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	7.568181818181818
kmeans des	6.022727272727272
kmeans desthr	3.931818181818181
parzen	6.0227272727272725
parzen des	4.045454545454545
parzen desthr	2.4545454545454537
svdd	6.704545454545455
svdd des	5.113636363636363
svdd desthr	3.136363636363636

Friedman statistic considering reduction performance (distributed according to chi-square with 8 degrees of freedom: 69.2575757575757.

P-value computed by Friedman Test: 8.072331691977297E-11.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 8 and 168 degrees of freedom: 13.62540809084455.

P-value computed by Iman and Daveport Test: 3.901385635345888E-15.

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
8	kmeans	6.19292117883578	5.905926759821309E-10	0.00625
7	svdd	5.147005601965738	2.646774257297969E-7	0.0071428571428571435
6	parzen	4.321282778120966	1.551247185524191E-5	0.008333333333333333
5	kmeans des	4.321282778120965	1.5512471855241972E-5	0.01
4	svdd des	3.2203190129946053	0.001280480176101414	0.0125
3	parzen des	1.9266865889711315	0.054018700198307276	0.016666666666666666
2	kmeans desthr	1.7890661183303362	0.07360416794958406	0.025
1	svdd desthr	0.8257228238447708	0.4089613420368744	0.05

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 $\leq 0.016666666666666666$.
Hochberg's procedure rejects those hypotheses that have a p-value ≤ 0.0125.
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	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
8	kmeans	6.19292117883578	5.905926759821309E-10	0.0125
7	svdd	5.147005601965738	2.646774257297969E-7	0.014285714285714287
6	parzen	4.321282778120966	1.551247185524191E-5	0.016666666666666666
5	kmeans des	4.321282778120965	1.5512471855241972E-5	0.02
4	svdd des	3.2203190129946053	0.001280480176101414	0.025
3	parzen des	1.9266865889711315	0.054018700198307276	0.03333333333333333
2	kmeans desthr	1.7890661183303362	0.07360416794958406	0.05
1	svdd desthr	0.8257228238447708	0.4089613420368744	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 ≤ 0.03333333333333333.

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_{Homm}
1	kmeans	5.905926759821309E-10	4.7247414078570474E-9	4.7247414078570474E-9	4.7247414078570474E-9	4.7247414078570474E-9
2	svdd	2.646774257297969E-7	2.1174194058383752E-6	1.8527419801085783E-6	1.8527419801085783E-6	1.8527419801085783E-6
3	parzen	1.551247185524191E-5	1.240997748419353E-4	9.307483113145146E-5	7.756235927620986E-5	7.756235927620956E-5
4	kmeans des	1.5512471855241972E-5	1.2409977484193578E-4	9.307483113145146E-5	7.756235927620986E-5	7.756235927620986E-5
5	svdd des	0.001280480176101414	0.010243841408811311	0.005121920704405656	0.005121920704405656	0.005121920704405656
6	parzen des	0.054018700198307276	0.4321496015864582	0.16205610059492181	0.14720833589916812	0.11040625192437609
7	kmeans desthr	0.07360416794958406	0.5888333435966725	0.16205610059492181	0.14720833589916812	0.14720833589916812
8	svdd desthr	0.4089613420368744	3.271690736294995	0.4089613420368744	0.4089613420368744	0.4089613420368744

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 $\leq 0.002173913043478261$.
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 $\leq 0.002777777777777778$.
Holm's procedure rejects those hypotheses that have a p-value $\leq 0.004545454545454546$.
Shaffer's procedure rejects those hypotheses that have a p-value $\leq 0.002777777777777778$.

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

i	algorithms	$z = (R_0 - R_i)/SE$	p	Holm	Shaffer
36	kmeans vs. parzen desthr	6.19292117883578	5.905926759821309E-10	0.001388888888888889	0.001388888888888889
35	kmeans vs. svdd desthr	5.367198354991009	7.996909514674459E-8	0.0014285714285714286	0.0017857142857142859
34	parzen desthr vs. svdd	5.147005601965738	2.646774257297969E-7	0.0014705882352941176	0.0017857142857142859
33	kmeans vs. kmeans desthr	4.403855060505443	1.063440063317719E-5	0.0015151515151515152	0.0017857142857142859
32	svdd vs. svdd desthr	4.321282778120967	1.551247185524185 4E-5	0.0015625	0.0017857142857142859
31	parzen vs. parzen desthr	4.321282778120966	1.551247185524191E-5	0.0016129032258064516	0.0017857142857142859
30	kmeans des vs. parzen desthr	4.321282778120965	1.551247185524197 2E-5	0.0016666666666666668	0.0017857142857142859
29	kmeans vs. parzen des	4.266234589864648	1.987997424302772 3E-5	0.00172413793103448 3	0.0017857142857142859
28	parzen vs. svdd desthr	3.495559954276195	4.730681618272383 4E-4	0.0017857142857142859	0.0017857142857142859
27	kmeans des vs. svdd desthr	3.495559954276194	4.730681618272401E-4	0.0018518518518518 52	0.0022727272727272 73
26	kmeans desthr vs. svdd	3.357939483635401	7.852580287692203E-4	0.0019230769230769232	0.0022727272727272 73
25	parzen des vs. svdd	3.2203190129946058	0.0012804801761014128	0.002	0.0022727272727272 73
24	parzen desthr vs. svdd des	3.2203190129946053	0.001280480176101414	0.0020833333333333333	0.0022727272727272 73
23	kmeans vs. svdd des	2.9726021658411743	0.002952869178276362	0.0021739130434782 61	0.0022727272727272 73
22	kmeans desthr vs. parzen	2.5322166597906297	0.011334393238858221	0.0022727272727272 73	0.0022727272727272 73
21	kmeans des vs. kmeans desthr	2.532216659790629	0.011334393238858247	0.0023809523809523 81	0.0023809523809523 81
20	parzen vs. parzen des	2.3945961891498344	0.016638678549945687	0.0025	0.0025
19	svdd des vs. svdd desthr	2.3945961891498344	0.016638678549945687	0.0026315789473684 21	0.0026315789473684 21
18	kmeans des vs. parzen des	2.3945961891498335	0.016638678549945732	0.0027777777777777 78	0.0027777777777777 78
17	svdd vs. svdd des	1.926686588971132	0.054018700198307214	0.0029411764705882353	0.0029411764705882353
16	parzen des vs. parzen desthr	1.9266865889711315	0.054018700198307276	0.003125	0.003125
15	kmeans vs. kmeans des	1.8716384007148146	0.0612566469679656	0.0033333333333333335	0.0033333333333333335
14	kmeans vs. parzen	1.8716384007148135	0.06125664696796575	0.0035714285714285718	0.0035714285714285718
13	kmeans desthr vs. parzen desthr	1.7890661183303362	0.07360416794958406	0.0038461538461538464	0.0038461538461538464
12	kmeans desthr vs. svdd des	1.431252894664269	0.15235774893354156	0.0041666666666666667	0.0041666666666666667
11	parzen des vs. svdd des	1.2936324240234738	0.19579241717644197	0.0045454545454545546	0.0045454545454545546
10	parzen vs. svdd des	1.1009637651263606	0.27091242780280095	0.005	0.005
9	parzen des vs. svdd desthr	1.1009637651263606	0.27091242780280095	0.0055555555555555556	0.0055555555555555556
8	kmeans des vs. svdd des	1.1009637651263595	0.2709124278028014	0.00625	0.00625
7	kmeans vs. svdd	1.045915576870042	0.29560001190371177	0.0071428571428571435	0.0071428571428571435
6	kmeans desthr vs. svdd desthr	0.9633432944855654	0.3353752731713218	0.0083333333333333333	0.0083333333333333333
5	kmeans des vs. svdd	0.8257228238447724	0.4089613420368735	0.01	0.01
4	parzen vs. svdd	0.8257228238447714	0.4089613420368741	0.0125	0.0125
3	parzen desthr vs. svdd desthr	0.8257228238447708	0.4089613420368744	0.016666666666666666	0.016666666666666666
2	kmeans desthr vs. parzen des	0.13762047064079522	0.8905403762382124	0.025	0.025
1	kmeans des vs. parzen	1.0756374827627338E-15	0.9999999999999991	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 vs. parzen desthr	6.19292117883578	5.905926759821309E-10	0.002777777777777778	0.002777777777777778
35	kmeans vs. svdd desthr	5.367198354991009	7.996909514674459E-8	0.00285714285714285	0.0035714285714285718
34	parzen desthr vs. svdd	5.147005601965738	2.646774257297969E-7	0.0029411764705882353	0.0035714285714285718
33	kmeans vs. kmeans desthr	4.403855060505443	1.063440063317719E-5	0.0030303030303030303	0.0035714285714285718
32	svdd vs. svdd desthr	4.321282778120967	1.551247185524185 4E-5	0.003125	0.0035714285714285718
31	parzen vs. parzen desthr	4.321282778120966	1.551247185524191E-5	0.0032258064516129032	0.0035714285714285718
30	kmeans des vs. parzen desthr	4.321282778120965	1.551247185524197 2E-5	0.0333333333333333335	0.0035714285714285718
29	kmeans vs. parzen des	4.266234589864648	1.987997424302772 3E-5	0.003448275862068966	0.0035714285714285718
28	parzen vs. svdd desthr	3.495559954276195	4.730681618272383 4E-4	0.0035714285714285718	0.0035714285714285718
27	kmeans des vs. svdd desthr	3.495559954276194	4.730681618272401E-4	0.003703703703703704	0.004545454545454546
26	kmeans desthr vs. svdd	3.357939483635401	7.852580287692203E-4	0.0038461538461538464	0.004545454545454546
25	parzen des vs. svdd	3.2203190129946058	0.0012804801761014128	0.004	0.004545454545454546
24	parzen desthr vs. svdd des	3.2203190129946053	0.001280480176101414	0.004166666666666667	0.004545454545454546
23	kmeans vs. svdd des	2.9726021658411743	0.002952869178276362	0.004347826086956522	0.004545454545454546
22	kmeans desthr vs. parzen	2.5322166597906297	0.011334393238858221	0.004545454545454546	0.004545454545454546
21	kmeans des vs. kmeans desthr	2.532216659790629	0.011334393238858247	0.004761904761904762	0.004761904761904762
20	parzen vs. parzen des	2.3945961891498344	0.016638678549945687	0.005	0.005
19	svdd des vs. svdd desthr	2.3945961891498344	0.016638678549945687	0.005263157894736842	0.005263157894736842
18	kmeans des vs. parzen des	2.3945961891498335	0.016638678549945732	0.005555555555555556	0.005555555555555556
17	svdd vs. svdd des	1.926686588971132	0.054018700198307214	0.0058823529411764705	0.0058823529411764705
16	parzen des vs. parzen desthr	1.9266865889711315	0.054018700198307276	0.00625	0.00625
15	kmeans vs. kmeans des	1.8716384007148146	0.0612566469679656	0.006666666666666667	0.006666666666666667
14	kmeans vs. parzen	1.8716384007148135	0.06125664696796575	0.007142857142857143 5	0.007142857142857143 5
13	kmeans desthr vs. parzen desthr	1.7890661183303362	0.07360416794958406	0.007692307692307693	0.007692307692307693
12	kmeans desthr vs. svdd des	1.431252894664269	0.15235774893354156	0.008333333333333333	0.008333333333333333
11	parzen des vs. svdd des	1.2936324240234738	0.19579241717644197	0.009090909090909092	0.009090909090909092
10	parzen vs. svdd des	1.1009637651263606	0.27091242780280095	0.01	0.01
9	parzen des vs. svdd desthr	1.1009637651263606	0.27091242780280095	0.011111111111111112	0.011111111111111112
8	kmeans des vs. svdd des	1.1009637651263595	0.2709124278028014	0.0125	0.0125
7	kmeans vs. svdd	1.045915576870042	0.29560001190371177	0.014285714285714287	0.014285714285714287
6	kmeans desthr vs. svdd desthr	0.9633432944855654	0.3353752731713218	0.016666666666666666	0.016666666666666666
5	kmeans des vs. svdd	0.8257228238447724	0.4089613420368735	0.02	0.02
4	parzen vs. svdd	0.8257228238447714	0.4089613420368741	0.025	0.025
3	parzen desthr vs. svdd desthr	0.8257228238447708	0.4089613420368744	0.03333333333333333	0.03333333333333333
2	kmeans desthr vs. parzen des	0.13762047064079522	0.8905403762382124	0.05	0.05
1	kmeans des vs. parzen	1.0756374827627338E-15	0.9999999999999991	0.1	0.1

Table 7: Adjusted p-values

i	hypothesis	unadjusted p	p_{Neme}	p_{Holm}	p_{Shaf}	p_B
1	kmeans vs .parzen desthr	5.905926759821309E-10	2.1261336335356714E-8	2.1261336335356714E-8	2.1261336335356714E-8	0
2	kmeans vs .svdd desthr	7.996909514674459E-8	2.878887425282805E-6	2.7989183301360604E-6	2.2391346641088486E-6	0
3	parzen desthr vs .svdd	2.646774257297969E-7	9.528387326272688E-6	8.999032474813094E-6	7.410967920434313E-6	0
4	kmeans vs .kmeans desthr	1.06344006317719E-5	3.8283842279437886E-4	3.5093522089484725E-4	2.977632177289613E-4	0
5	svdd vs .svdd desthr	1.5512471855241854E-5	5.584489867887068E-4	4.963990993677393E-4	4.3434921194677187E-4	0
6	parzen vs .parzen desthr	1.551247185524191E-5	5.584489867887088E-4	4.963990993677393E-4	4.343492119467735E-4	0
7	kmeans des vs .parzen desthr	1.551247185524197 2E-5	5.584489867887111E-4	4.963990993677393E-4	4.3434921194677523E-4	0
8	kmeans vs .parzen des	1.9879974243027723E-5	7.15679072748998E-4	5.76519253047804E-4	5.566392788047763E-4	0
9	parzen vs .svdd desthr	4.7306816182723834E-4	0.01703045382578058	0.013245908531162674	0.013245908531162674	0
10	kmeans des vs .svdd desthr	4.730681618272401E-4	0.017030453825780643	0.013245908531162674	0.013245908531162674	0
11	kmeans desthr vs .svdd	7.852580287692203E-4	0.02826928903569193	0.02041670874799973	0.017275676632922846	0
12	parzen des vs .svdd	0.0012804801761014128	0.046097286339650864	0.03201200440253532	0.028170563874231083	0
13	parzen desthr vs .svdd des	0.001280480176101414	0.046097286339650	0.03201200440253532	0.028170563874231107	0
14	kmeans vs .svdd des	0.002952869178276362	0.10630329041794903	0.06791599110035633	0.06496312192207997	0
15	kmeans desthr vs .parzen	0.011334393238858221	0.408038156598896	0.24935665125488088	0.24935665125488088	0
16	kmeans des vs .kmeans desthr	0.011334393238858247	0.4080381565988969	0.24935665125488088	0.24935665125488088	0
17	parzen vs .parzen des	0.016638678549945687	0.5989924277980447	0.33277357099891375	0.29949621389902237	0
18	svdd des vs .svdd desthr	0.016638678549945687	0.5989924277980447	0.33277357099891375	0.29949621389902237	0
19	kmeans des vs .parzen des	0.016638678549945732	0.5989924277980463	0.33277357099891375	0.29949621389902314	0
20	svdd vs .svdd des	0.054018700198307214	1.9446732071390598	0.9183179033712227	0.8642992031729154	0
21	parzen des vs .parzen desthr	0.054018700198307276	1.944673207139062	0.9183179033712227	0.8642992031729164	0
22	kmeans vs .kmeans des	0.0612566469679656	2.2052392908467615	0.918849704519484	0.918849704519484	0
23	kmeans vs .parzen	0.06125664696796575	2.205239290846767	0.918849704519484	0.918849704519484	0
24	kmeans desthr vs .parzen desthr	0.07360416794958406	2.649750046185026	0.9568541833445928	0.9568541833445928	0
25	kmeans desthr vs .svdd des	0.15235774893354156	5.484878961607496	1.8282929872024987	1.8282929872024987	0
26	parzen des vs .svdd des	0.19579241717644197	7.048527018351911	2.1537165889408616	2.1537165889408616	0
27	parzen vs .svdd des	0.27091242780280095	9.752847400900833	2.7091242780280096	2.7091242780280096	0
28	parzen des vs .svdd desthr	0.27091242780280095	9.752847400900833	2.7091242780280096	2.7091242780280096	0
29	kmeans des vs .svdd des	0.2709124278028014	9.75284740090085	2.7091242780280096	2.7091242780280096	0
30	kmeans vs .svdd	0.29560001190371177	10.641600428533623	2.7091242780280096	2.7091242780280096	0
31	kmeans desthr vs .svdd desthr	0.3353752731713218	12.073509834167586	2.7091242780280096	2.7091242780280096	0
32	kmeans des vs .svdd	0.4089613420368735	14.722608313327447	2.7091242780280096	2.7091242780280096	0
33	parzen vs .svdd	0.4089613420368741	14.722608313327468	2.7091242780280096	2.7091242780280096	0
34	parzen desthr vs .svdd desthr	0.4089613420368744	14.722608313327479	2.7091242780280096	2.7091242780280096	0
35	kmeans desthr vs .parzen des	0.8905403762382124	32.059453544575646	2.7091242780280096	2.7091242780280096	0
36	kmeans des vs .parzen	0.9999999999999991	35.99999999999997	2.7091242780280096	2.7091242780280096	0