

Results

May 1, 2015

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

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Table 1: Average Rankings of the algorithms

Algorithm	Ranking
Carter96	2.04545454545454
Yang2005	4.909090909090908
Eley2007	1.86363636363642
Burke2008	7.409090909090909
Burke2010	5.4545454545454
Pillay2010	2.4545454545454
Demeester2012	8.1818181818182
Abdullah2013	4.909090909090908
Leite2014	8.636363636363637
cMA	9.136363636363637

Friedman statistic considering reduction performance (distributed according to chi-square with 9 degrees of freedom: 82.8347107438017.

P-value computed by Friedman Test: 6.59312604511797E-11.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 9 and 90 degrees of freedom: 51.24233128834371.

P-value computed by Iman and Davenport Test: 4.440892098500626E-16.

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

i	algorithm	$z = (R_0 - R_i) / S E$	p	Holm/Hochberg/Hommel
9	cMA	5.633430321756243	1.766599127657994E-8	0.005555555555555556
8	Leite2014	5.2461319871355006	1.553256469774619E-7	0.00625
7	Demeester2012	4.894042592025736	9.878544495237655E-7	0.0071428571428571435
6	Burke2008	4.295490620339135	1.7430740750850054E-5	0.008333333333333333
5	Burke2010	2.781506221367144	0.005410729359599633	0.01
4	Yang2005	2.358998947235426	0.01832430775151701	0.0125
3	Abdullah2013	2.358998947235426	0.01832430775151701	0.016666666666666666
2	Pillay2010	0.457716213642694	0.6471563379312679	0.025
1	Carter96	0.1408357580439056	0.8879996937548641	0.05

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value $\leq 0.005555555555555556$.

Holm's procedure rejects those hypotheses that have a p-value ≤ 0.0125 .

Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.01 .

Hommel's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.

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

i	algorithm	$z = (R_0 - R_i) / S E$	p	Holm/Hochberg/Hommel
9	cMA	5.633430321756243	1.766599127657994E-8	0.01111111111111112
8	Leite2014	5.2461319871355006	1.553256469774619E-7	0.0125
7	Demeester2012	4.894042592025736	9.878544495237655E-7	0.014285714285714287
6	Burke2008	4.295490620339135	1.7430740750850054E-5	0.016666666666666666
5	Burke2010	2.781506221367144	0.005410729359599633	0.02
4	Yang2005	2.358998947235426	0.01832430775151701	0.025
3	Abdullah2013	2.358998947235426	0.01832430775151701	0.03333333333333333
2	Pillay2010	0.457716213642694	0.6471563379312679	0.05
1	Carter96	0.1408357580439056	0.8879996937548641	0.1

Bonferroni-Dunn's procedure rejects those hypotheses that have a p-value $\leq 0.011111111111111112$.

Holm's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.05$.
Hochberg's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.0333333333333333$.
Hommel's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.025$.

Table 4: Adjusted p -values

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{Hoch}	p_{Hommel}
1	cMA	1.7665691277657994E-8	1.5893392149892195E-7	1.5893392149892195E-7	1.5893392149892195E-7	1.5893392149892195E-7
2	Leite2014	1.53226469774019E-7	1.397930822797157E-6	1.2426051758196952E-6	1.2426051758196952E-6	1.2426051758196952E-6
3	Demeester2012	9.878544495237655E-7	8.89069004571389E-6	6.914981146666359E-6	6.914981146666359E-6	6.914981146666359E-6
4	Burke2008	1.7430740750850054E-5	1.508766607576505E-4	1.0458444450510033E-4	1.0458444450510033E-4	1.0458444450510033E-4
5	Burke2010	0.0094107293959599633	0.04869656423639669	0.02705364679799816	0.02705364679799816	0.02705364679799816
6	Yang2005	0.01832430775151701	0.164918767976365308	0.07329723100606804	0.054972923254551026	0.054972923254551026
7	Abdullah2013	0.01832430775151701	0.164918767976365308	0.07329723100606804	0.054972923254551026	0.054972923254551026
8	Pillay2010	0.01832430775151701	5.824407041381411	1.2943126758625358	0.8879996937548641	0.8879996937548641
9	Carter96	0.8879996937548641	7.991997243793777	1.2943126758625358	0.8879996937548641	0.8879996937548641

Nemenyi's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.0011111111111111111$.
Holm's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.0016129032258064516$.
Shaffer's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.0011111111111111111$.
Nemenyi's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.002222222222222222$.
Holm's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.0032258064516129032$.
Shaffer's procedure rejects those hypotheses that have a $p\text{-value} \leq 0.002222222222222222$.

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
45	Eley2007 vs. cMA	5.633430321756243	1.7665991277657994E-8	0.001111111111111111	0.001111111111111111
44	Carter96 vs. cMA	5.492594563712338	3.960713493349616E-8	0.001136363636363636	0.001388888888888889
43	Eley2007 vs. Leite2014	5.2461319871355006	1.553256469774619E-7	0.0011627906976744186	0.001388888888888889
42	Pillay2010 vs. cMA	5.1757141081135485	2.270408934550007E-7	0.0011904761904761906	0.001388888888888889
41	Carter96 vs. Leite2014	5.1052962290915955	3.302767180342633E-7	0.0012195121951219512	0.001388888888888889
40	Eley2007 vs. Demeester2012	4.894042592025736	9.878544495237655E-7	0.00125	0.001388888888888889
39	Pillay2010 vs. Leite2014	4.788415773492807	1.6810308959587969E-6	0.001282051282051282	0.001388888888888889
38	Carter96 vs. Demeester2012	4.75320683398183	2.002153388604796E-6	0.0013157894736842105	0.001388888888888889
37	Pillay2010 vs. Demeester2012	4.436326378383042	9.150707515899196E-6	0.0013513513513513514	0.001388888888888889
36	Eley2007 vs. Burke2008	4.295490620339135	1.7430740750850054E-5	0.001388888888888889	0.001388888888888889
35	Carter96 vs. Burke2008	4.154654862295229	3.2577891212883965E-5	0.0014285714285714286	0.001724137931034483
34	Burke2008 vs. Pillay2010	3.837774406696441	1.241544606016023E-4	0.0014705882352941176	0.001724137931034483
33	Yang2005 vs. cMA	3.274431374520817	0.0010587485169372833	0.0015151515151515152	0.001724137931034483
32	Abdullah2013 vs. cMA	3.274431374520817	0.0010587485169372833	0.0015625	0.001724137931034483
31	Yang2005 vs. Leite2014	2.887133039900075	0.0038876980601048657	0.0016129032258064516	0.001724137931034483
30	Abdullah2013 vs. Leite2014	2.887133039900075	0.0038876980601048657	0.0016666666666666668	0.001724137931034483
29	Burke2010 vs. cMA	2.8519241003890987	0.004345547523260482	0.001724137931034483	0.001724137931034483
28	Eley2007 vs. Burke2010	2.781506221367144	0.005410729359599633	0.0017857142857142859	0.0017857142857142859
27	Carter96 vs. Burke2010	2.6406704633232385	0.008274215650715198	0.001851851851851852	0.001851851851851852
26	Yang2005 vs. Demeester2012	2.53504364479031	0.011243331690886673	0.0019230769230769232	0.0019230769230769232
25	Demeester2012 vs. Abdullah2013	2.53504364479031	0.011243331690886673	0.002	0.002
24	Burke2010 vs. Leite2014	2.464625765768357	0.0137156420347944	0.0020833333333333333	0.0020833333333333333
23	Yang2005 vs. Eley2007	2.3589898947235426	0.01832430775151701	0.002173913043478261	0.002173913043478261
22	Eley2007 vs. Abdullah2013	2.3589898947235426	0.01832430775151701	0.002272727272727273	0.002272727272727273
21	Burke2010 vs. Pillay2010	2.32379000772445	0.020136751550346325	0.002380952380952381	0.002380952380952381
20	Carter96 vs. Yang2005	2.21816318919152	0.02654370762772403	0.0025	0.0025
19	Carter96 vs. Abdullah2013	2.21816318919152	0.02654370762772403	0.002631578947368421	0.002631578947368421
18	Burke2010 vs. Demeester2012	2.1125363706585913	0.03464046979418944	0.002777777777777778	0.002777777777777778
17	Yang2005 vs. Burke2008	1.9364916731037092	0.052807511416113576	0.0029411764705882353	0.0029411764705882353
16	Burke2008 vs. Abdullah2013	1.9364916731037092	0.052807511416113576	0.003125	0.003125
15	Yang2005 vs. Pillay2010	1.9012827335927316	0.0572649894246618	0.0033333333333333335	0.0033333333333333335
14	Pillay2010 vs. Abdullah2013	1.9012827335927316	0.0572649894246618	0.0035714285714285718	0.0035714285714285718
13	Burke2008 vs. Burke2010	1.5139843989719906	0.1300297963838357	0.0038461538461538464	0.0038461538461538464
12	Burke2008 vs. cMA	1.337939701417108	0.18091609383032212	0.004166666666666667	0.004166666666666667
11	Burke2008 vs. Leite2014	0.9506413667963661	0.34178646181502725	0.004545454545454546	0.004545454545454546
10	Demeester2012 vs. cMA	0.7393877297305073	0.45967159095856364	0.005	0.005
9	Burke2008 vs. Demeester2012	0.5985519716866006	0.5494716918239421	0.005555555555555556	0.005555555555555556
8	Eley2007 vs. Pillay2010	0.457716213642694	0.6471563379312679	0.00625	0.00625
7	Yang2005 vs. Burke2010	0.4225072741317185	0.6726547923771843	0.0071428571428571435	0.0071428571428571435
6	Burke2010 vs. Abdullah2013	0.4225072741317185	0.6726547923771843	0.0083333333333333333	0.0083333333333333333
5	Leite2014 vs. cMA	0.3872983346207417	0.6985353583033387	0.01	0.01
4	Demeester2012 vs. Leite2014	0.35208939510976556	0.7247712213061897	0.0125	0.0125
3	Carter96 vs. Pillay2010	0.31688045559878836	0.7513343125576339	0.016666666666666666	0.016666666666666666
2	Carter96 vs. Eley2007	0.1408357580439056	0.8879996937548641	0.025	0.025
1	Yang2005 vs. Abdullah2013	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
45	Eley2007 vs. cMA	5.633430321756243	1.7665991277657994E-8	0.002222222222222222	0.002222222222222222
44	Carter96 vs. cMA	5.492594563712338	3.960713493349616E-8	0.002272727272727273	0.002777777777777778
43	Eley2007 vs. Leite2014	5.2461319871355006	1.553256469774619E-7	0.002325581395348837	0.002777777777777778
42	Pillay2010 vs. cMA	5.1757141081135485	2.270408934550007E-7	0.002380952380952381	0.002777777777777778
41	Carter96 vs. Leite2014	5.1052962290915955	3.302767180342633E-7	0.0024390243902439024	0.002777777777777778
40	Eley2007 vs. Demeester2012	4.894042592025736	9.878544495237655E-7	0.0025	0.002777777777777778
39	Pillay2010 vs. Leite2014	4.788415773492807	1.6810308959587969E-6	0.002564102564102564	0.002777777777777778
38	Carter96 vs. Demeester2012	4.75320683398183	2.002153388604796E-6	0.002631578947368421	0.002777777777777778
37	Pillay2010 vs. Demeester2012	4.436326378383042	9.150707515899196E-6	0.002702702702702703	0.002777777777777778
36	Eley2007 vs. Burke2008	4.295490620339135	1.7430740750850054E-5	0.002777777777777778	0.002777777777777778
35	Carter96 vs. Burke2008	4.154654862295229	3.2577891212883965E-5	0.002857142857142857	0.003448275862068966
34	Burke2008 vs. Pillay2010	3.837774406696441	1.241544606016023E-4	0.0029411764705882353	0.003448275862068966
33	Yang2005 vs. cMA	3.274431374520817	0.0010587485169372833	0.0030303030303030303	0.003448275862068966
32	Abdullah2013 vs. cMA	3.274431374520817	0.0010587485169372833	0.003125	0.003448275862068966
31	Yang2005 vs. Leite2014	2.887133039900075	0.0038876980601048657	0.0032258064516129032	0.003448275862068966
30	Abdullah2013 vs. Leite2014	2.887133039900075	0.0038876980601048657	0.0033333333333333335	0.003448275862068966
29	Burke2010 vs. cMA	2.8519241003890987	0.004345547523260482	0.003448275862068966	0.003448275862068966
28	Eley2007 vs. Burke2010	2.781506221367144	0.005410729359599633	0.0035714285714285718	0.0035714285714285718
27	Carter96 vs. Burke2010	2.6406704633232385	0.008274215650715198	0.0037037037037037034	0.0037037037037037034
26	Yang2005 vs. Demeester2012	2.53504364479031	0.011243331690886673	0.0038461538461538464	0.0038461538461538464
25	Demeester2012 vs. Abdullah2013	2.53504364479031	0.011243331690886673	0.004	0.004
24	Burke2010 vs. Leite2014	2.464625765768357	0.0137156420347944	0.004166666666666667	0.004166666666666667
23	Yang2005 vs. Eley2007	2.358998947235426	0.01832430775151701	0.004347826086956522	0.004347826086956522
22	Eley2007 vs. Abdullah2013	2.358998947235426	0.01832430775151701	0.004545454545454546	0.004545454545454546
21	Burke2010 vs. Pillay2010	2.32379000772445	0.020136751550346325	0.004761904761904762	0.004761904761904762
20	Carter96 vs. Yang2005	2.21816318919152	0.02654370762772403	0.005	0.005
19	Carter96 vs. Abdullah2013	2.21816318919152	0.02654370762772403	0.005263157894736842	0.005263157894736842
18	Burke2010 vs. Demeester2012	2.1125363706585913	0.03464046979418944	0.005555555555555556	0.005555555555555556
17	Yang2005 vs. Burke2008	1.9364916731037092	0.052807511416113576	0.0058823529411764705	0.0058823529411764705
16	Burke2008 vs. Abdullah2013	1.9364916731037092	0.052807511416113576	0.00625	0.00625
15	Yang2005 vs. Pillay2010	1.9012827335927316	0.0572649894246618	0.006666666666666667	0.006666666666666667
14	Pillay2010 vs. Abdullah2013	1.9012827335927316	0.0572649894246618	0.0071428571428571435	0.0071428571428571435
13	Burke2008 vs. Burke2010	1.5139843989719906	0.1300297963838357	0.007692307692307693	0.007692307692307693
12	Burke2008 vs. cMA	1.337939701417108	0.18091609383032212	0.0083333333333333333	0.0083333333333333333
11	Burke2008 vs. Leite2014	0.9506413667963661	0.34178646181502725	0.009090909090909092	0.009090909090909092
10	Demeester2012 vs. cMA	0.7393877297305073	0.45967159095856364	0.01	0.01
9	Burke2008 vs. Demeester2012	0.5985519716866006	0.5494716918239421	0.011111111111111112	0.011111111111111112
8	Eley2007 vs. Pillay2010	0.457716213642694	0.6471563379312679	0.0125	0.0125
7	Yang2005 vs. Burke2010	0.4225072741317185	0.6726547923771843	0.014285714285714287	0.014285714285714287
6	Burke2010 vs. Abdullah2013	0.4225072741317185	0.6726547923771843	0.016666666666666666	0.016666666666666666
5	Leite2014 vs. cMA	0.3872983346207417	0.6985353583033387	0.02	0.02
4	Demeester2012 vs. Leite2014	0.35208939510976556	0.7247712213061897	0.025	0.025
3	Carter96 vs. Pillay2010	0.31688045559878836	0.7513343125576339	0.03333333333333333	0.03333333333333333
2	Carter96 vs. Eley2007	0.1408357580439056	0.8879996937548641	0.05	0.05
1	Yang2005 vs. Abdullah2013	0.0	1.0	0.1	0.1

Table 7: Adjusted p -values

i	hypothesis	unadjusted p	p_{Nernc}	p_{Holm}	p_{Shaf}	p_{Efr}
1	Eley2007 vs .cMA	1.7665991277657994E-8	7.949696074946097E-7	7.949696074946097E-7	7.949696074946097E-7	7.949696074946097E-7
2	Carter96 vs .cMA	3.960713493349616E-8	1.7823210720073271E-6	1.742713937073831E-6	1.4258568576058618E-6	1.4258568576058618E-6
3	Eley2007 vs .Leite2014	1.553256469774619E-7	6.9896541139857855E-6	6.679002820030861E-6	5.591723291188628E-6	5.591723291188628E-6
4	Pillay2010 vs .cMA	2.270408934550007E-7	1.021684020547503E-5	9.53571752511003E-6	8.173472164380026E-6	8.173472164380026E-6
5	Carter96 vs .Leite2014	3.302767180342633E-7	1.4862452311541848E-5	1.3541345439404796E-5	1.188996184923348E-5	1.188996184923348E-5
6	Eley2007 vs .Demeester2012	9.878544495237655E-7	4.445345022856945E-5	3.951417798095062E-5	3.556276018285556E-5	3.556276018285556E-5
7	Pillay2010 vs .Leite2014	1.6810308959587969E-6	7.564639031814586E-5	6.556020494239308E-5	6.051711225451669E-5	6.051711225451669E-5
8	Carter96 vs .Demeester2012	2.002153388604796E-6	9.009690248721582E-5	7.608182876698224E-5	7.207752198977265E-5	7.207752198977265E-5
9	Pillay2010 vs .Demeester2012	9.150707515899196E-6	4.117818382154638E-4	3.3857617808827025E-4	3.2942547057237105E-4	3.2942547057237105E-4
10	Eley2007 vs .Burke2008	1.7430740750850054E-5	7.843833337882524E-4	6.27506667030602E-4	6.27506667030602E-4	6.27506667030602E-4
11	Carter96 vs .Burke2008	3.2577891212883965E-5	0.0014660051045797785	0.0011402261924509387	9.447588451736349E-4	9.447588451736349E-4
12	Burke2008 vs .Pillay2010	1.241544606016023E-4	0.005586950727072103	0.004221251660454478	0.0036004793574464663	0.0036004793574464663
13	Yang2005 vs .cMA	0.0010587485169372833	0.04764368326217775	0.03493870105893035	0.030703706991181218	0.030703706991181218
14	Abdullah2013 vs .cMA	0.0010587485169372833	0.04764368326217775	0.03493870105893035	0.030703706991181218	0.030703706991181218
15	Yang2005 vs .Leite2014	0.0038876980601048657	0.17494641270471895	0.12051863986325084	0.11274324374304111	0.11274324374304111
16	Abdullah2013 vs .Leite2014	0.0038876980601048657	0.17494641270471895	0.12051863986325084	0.11274324374304111	0.11274324374304111
17	Burke2010 vs .cMA	0.004345547523260482	0.1955496385467217	0.12602087817455399	0.12602087817455399	0.12602087817455399
18	Eley2007 vs .Burke2010	0.005410729359599633	0.24348282118198347	0.15150042206878972	0.15150042206878972	0.15150042206878972
19	Carter96 vs .Burke2010	0.008274215650715198	0.37233970428218394	0.22340382256931035	0.19858117561716476	0.19858117561716476
20	Yang2005 vs .Demeester2012	0.011243331690886673	0.5059499260899003	0.2923266239630535	0.2698399605812801	0.2698399605812801
21	Demeester2012 vs .Abdullah2013	0.011243331690886673	0.5059499260899003	0.2923266239630535	0.2698399605812801	0.2698399605812801
22	Burke2010 vs .Leite2014	0.0137156420347944	0.617203891565748	0.3291754088350656	0.3291754088350656	0.3291754088350656
23	Yang2005 vs .Eley2007	0.01832430775151701	0.8245938488182655	0.4214590782848912	0.4031347705333742	0.4031347705333742
24	Eley2007 vs .Abdullah2013	0.01832430775151701	0.8245938488182655	0.4214590782848912	0.4031347705333742	0.4031347705333742
25	Burke2010 vs .Pillay2010	0.020136751550346325	0.9061538197655846	0.4228717825572728	0.4228717825572728	0.4228717825572728
26	Carter96 vs .Yang2005	0.02654370762772403	1.1944668432475813	0.5308741525544806	0.5308741525544806	0.5308741525544806
27	Carter96 vs .Abdullah2013	0.02654370762772403	1.1944668432475813	0.5308741525544806	0.5308741525544806	0.5308741525544806
28	Burke2010 vs .Demeester2012	0.03464046979418944	1.5588211407385246	0.6235284562954099	0.6235284562954099	0.6235284562954099
29	Yang2005 vs .Burke2008	0.052807511416113576	2.376338013725111	0.8977276940739308	0.8977276940739308	0.8977276940739308
30	Burke2008 vs .Abdullah2013	0.052807511416113576	2.376338013725111	0.8977276940739308	0.8977276940739308	0.8977276940739308
31	Yang2005 vs .Pillay2010	0.0572649894246618	2.576924524109781	0.8977276940739308	0.8977276940739308	0.8977276940739308
32	Pillay2010 vs .Abdullah2013	0.0572649894246618	2.576924524109781	0.8977276940739308	0.8977276940739308	0.8977276940739308
33	Burke2008 vs .Burke2010	0.1300297963838357	5.851340837272606	1.6903873529898639	1.6903873529898639	1.6903873529898639
34	Burke2008 vs .cMA	0.18091609383032212	8.141224222364496	2.1709931259638653	2.1709931259638653	2.1709931259638653
35	Burke2008 vs .Leite2014	0.34178646181502725	15.380390781676226	3.7596510799653	3.7596510799653	3.7596510799653
36	Demeester2012 vs .cMA	0.45967159095856364	20.685221593135363	4.596715909585637	4.596715909585637	4.596715909585637
37	Burke2008 vs .Demeester2012	0.5494716918239421	24.726226132077393	4.945245226415478	4.945245226415478	4.945245226415478
38	Eley2007 vs .Pillay2010	0.6471563379312679	29.122035206907057	5.177250703450143	5.177250703450143	5.177250703450143
39	Yang2005 vs .Burke2010	0.6726547923771843	30.269465656973292	5.177250703450143	5.177250703450143	5.177250703450143
40	Burke2010 vs .Abdullah2013	0.6726547923771843	30.269465656973292	5.177250703450143	5.177250703450143	5.177250703450143
41	Leite2014 vs .cMA	0.6985353583033387	31.43409112365024	5.177250703450143	5.177250703450143	5.177250703450143
42	Demeester2012 vs .Leite2014	0.7247712213061897	32.61470495877853	5.177250703450143	5.177250703450143	5.177250703450143
43	Carter96 vs .Pillay2010	0.7513343125576339	33.81004406509353	5.177250703450143	5.177250703450143	5.177250703450143
44	Carter96 vs .Eley2007	0.8879996937548641	39.959986218968886	5.177250703450143	5.177250703450143	5.177250703450143
45	Yang2005 vs .Abdullah2013	1.0	45.0	5.177250703450143	5.177250703450143	5.177250703450143