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	7.4318181818181825
kmeans des	6.022727272727272
kmeans desthr	4.159090909090907
parzen	5.795454545454546
parzen des	3.7499999999999996
parzen desthr	2.499999999999999
svdd	6.681818181818181
svdd des	5.159090909090908
svdd desthr	3.499999999999999

Friedman statistic considering reduction performance (distributed according to chi-square with 8 degrees of freedom: 62.233333333333334.

P-value computed by Friedman Test: 2.1730239829764741E-10.

Iman and Davenport statistic considering reduction performance (distributed according to F-distribution with 8 and 168 degrees of freedom: 11.487547612071491.

P-value computed by Iman and Daveport Test: 6.043801192459986E-13.

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

i	algorithm	$z = (R_0 - R_i)/SE$	p	Holm/Hochberg/Hommel
8	kmeans	5.972728425810508	2.33318119879579E-9	0.00625
7	svdd	5.0644333195812585	4.0961697785329716E-7	0.0071428571428571435
6	kmeans des	4.266234589864647	1.9879974243027805E-5	0.008333333333333333
5	parzen	3.990993648583059	6.579704265067839E-5	0.01
4	svdd des	3.220319012994605	0.0012804801761014165	0.0125
3	kmeans desthr	2.009258871355607	0.044509687216435126	0.016666666666666666
2	parzen des	1.5138251770487463	0.13007018523428457	0.025
1	svdd desthr	1.2110601416389966	0.22587235588913843	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	5.972728425810508	2.33318119879579E-9	0.0125
7	svdd	5.0644333195812585	4.0961697785329716E-7	0.014285714285714287
6	kmeans des	4.266234589864647	1.9879974243027805E-5	0.016666666666666666
5	parzen	3.990993648583059	6.579704265067839E-5	0.02
4	svdd des	3.220319012994605	0.0012804801761014165	0.025
3	kmeans desthr	2.009258871355607	0.044509687216435126	0.03333333333333333
2	parzen des	1.5138251770487463	0.13007018523428457	0.05
1	svdd desthr	1.2110601416389966	0.22587235588913843	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	2.33318119879579E-9	1.866544959036632E-8	1.866544959036632E-8	1.866544959036632E-8	1.866544959036632E-8
2	svdd	4.0961697785329716E-7	3.2769358228263773E-6	2.86731884497308E-6	2.86731884497308E-6	2.86731884497308E-6
3	kmeans des	1.9879974243027805E-5	1.5903979394422244E-4	1.1927984545816682E-4	1.1927984545816682E-4	1.1927984545816682E-4
4	parzen	6.579704265067839E-5	5.263763412054271E-4	3.2898521325339195E-4	3.2898521325339195E-4	3.2898521325339195E-4
5	svdd des	0.0012804801761014165	0.010243841408811332	0.005121920704405666	0.005121920704405666	0.005121920704405666
6	kmeans desthr	0.044509687216435126	0.356077497731481	0.1335290616493054	0.1335290616493054	0.1335290616493054
7	parzen des	0.13007018523428457	1.0405614818742766	0.26014037046856914	0.22587235588913843	0.22587235588913843
8	svdd desthr	0.22587235588913843	1.8069788471131074	0.26014037046856914	0.22587235588913843	0.22587235588913843

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 $\leq 0.0019230769230769232$.
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 $\leq 0.004166666666666667$.
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	5.972728425810508	2.33318119879579E-9	0.001388888888888889	0.001388888888888889
35	parzen desthr vs. svdd	5.0644333195812585	4.0961697785329716E-7	0.001428571428571286	0.001785714285714285
34	kmeans vs. svdd desthr	4.7616682841715114	1.9199909495562918E-6	0.0014705882352941176	0.001785714285714285
33	kmeans vs. parzen des	4.458903248761762	8.23800935461124E-6	0.0015151515151515152	0.001785714285714285
32	kmeans des vs. parzen desthr	4.266234589864647	1.9879974243027805E-5	0.0015625	0.001785714285714285
31	parzen vs. parzen desthr	3.990993648583059	6.579704265067839E-5	0.0016129032258064516	0.001785714285714285
30	kmeans vs. kmeans desthr	3.963469554454901	7.386287937597703E-5	0.0016666666666666668	0.001785714285714285
29	svdd vs. svdd desthr	3.8533731779422618	1.1650161951949738E-4	0.00172413793103448 3	0.001785714285714285
28	parzen des vs. svdd	3.550608142532512	3.8434219869509887E-4	0.0017857142857142859	0.001785714285714285
27	parzen desthr vs. svdd des	3.220319012994605	0.0012804801761014165	0.001851851851851852	0.002272727272727273
26	kmeans desthr vs. svdd	3.0551744482256513	0.002249296490663528	0.0019230769230769232	0.002272727272727273
25	kmeans des vs. svdd desthr	3.0551744482256504	0.0022492964906635346	0.002	0.002272727272727273
24	parzen vs. svdd desthr	2.779933506944062	0.005437003000700588	0.0020833333333333333	0.002272727272727273
23	kmeans vs. svdd des	2.7524094128159033	0.005915851074237986	0.002173913043478261	0.002272727272727273
22	kmeans des vs. parzen des	2.7524094128159007	0.005915851074238034	0.002272727272727273	0.002272727272727273
21	parzen vs. parzen des	2.4771684715343123	0.013242937567462025	0.002380952380952381	0.002380952380952381
20	kmeans des vs. kmeans desthr	2.25697571850904	0.02400959205819217	0.0025	0.0025
19	svdd des vs. svdd desthr	2.009258871355608	0.04450968721643503	0.002631578947368421	0.002631578947368421
18	kmeans desthr vs. parzen desthr	2.009258871355607	0.044509687216435126	0.002777777777777778	0.002777777777777778
17	kmeans desthr vs. parzen	1.9817347772274516	0.047508932706608505	0.0029411764705882353	0.0029411764705882353
16	kmeans vs. parzen	1.9817347772274494	0.047508932706608754	0.003125	0.003125
15	svdd vs. svdd des	1.8441143065866537	0.06516648336431852	0.0033333333333333335	0.0033333333333333335
14	kmeans vs. kmeans des	1.7064938359458612	0.08791617299952849	0.0035714285714285718	0.0035714285714285718
13	parzen des vs. svdd des	1.7064938359458586	0.08791617299952897	0.0038461538461538464	0.0038461538461538464
12	parzen des vs. parzen desthr	1.5138251770487463	0.13007018523428457	0.004166666666666667	0.004166666666666667
11	kmeans desthr vs. svdd des	1.2110601416389977	0.22587235588913804	0.004545454545454546	0.004545454545454546
10	parzen desthr vs. svdd desthr	1.2110601416389966	0.22587235588913843	0.005	0.005
9	parzen vs. svdd	1.0734396709981997	0.2830738931528096	0.005555555555555556	0.005555555555555556
8	kmeans des vs. svdd des	1.045915576870042	0.29560001190371177	0.00625	0.00625
7	kmeans vs. svdd	0.9082951062292496	0.36372232738071036	0.007142857142857143 5	0.007142857142857143 5
6	kmeans des vs. svdd	0.7981987297166115	0.4247551744745131	0.008333333333333333	0.008333333333333333
5	kmeans desthr vs. svdd desthr	0.7981987297166104	0.4247551744745137	0.01	0.01
4	parzen vs. svdd des	0.7706746355884538	0.44089980988589994	0.0125	0.0125
3	kmeans desthr vs. parzen des	0.49543369430686074	0.620294015349162	0.016666666666666666	0.016666666666666666
2	parzen des vs. svdd desthr	0.3027650354097497	0.7620689311980031	0.025	0.025
1	kmeans des vs. parzen	0.27524094128158827	0.7831311345963253	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	5.972728425810508	2.33318119879579E-9	0.002777777777777778	0.002777777777777778
35	parzen desthr vs. svdd	5.0644333195812585	4.0961697785329716E-7	0.002857142857142857	0.0035714285714285718
34	kmeans vs. svdd desthr	4.7616682841715114	1.9199909495562918E-6	0.0029411764705882353	0.0035714285714285718
33	kmeans vs. parzen des	4.458903248761762	8.23800935461124E-6	0.0030303030303030303	0.0035714285714285718
32	kmeans des vs. parzen desthr	4.266234589864647	1.9879974243027805E-5	0.003125	0.0035714285714285718
31	parzen vs. parzen desthr	3.990993648583059	6.579704265067839E-5	0.0032258064516129032	0.0035714285714285718
30	kmeans vs. kmeans desthr	3.963469554454901	7.386287937597O3E-5	0.0333333333333333335	0.0035714285714285718
29	svdd vs. svdd desthr	3.8533731779422618	1.1650161951949738E-4	0.003448275862068966	0.0035714285714285718
28	parzen des vs. svdd	3.550608142532512	3.8434219869509887E-4	0.0035714285714285718	0.0035714285714285718
27	parzen desthr vs. svdd des	3.220319012994605	0.0012804801761014165	0.003703703703703704	0.004545454545454546
26	kmeans desthr vs. svdd	3.0551744482256513	0.002249296490663528	0.0038461538461538464	0.004545454545454546
25	kmeans des vs. svdd desthr	3.0551744482256504	0.002249296490663534 6	0.004	0.004545454545454546
24	parzen vs. svdd desthr	2.779933506944062	0.005437003000700588	0.004166666666666667	0.004545454545454546
23	kmeans vs. svdd des	2.7524094128159033	0.005915851074237986	0.004347826086956522	0.004545454545454546
22	kmeans des vs. parzen des	2.7524094128159007	0.005915851074238034	0.004545454545454546	0.004545454545454546
21	parzen vs. parzen des	2.4771684715343123	0.013242937567462025	0.004761904761904762	0.004761904761904762
20	kmeans des vs. kmeans desthr	2.25697571850904	0.02400959205819217	0.005	0.005
19	svdd des vs. svdd desthr	2.009258871355608	0.04450968721643503	0.005263157894736842	0.005263157894736842
18	kmeans desthr vs. parzen desthr	2.009258871355607	0.044509687216435126	0.005555555555555556	0.005555555555555556
17	kmeans desthr vs. parzen	1.9817347772274516	0.047508932706608505	0.0058823529411764705	0.0058823529411764705
16	kmeans vs. parzen	1.9817347772274494	0.047508932706608754	0.00625	0.00625
15	svdd vs. svdd des	1.8441143065866537	0.06516648336431852	0.006666666666666667	0.006666666666666667
14	kmeans vs. kmeans des	1.7064938359458612	0.08791617299952849	0.007142857142857143 5	0.007142857142857143 5
13	parzen des vs. svdd des	1.7064938359458586	0.08791617299952897	0.007692307692307693	0.007692307692307693
12	parzen des vs. parzen desthr	1.5138251770487463	0.13007018523428457	0.008333333333333333	0.008333333333333333
11	kmeans desthr vs. svdd des	1.2110601416389977	0.22587235588913804	0.009090909090909092	0.009090909090909092
10	parzen desthr vs. svdd desthr	1.2110601416389966	0.22587235588913843	0.01	0.01
9	parzen vs. svdd	1.0734396709981997	0.2830738931528096	0.011111111111111112	0.011111111111111112
8	kmeans des vs. svdd des	1.045915576870042	0.29560001190371177	0.0125	0.0125
7	kmeans vs. svdd	0.9082951062292496	0.36372232738071036	0.014285714285714287	0.014285714285714287
6	kmeans des vs. svdd	0.7981987297166115	0.4247551744745131	0.016666666666666666	0.016666666666666666
5	kmeans desthr vs. svdd desthr	0.7981987297166104	0.4247551744745137	0.02	0.02
4	parzen vs. svdd des	0.7706746355884538	0.44089980988589994	0.025	0.025
3	kmeans desthr vs. parzen des	0.49543369430686074	0.620294015349162	0.03333333333333333	0.03333333333333333
2	parzen des vs. svdd desthr	0.3027650354097497	0.7620689311980031	0.05	0.05
1	kmeans des vs. parzen	0.27524094128158827	0.7831311345963253	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	2.33318119879579E-9	8.399452315664844E-8	8.399452315664844E-8	8.399452315664844E-8	0
2	parzen desthr vs .svdd	4.0961697785329716E-7	1.4746211202718697E-5	1.43365942248654E-5	1.146927537989232E-5	0
3	kmeans vs .svdd desthr	1.9199909495562918E-6	6.91196741840265E-5	6.527969228491392E-5	5.375974658757617E-5	0
4	kmeans vs .parzen des	8.23800935461124E-6	2.9656833676600466E-4	2.7185430870217095E-4	2.3066426192911474E-4	0
5	kmeans des vs .parzen desthr	1.9879974243027805E-5	7.156790727490009E-4	6.361591757768898E-4	5.566392788047786E-4	0
6	parzen vs .parzen desthr	6.579704265067839E-5	0.002368693535424422	0.00203970832217103	0.001842317194218995	0
7	kmeans vs .kmeans desthr	7.386828793759703E-5	0.002659258365753493	0.0022160486381279107	0.002068312062252717	0
8	svdd vs .svdd desthr	1.1650161951949738E-4	0.004194058302701906	0.003378546966065424	0.0032620453465459264	0
9	parzen des vs .svdd	3.8434219869509887E-4	0.013836319153023559	0.010761581563462769	0.010761581563462769	0
10	parzen desthr vs .svdd des	0.0012804801761014165	0.046097286339650996	0.03457296475473825	0.028170563874231162	0
11	kmeans desthr vs .svdd	0.002249296490663528	0.08097467366388701	0.05848170875725173	0.04948452279459762	0
12	kmeans des vs .svdd desthr	0.0022492964906635346	0.08097467366388725	0.05848170875725173	0.04948452279459776	0
13	parzen vs .svdd desthr	0.005437003000700588	0.19573210802522117	0.13048807201681412	0.11961406601541294	0
14	kmeans vs .svdd des	0.005915851074237986	0.2129706386725675	0.13606457470747368	0.1301487236332357	0
15	kmeans des vs .parzen des	0.005915851074238034	0.2129706386725692	0.13606457470747368	0.13014872363323673	0
16	parzen vs .parzen des	0.013242937567462025	0.47674575242863293	0.2781016889167025	0.2781016889167025	0
17	kmeans des vs .kmeans desthr	0.02400959205819217	0.8643453140949181	0.4801918411638434	0.43217265704745905	0
18	svdd des vs .svdd desthr	0.04450968721643503	1.602348739791661	0.8456840571122656	0.8011743698958305	0
19	kmeans desthr vs .parzen desthr	0.044509687216435126	1.6023487397916645	0.8456840571122656	0.8011743698958322	0
20	kmeans desthr vs .parzen	0.047508932706608505	1.7103215774379061	0.8456840571122656	0.8011743698958322	0
21	kmeans vs .parzen	0.047508932706608754	1.7103215774379152	0.8456840571122656	0.8011743698958322	0
22	svdd vs .svdd des	0.06516648336431852	2.3459934011154666	0.9774972504647778	0.9774972504647778	0
23	kmeans vs .kmeans des	0.08791617299952849	3.1649822279830255	1.2308264219933989	1.1429102489938703	0
24	parzen des vs .svdd des	0.08791617299952897	3.1649822279830433	1.2308264219933989	1.1429102489938767	0
25	parzen des vs .parzen desthr	0.13007018523428457	4.682526668434244	1.5608422228114147	1.5608422228114147	0
26	kmeans desthr vs .svdd des	0.22587235588913804	8.13140481200897	2.4845959147805186	2.4845959147805186	0
27	parzen desthr vs .svdd desthr	0.22587235588913843	8.131404812008983	2.4845959147805186	2.4845959147805186	0
28	parzen vs .svdd	0.2830738931528096	10.190660153501145	2.5476650383752864	2.5476650383752864	0
29	kmeans des vs .svdd des	0.29560001190371177	10.641600428533623	2.5476650383752864	2.5476650383752864	0
30	kmeans vs .svdd	0.36372232738071036	13.094003785705572	2.5476650383752864	2.5476650383752864	0
31	kmeans des vs .svdd	0.4247551744745131	15.291186281082473	2.5485310468470788	2.5485310468470788	0
32	kmeans desthr vs .svdd desthr	0.4247551744745137	15.291186281082494	2.5485310468470788	2.5485310468470788	0
33	parzen vs .svdd des	0.44089980988589994	15.872393155892398	2.5485310468470788	2.5485310468470788	0
34	kmeans desthr vs .parzen des	0.620294015349162	22.33058455256983	2.5485310468470788	2.5485310468470788	0
35	parzen des vs .svdd desthr	0.7620689311980031	27.434481523128113	2.5485310468470788	2.5485310468470788	0
36	kmeans des vs .parzen	0.7831311345963253	28.19272084546771	2.5485310468470788	2.5485310468470788	0