

Results

April 5, 2021

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

Table 1: Average Rankings of the algorithms

Algorithm	Ranking
kmeans	5.249999999999999
kmeans des	4.749999999999998
kmeans desthr	3.1590909090909083
parzen	7.818181818181819
parzen des	5.65909090909091
parzen desthr	3.636363636363636
svdd	6.363636363636364
svdd des	5.181818181818182
svdd desthr	3.1818181818181808

Friedman statistic considering reduction performance (distributed according to chi-square with 8 degrees of freedom: 55.5818181818182.

P-value computed by Friedman Test: 3.437341300482899E-9.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 8 and 168 degrees of freedom: 9.693039408123212.

P-value computed by Iman and Davenport Test: 5.1547187198081455E-11.

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
8	parzen	5.642439296272601	1.6765765688438208E-8	0.00625
7	svdd	3.8808972720704227	1.040717959987175E-4	0.0071428571428571435
6	parzen_des	3.027650354097494	0.002464630724967834	0.008333333333333333
5	kmeans	2.5322166597906293	0.011334393238858239	0.01
4	svdd_des	2.449644377406153	0.01429973684138751	0.0125
3	kmeans_des	1.9266865889711298	0.05401870019830751	0.016666666666666666
2	parzen_desthr	0.5780059766913396	0.5632600841286354	0.025
1	svdd_desthr	0.027524094128158722	0.9780417227898056	0.05

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

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

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

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

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
8	parzen	5.642439296272601	1.6765765688438208E-8	0.0125
7	svdd	3.8808972720704227	1.040717959987175E-4	0.014285714285714287
6	parzen_des	3.027650354097494	0.002464630724967834	0.016666666666666666
5	kmeans	2.5322166597906293	0.011334393238858239	0.02
4	svdd_des	2.449644377406153	0.01429973684138751	0.025
3	kmeans_des	1.9266865889711298	0.05401870019830751	0.033333333333333333
2	parzen_desthr	0.5780059766913396	0.5632600841286354	0.05
1	svdd_desthr	0.027524094128158722	0.9780417227898056	0.1

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

Holm's procedure rejects those hypotheses that have a p-value $\leq 0.033333333333333333$.

Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.025 .
Hommel's procedure rejects those hypotheses that have a p-value $\leq 0.016666666666666666$.

Table 4: Adjusted p -values

i	algorithm	unadjusted p	p_{Bonf}	p_{Holm}	p_{Hoch}	p_{Hommel}
1	parzen	1.6765765688438208E-8	1.3412612350750566E-7	1.3412612350750566E-7	1.3412612350750566E-7	1.3412612350750566E-7
2	svdd	1.040717939987173E-4	8.3257436798974E-4	7.285023719910223E-4	7.285023719910223E-4	7.285023719910223E-4
3	parzen des	0.002464630724967834	0.01971704879974267	0.014787784349807003	0.014787784349807003	0.014787784349807003
4	kmeans	0.011334393238858239	0.09067514391086591	0.05667196619429119	0.05667196619429119	0.045337572955432955
5	svdd des	0.01429973684138751	0.11439789473110008	0.05719894736555004	0.05719894736555004	0.05719894736555004
6	kmeans des	0.05401870019830751	0.4321496015864601	0.16205610059492254	0.16205610059492254	0.16205610059492254
7	parzen destr	0.5632600841286354	4.506080673029083	1.1265201682572707	0.9780417227898056	0.9780417227898056
8	svdd destr	0.9780417227898056	7.824333782318445	1.1265201682572707	0.9780417227898056	0.9780417227898056

Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 0.001388888888888889$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.0017857142857142859$.
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.001388888888888889$.
Nemenyi's procedure rejects those hypotheses that have a p-value $\leq 0.0027777777777777778$.
Holm's procedure rejects those hypotheses that have a p-value ≤ 0.004 .
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.0027777777777777778$.

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
36	kmeans desthr vs. parzen	5.642439296272601	1.6765765688438208E-8	0.001388888888888889	0.001388888888888889
35	parzen vs. svdd desthr	5.6149152021444415	1.966586639185974E-8	0.0014285714285714286	0.0017857142857142859
34	parzen vs. parzen desthr	5.06443331958126	4.0961697785329356E-7	0.0014705882352941176	0.0017857142857142859
33	kmeans desthr vs. svdd	3.88089727270704227	1.040717959987175E-4	0.0015151515151515152	0.0017857142857142859
32	svdd vs. svdd desthr	3.853373177942264	1.1650161951949643E-4	0.0015625	0.0017857142857142859
31	kmeans des vs. parzen	3.7157527073014704	2.0259966077290642E-4	0.0016129032258064516	0.0017857142857142859
30	parzen desthr vs. svdd	3.302891295379083	9.569347564412685E-4	0.0016666666666666668	0.0017857142857142859
29	parzen vs. svdd des	3.192794918866447	0.001409029782705754	0.001724137931034483	0.0017857142857142859
28	kmeans vs. parzen	3.110222636481971	0.0018694637730590899	0.0017857142857142859	0.0017857142857142859
27	kmeans desthr vs. parzen des	3.027650354097494	0.002464630724967834	0.001851851851851852	0.001851851851851852
26	parzen des vs. svdd desthr	3.0001262599693352	0.002698677145099263	0.0019230769230769232	0.0019230769230769232
25	parzen vs. parzen des	2.6147889421751063	0.008928260728399738	0.002	0.002
24	kmeans vs. kmeans desthr	2.5322166597906293	0.011334393238858239	0.0020833333333333333	0.0020833333333333333
23	kmeans vs. svdd desthr	2.5046925656624706	0.012255787026137163	0.002173913043478261	0.002173913043478261
22	parzen des vs. parzen desthr	2.449644377406154	0.014299736841387474	0.002272727272727273	0.002272727272727273
21	kmeans desthr vs. svdd des	2.449644377406153	0.01429973684138751	0.002380952380952381	0.002380952380952381
20	svdd des vs. svdd desthr	2.4221202832779944	0.01543024222338637	0.0025	0.0025
19	kmeans des vs. svdd	1.954210683099293	0.05067630642667913	0.002631578947368421	0.002631578947368421
18	kmeans vs. parzen desthr	1.9542106830992896	0.05067630642667952	0.002777777777777778	0.002777777777777778
17	kmeans des vs. kmeans desthr	1.9266865889711298	0.05401870019830751	0.0029411764705882353	0.0029411764705882353
16	kmeans des vs. svdd desthr	1.899162494842971	0.05754311427748182	0.003125	0.003125
15	parzen desthr vs. svdd des	1.8716384007148135	0.06125664696796575	0.0033333333333333335	0.0033333333333333335
14	parzen vs. svdd	1.7615420242021775	0.07814670674454167	0.0035714285714285718	0.0035714285714285718
13	svdd vs. svdd des	1.4312528946642697	0.1523577489335414	0.0038461538461538464	0.0038461538461538464
12	kmeans vs. svdd	1.3486806122797934	0.1774395754711504	0.0041666666666666667	0.0041666666666666667
11	kmeans des vs. parzen desthr	1.3486806122797903	0.17743957547115144	0.004545454545454546	0.004545454545454546
10	kmeans des vs. parzen des	1.100963765126364	0.2709124278027994	0.005	0.005
9	parzen des vs. svdd	0.853246917972929	0.39352238992634825	0.005555555555555556	0.005555555555555556
8	kmeans vs. kmeans des	0.6055300708194994	0.544826850517266	0.00625	0.00625
7	parzen des vs. svdd des	0.5780059766913407	0.5632600841286347	0.0071428571428571435	0.0071428571428571435
6	kmeans desthr vs. parzen desthr	0.5780059766913396	0.5632600841286354	0.0083333333333333333	0.0083333333333333333
5	parzen desthr vs. svdd desthr	0.5504818825631809	0.5819889000572426	0.01	0.01
4	kmeans des vs. svdd des	0.5229577884350233	0.6010036284073744	0.0125	0.0125
3	kmeans vs. parzen des	0.4954336943068645	0.6202940153491592	0.016666666666666666	0.016666666666666666
2	kmeans vs. svdd des	0.08257228238447617	0.9341916414436118	0.025	0.025
1	kmeans desthr vs. svdd desthr	0.027524094128158722	0.9780417227898056	0.05	0.05

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
36	kmeans desthr vs. parzen	5.642439296272601	1.6765765688438208E-8	0.002777777777777778	0.002777777777777778
35	parzen vs. svdd desthr	5.6149152021444415	1.966586639185974E-8	0.002857142857142857	0.0035714285714285718
34	parzen vs. parzen desthr	5.06443331958126	4.0961697785329356E-7	0.0029411764705882353	0.0035714285714285718
33	kmeans desthr vs. svdd	3.88089727270704227	1.040717959987175E-4	0.0030303030303030303	0.0035714285714285718
32	svdd vs. svdd desthr	3.853373177942264	1.1650161951949643E-4	0.003125	0.0035714285714285718
31	kmeans des vs. parzen	3.7157527073014704	2.0259966077290642E-4	0.0032258064516129032	0.0035714285714285718
30	parzen desthr vs. svdd	3.302891295379083	9.569347564412685E-4	0.0033333333333333335	0.0035714285714285718
29	parzen vs. svdd des	3.192794918866447	0.001409029782705754	0.003448275862068966	0.0035714285714285718
28	kmeans vs. parzen	3.110222636481971	0.0018694637730590899	0.0035714285714285718	0.0035714285714285718
27	kmeans desthr vs. parzen des	3.027650354097494	0.002464630724967834	0.003703703703703704	0.004545454545454546
26	parzen des vs. svdd desthr	3.0001262599693352	0.002698677145099263	0.0038461538461538464	0.004545454545454546
25	parzen vs. parzen des	2.6147889421751063	0.008928260728399738	0.004	0.004545454545454546
24	kmeans vs. kmeans desthr	2.5322166597906293	0.011334393238858239	0.004166666666666667	0.004545454545454546
23	kmeans vs. svdd desthr	2.5046925656624706	0.012255787026137163	0.004347826086956522	0.004545454545454546
22	parzen des vs. parzen desthr	2.449644377406154	0.014299736841387474	0.004545454545454546	0.004545454545454546
21	kmeans desthr vs. svdd des	2.449644377406153	0.01429973684138751	0.004761904761904762	0.004761904761904762
20	svdd des vs. svdd desthr	2.4221202832779944	0.01543024222338637	0.005	0.005
19	kmeans des vs. svdd	1.954210683099293	0.05067630642667913	0.005263157894736842	0.005263157894736842
18	kmeans vs. parzen desthr	1.9542106830992896	0.05067630642667952	0.005555555555555556	0.005555555555555556
17	kmeans des vs. kmeans desthr	1.9266865889711298	0.05401870019830751	0.0058823529411764705	0.0058823529411764705
16	kmeans des vs. svdd desthr	1.899162494842971	0.05754311427748182	0.00625	0.00625
15	parzen desthr vs. svdd des	1.8716384007148135	0.06125664696796575	0.006666666666666667	0.006666666666666667
14	parzen vs. svdd	1.7615420242021775	0.07814670674454167	0.0071428571428571435	0.0071428571428571435
13	svdd vs. svdd des	1.4312528946642697	0.1523577489335414	0.007692307692307693	0.007692307692307693
12	kmeans vs. svdd	1.3486806122797934	0.1774395754711504	0.008333333333333333	0.008333333333333333
11	kmeans des vs. parzen desthr	1.3486806122797903	0.17743957547115144	0.009090909090909092	0.009090909090909092
10	kmeans des vs. parzen des	1.100963765126364	0.2709124278027994	0.01	0.01
9	parzen des vs. svdd	0.853246917972929	0.39352238992634825	0.011111111111111112	0.011111111111111112
8	kmeans vs. kmeans des	0.6055300708194994	0.544826850517266	0.0125	0.0125
7	parzen des vs. svdd des	0.5780059766913407	0.5632600841286347	0.014285714285714287	0.014285714285714287
6	kmeans desthr vs. parzen desthr	0.5780059766913396	0.5632600841286354	0.016666666666666666	0.016666666666666666
5	parzen desthr vs. svdd desthr	0.5504818825631809	0.5819889000572426	0.02	0.02
4	kmeans des vs. svdd des	0.5229577884350233	0.6010036284073744	0.025	0.025
3	kmeans vs. parzen des	0.4954336943068645	0.6202940153491592	0.03333333333333333	0.03333333333333333
2	kmeans vs. svdd des	0.08257228238447617	0.9341916414436118	0.05	0.05
1	kmeans desthr vs. svdd desthr	0.027524094128158722	0.9780417227898056	0.1	0.1

Table 7: Adjusted p -values

i	hypothesis	unadjusted p	P_{Neme}	P_{Holm}	P_{Shaf}	P_B
1	kmeans desthr vs .parzen	1.6765765688438208E-8	6.035675647837755E-7	6.035675647837755E-7	6.035675647837755E-7	0
2	parzen vs .svdd desthr	1.966586639185974E-8	7.079711901069506E-7	6.883053237150909E-7	6.035675647837755E-7	0
3	parzen vs .parzen desthr	4.0961697785329356E-7	1.4746211202718569E-5	1.3926977247011981E-5	1.1469275379892219E-5	0
4	kmeans desthr vs .svdd	1.040717959987175E-4	0.00374658465595383	0.0034343692679576774	0.00291401028796409	0
5	svdd vs .svdd desthr	1.1650161951949643E-4	0.004194058302701871	0.0037280518246238857	0.0032620453465459	0
6	kmeans des vs .parzen	2.0259966077290642E-4	0.007293587787824631	0.006280589483960099	0.00567279050164138	0
7	parzen desthr vs .svdd	9.569347564412685E-4	0.03444965123188566	0.028708042693238053	0.026794173180355516	0
8	parzen vs .svdd des	0.001409029782705754	0.05072507217740714	0.040861863698466866	0.03945283391576111	0
9	kmeans vs .parzen	0.0018694637730590899	0.06730069583012724	0.05234498564565451	0.05234498564565451	0
10	kmeans desthr vs .parzen des	0.002464630724967834	0.08872670609884202	0.06654502957413151	0.05422187594929234	0
11	parzen des vs .svdd desthr	0.002698677145099263	0.09715237722357346	0.07016560577258084	0.05937089719218378	0
12	parzen vs .parzen des	0.008928260728399738	0.3214173862223906	0.22320651820999346	0.19642173602479424	0
13	kmeans vs .kmeans desthr	0.011334393238858239	0.4080381565988966	0.27202543773259774	0.24935665125488124	0
14	kmeans vs .svdd desthr	0.012255787026137163	0.44120833294093786	0.28188310160115476	0.2696273145750176	0
15	parzen des vs .parzen desthr	0.014299736841387474	0.514790526289949	0.31459421051052444	0.31459421051052444	0
16	kmeans desthr vs .svdd des	0.01429973684138751	0.5147905262899504	0.31459421051052444	0.31459421051052444	0
17	svdd des vs .svdd desthr	0.01543024222338637	0.5554887200419093	0.31459421051052444	0.31459421051052444	0
18	kmeans des vs .svdd	0.05067630642667913	1.8243470313604486	0.9628498221069034	0.9121735156802243	0
19	kmeans vs .parzen desthr	0.05067630642667952	1.8243470313604628	0.9628498221069034	0.9121735156802314	0
20	kmeans des vs .kmeans desthr	0.05401870019830751	1.9446732071390704	0.9628498221069034	0.9121735156802314	0
21	kmeans des vs .svdd desthr	0.05754311427748182	2.0715521139893456	0.9628498221069034	0.9206898284397091	0
22	parzen desthr vs .svdd des	0.06125664696796575	2.205239290846767	0.9628498221069034	0.9206898284397091	0
23	parzen vs .svdd	0.07814670674454167	2.8132814428035005	1.0940538944235834	1.0159071876790418	0
24	svdd vs .svdd des	0.1523577489335414	5.484878961607491	1.9806507361360381	1.9806507361360381	0
25	kmeans vs .svdd	0.1774395754711504	6.387824716961415	2.129274905653805	2.129274905653805	0
26	kmeans des vs .parzen desthr	0.17743957547115144	6.387824716961452	2.129274905653805	2.129274905653805	0
27	kmeans des vs .parzen des	0.2709124278027994	9.752847400900778	2.709124278027994	2.709124278027994	0
28	parzen des vs .svdd	0.39352238992634825	14.166806037348536	3.541701509337134	3.541701509337134	0
29	kmeans vs .kmeans des	0.544826850517266	19.613766618621575	4.358614804138128	4.358614804138128	0
30	parzen des vs .svdd des	0.5632600841286347	20.277363028630848	4.358614804138128	4.358614804138128	0
31	kmeans desthr vs .parzen desthr	0.5632600841286354	20.277363028630873	4.358614804138128	4.358614804138128	0
32	parzen desthr vs .svdd desthr	0.5819889000572426	20.951600402060734	4.358614804138128	4.358614804138128	0
33	kmeans des vs .svdd des	0.6010036284073744	21.63613062266548	4.358614804138128	4.358614804138128	0
34	kmeans vs .parzen des	0.6202940153491592	22.330584552569732	4.358614804138128	4.358614804138128	0
35	kmeans vs .svdd des	0.9341916414436118	33.63089909197002	4.358614804138128	4.358614804138128	0
36	kmeans desthr vs .svdd desthr	0.9780417227898056	35.209502020433	4.358614804138128	4.358614804138128	0