS $_G M_t st$	0.005977268092463451	0.04781814473970761	0.005977268092463451	0.005977268092463451	0.005977268092463451

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

$i$	algorithm	unadjusted $p$	$p_{Hol}$	$p_{Bonm}$	$p_{Finn}$	$p_{Li}$
1	REGAL $_G M_t st$	4.482284806287803E-19	0.0	3.409035154625536E-18	0.0	4.509237729087209E-18
2	C45Rules $_G M_t st$	8.308542729923667E-17	7.771561172376096E-16	5.529569736318194E-16	4.440892098500626E-16	8.358503747675383E-17
3	REGALTC $_G M_t st$	1.6101422946034682E-15	9.992007221626409E-15	9.185944902727147E-15	4.440892098500626E-15	1.6198244194210644E-15
4	GAssist $_G M_t st$	2.2889307173162826E-13	1.144639938885364E-12	1.0883758943460732E-12	4.57859753554146E-13	2.3026945399158844E-13
5	Ripper $_G M_t st$	9.36217038023869E-8	3.7448676271090164E-7	3.570792040138713E-7	1.4979472195975063E-7	9.418466195938768E-8
6	OCEC $_G M_t st$	1.7449962509110769E-6	5.234979617796398E-6	5.23498875273323E-6	2.3266609912031555E-6	1.7554861992397162E-6
7	SIA $_G M_t st$	4.828490292616826E-5	9.656747442055025E-5	9.656980585233652E-5	5.518255587775211E-5	4.857289077906457E-5
8	UCS $_G M_t st$	0.005977268092463451	0.005977268092463461	0.005977268092463451	0.005977268092463461	0.005977268092463451

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

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Hommel}$
1	C45Rules $_G M_{t,st}$	2.378199618500324E-19	1.902559694800259E-18	1.902559694800259E-18	1.902559694800259E-18	1.6647397329502267E-18
2	REGAL $_G M_{t,st}$	3.480770375768895E-19	2.784616300615116E-18	2.4365392630382266E-18	2.4365392630382266E-18	2.4365392630382266E-18
3	REGALTC $_G M_{t,st}$	4.3110506648068706E-16	3.4488405318454965E-15	2.5866303988841222E-15	2.5866303988841222E-15	2.5866303988841222E-15
4	GAssist $_G M_{t,st}$	4.617946297566786E-15	3.694357038053429E-14	2.308973148783393E-14	2.308973148783393E-14	2.308973148783393E-14
5	Ripper $_G M_{t,st}$	2.7223558682498646E-7	2.1778846945998917E-6	1.0889423472999459E-6	1.0889423472999459E-6	1.0889423472999459E-6
6	OCEC $_G M_{t,st}$	1.0443852443476058E-6	8.355081954780846E-6	3.1331557330428173E-6	3.1331557330428173E-6	3.1331557330428173E-6
7	SIA $_G M_{t,st}$	4.86024301522163E-5	3.888194412177304E-4	9.72048603044326E-5	9.72048603044326E-5	9.72048603044326E-5
8	UCS $_G M_{t,st}$	0.010668168084206958	0.08534534467365566	0.010668168084206958	0.010668168084206958	0.010668168084206958

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

$i$	algorithm	unadjusted $p$	$p_{Hol}$	$p_{Rom}$	$p_{Finn}$	$p_{Li}$
1	C45Rules $_G M_{t,st}$	2.378199618500324E-19	0.0	1.808757465123932E-18	0.0	2.4038442328243456E-19
2	REGAL $_G M_{t,st}$	3.480770375768895E-19	0.0	2.316550946967498E-18	0.0	3.5183042367377916E-19
3	REGALTC $_G M_{t,st}$	4.3110506648068706E-16	2.6645352591003757E-15	2.4594766569704796E-15	1.2212453270876722E-15	4.3575376084470352E-16
4	GAssist $_G M_{t,st}$	4.617946297566786E-15	2.3314683517128287E-14	2.1958119543038537E-14	9.325873406851315E-15	4.667742559768178E-15
5	Ripper $_G M_{t,st}$	2.7223558682498646E-7	1.088941902760432E-6	1.0383240498688398E-6	4.35576903437645E-7	2.751710832819908E-7
6	OCEC $_G M_{t,st}$	1.0443852443476058E-6	3.1331524609212735E-6	3.1331557330428173E-6	1.3925134167980247E-6	1.0556459502815683E-6
7	SIA $_G M_{t,st}$	4.86024301522163E-5	9.720249810829529E-5	9.72048603044326E-5	5.5545441624671454E-5	4.912410682989315E-5
8	UCS $_G M_{t,st}$	0.010668168084206958	0.010668168084207008	0.010668168084206958	0.010668168084207008	0.010668168084206958

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

$i$	algorithm	unadjusted $p$	$p_{Bonf}$	$p_{Holm}$	$p_{Hoch}$	$p_{Homn}$
1	C45Rules $_G M_t st$	5.8949568014888543E-5	4.7159654411910835E-4	4.7159654411910835E-4	4.7159654411910835E-4	4.7159654411910835E-4
2	REGAL $_G M_t st$	3.2056570010664717E-4	0.0025645256008531773	0.00224395990074653	0.00224395990074653	0.002013765887467226
3	REGALTC $_G M_t st$	6.992993408969091E-4	0.005594394727175273	0.004195796045381455	0.004195796045381455	0.0034964967044845458
4	GAssist $_G M_t st$	8.630425232002396E-4	0.006904340185601917	0.004315212616001198	0.004315212616001198	0.004315212616001198
5	Ripper $_G M_t st$	0.013612513607356415	0.10890010885885132	0.05445005442942566	0.05445005442942566	0.05445005442942566
6	SIA $_G M_t st$	0.05108321121079611	0.40866568963689	0.15324963363238833	0.15324963363238833	0.12106486994337218
7	OCEC $_G M_t st$	0.08070991329558146	0.6456793063646517	0.1614198265911629	0.1614198265911629	0.1614198265911629
8	UCS $_G M_t st$	0.519528615189382	4.156228921515056	0.519528615189382	0.519528615189382	0.519528615189382

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

$i$	algorithm	unadjusted $p$	$p_{Hol}$	$p_{Rom}$	$p_{Finn}$	$p_{Li}$
1	C45Rules $_G M_t st$	5.8949568014888543E-5	4.714992541460239E-4	4.483453381428002E-4	4.714992541460239E-4	1.2267605975617625E-4
2	REGAL $_G M_t st$	3.2056570010664717E-4	0.0022418030436203162	0.0021334552296725755	0.001281646359757853	6.667451478048332E-4
3	REGALTC $_G M_t st$	6.992993408969091E-4	0.0041884675876942	0.003989538836115348	0.0018637117011248705	0.0014533290658179582
4	GAssist $_G M_t st$	8.630425232002396E-4	0.00430777061756582	0.004103726997678972	0.0018637117011248705	0.0017930205574131866
5	Ripper $_G M_t st$	0.013612513607356415	0.05334830655664269	0.05191900303163352	0.021690915310771497	0.027551016438590346
6	SIA $_G M_t st$	0.05108321121079611	0.14555445158660996	0.15324963363238833	0.06752433378550404	0.09610153236025858
7	OCEC $_G M_t st$	0.08070991329558146	0.15490573648698258	0.1614198265911629	0.09169539416198558	0.14382145942487856
8	UCS $_G M_t st$	0.519528615189382	0.519528615189382	0.519528615189382	0.519528615189382	0.519528615189382