

Output tables for the test of Multiple comparisons.

June 12, 2017

1 Average rankings of Friedman test

Average ranks obtained by applying the Friedman procedure

Algorithm	Ranking
Base	4.1562
ADASYN	7.3281
SMOTE	4.0469
Bord	4.5156
NCL	4.4688
SMOTE+TL	4.5625
SMOTE+ENN	3.2812
CCR	3.6406

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 56.270833.

P-value computed by Friedman Test: 8.713790800030097E-10.

2 Post hoc comparisons

Results achieved on post hoc comparisons for $\alpha = 0.05$, $\alpha = 0.10$ and adjusted p-values.

2.1 P-values for $\alpha = 0.05$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Shaffer
28	ADASYN vs. SMOTE+ENN	6.608519	0	0.001786
27	ADASYN vs. CCR	6.021662	0	0.002381
26	ADASYN vs. SMOTE	5.358259	0	0.002381
25	Base vs. ADASYN	5.17965	0	0.002381
24	ADASYN vs. NCL	4.66934	0.000003	0.002381
23	ADASYN vs. Bord	4.592793	0.000004	0.002381
22	ADASYN vs. SMOTE+TL	4.516247	0.000006	0.002381
21	SMOTE+TL vs. SMOTE+ENN	2.092272	0.036414	0.002381
20	Bord vs. SMOTE+ENN	2.015726	0.043829	0.0025
19	NCL vs. SMOTE+ENN	1.939179	0.052479	0.002632
18	SMOTE+TL vs. CCR	1.505416	0.132217	0.002778
17	Base vs. SMOTE+ENN	1.428869	0.153042	0.002941
16	Bord vs. CCR	1.428869	0.153042	0.003125
15	NCL vs. CCR	1.352322	0.176272	0.003333
14	SMOTE vs. SMOTE+ENN	1.25026	0.211204	0.003571
13	Base vs. CCR	0.842012	0.399781	0.003846
12	SMOTE vs. SMOTE+TL	0.842012	0.399781	0.004167
11	SMOTE vs. Bord	0.765466	0.443994	0.004545
10	SMOTE vs. NCL	0.688919	0.490874	0.005
9	Base vs. SMOTE+TL	0.663403	0.507072	0.005556
8	SMOTE vs. CCR	0.663403	0.507072	0.00625
7	Base vs. Bord	0.586857	0.5573	0.007143
6	SMOTE+ENN vs. CCR	0.586857	0.5573	0.008333
5	Base vs. NCL	0.51031	0.609834	0.01
4	Base vs. SMOTE	0.178609	0.858245	0.0125
3	NCL vs. SMOTE+TL	0.153093	0.878325	0.016667
2	Bord vs. NCL	0.076547	0.938984	0.025
1	Bord vs. SMOTE+TL	0.076547	0.938984	0.05

Table 2: P-values Table for $\alpha = 0.05$

Shaffer's procedure rejects those hypotheses that have an unadjusted p-value ≤ 0.001786 .

2.2 P-values for $\alpha = 0.10$

i	algorithms	$z = (R_0 - R_i)/SE$	p	Shaffer
28	ADASYN vs. SMOTE+ENN	6.608519	0	0.003571
27	ADASYN vs. CCR	6.021662	0	0.004762
26	ADASYN vs. SMOTE	5.358259	0	0.004762
25	Base vs. ADASYN	5.17965	0	0.004762
24	ADASYN vs. NCL	4.66934	0.000003	0.004762
23	ADASYN vs. Bord	4.592793	0.000004	0.004762
22	ADASYN vs. SMOTE+TL	4.516247	0.000006	0.004762
21	SMOTE+TL vs. SMOTE+ENN	2.092272	0.036414	0.004762
20	Bord vs. SMOTE+ENN	2.015726	0.043829	0.005
19	NCL vs. SMOTE+ENN	1.939179	0.052479	0.005263
18	SMOTE+TL vs. CCR	1.505416	0.132217	0.005556
17	Base vs. SMOTE+ENN	1.428869	0.153042	0.005882
16	Bord vs. CCR	1.428869	0.153042	0.00625
15	NCL vs. CCR	1.352322	0.176272	0.006667
14	SMOTE vs. SMOTE+ENN	1.25026	0.211204	0.007143
13	Base vs. CCR	0.842012	0.399781	0.007692
12	SMOTE vs. SMOTE+TL	0.842012	0.399781	0.008333
11	SMOTE vs. Bord	0.765466	0.443994	0.009091
10	SMOTE vs. NCL	0.688919	0.490874	0.01
9	Base vs. SMOTE+TL	0.663403	0.507072	0.01111
8	SMOTE vs. CCR	0.663403	0.507072	0.0125
7	Base vs. Bord	0.586857	0.5573	0.014286
6	SMOTE+ENN vs. CCR	0.586857	0.5573	0.016667
5	Base vs. NCL	0.51031	0.609834	0.02
4	Base vs. SMOTE	0.178609	0.858245	0.025
3	NCL vs. SMOTE+TL	0.153093	0.878325	0.033333
2	Bord vs. NCL	0.076547	0.938984	0.05
1	Bord vs. SMOTE+TL	0.076547	0.938984	0.1

Table 3: P-values Table for $\alpha = 0.10$

Shaffer's procedure rejects those hypotheses that have an unadjusted p-value ≤ 0.003571 .

2.3 Adjusted p-values

i	hypothesis	unadjusted p	p_{Shelf}
1	ADASYN vs .SMOTE+ENN	0	0
2	ADASYN vs .CCR	0	0
3	ADASYN vs .SMOTE	0	0.000002
4	Base vs .ADASYN	0	0.000005
5	ADASYN vs .NCL	0.000003	0.000063
6	ADASYN vs .Bord	0.000004	0.000092
7	ADASYN vs .SMOTE+TL	0.000006	0.000132
8	SMOTE+TL vs .SMOTE+ENN	0.036414	0.764697
9	Bord vs .SMOTE+ENN	0.043829	0.764697
10	NCL vs .SMOTE+ENN	0.052479	0.839672
11	SMOTE+TL vs .CCR	0.132217	2.115476
12	Base vs .SMOTE+ENN	0.153042	2.44867
13	Bord vs .CCR	0.153042	2.44867
14	NCL vs .CCR	0.176272	2.644083
15	SMOTE vs .SMOTE+ENN	0.211204	2.745658
16	Base vs .CCR	0.399781	5.197155
17	SMOTE vs .SMOTE+TL	0.399781	5.197155
18	SMOTE vs .Bord	0.443994	5.197155
19	SMOTE vs .NCL	0.490874	5.197155
20	Base vs .SMOTE+TL	0.507072	5.197155
21	SMOTE vs .CCR	0.507072	5.197155
22	Base vs .Bord	0.5573	5.197155
23	SMOTE+ENN vs .CCR	0.5573	5.197155
24	Base vs .NCL	0.609834	5.197155
25	Base vs .SMOTE	0.858245	5.197155
26	NCL vs .SMOTE+TL	0.878325	5.197155
27	Bord vs .NCL	0.938984	5.197155
28	Bord vs .SMOTE+TL	0.938984	5.197155

Table 4: Adjusted p -values