

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	6.0625
ADASYN	4.5312
SMOTE	3.4844
Bord	4.2188
NCL	4.8438
SMOTE+TL	3.8281
SMOTE+ENN	3.5625
CCR	5.4688

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 31.679688.

P-value computed by Friedman Test: 4.656175000572471E-5.

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	Base vs. SMOTE	4.21006	0.000026	0.001786
27	Base vs. SMOTE+ENN	4.082483	0.000045	0.002381
26	Base vs. SMOTE+TL	3.648719	0.000264	0.002381
25	SMOTE vs. CCR	3.240471	0.001193	0.002381
24	SMOTE+ENN vs. CCR	3.112893	0.001853	0.002381
23	Base vs. Bord	3.010831	0.002605	0.002381
22	SMOTE+TL vs. CCR	2.679129	0.007381	0.002381
21	Base vs. ADASYN	2.500521	0.012401	0.002381
20	SMOTE vs. NCL	2.21985	0.026429	0.0025
19	NCL vs. SMOTE+ENN	2.092272	0.036414	0.002632
18	Bord vs. CCR	2.041241	0.041227	0.002778
17	Base vs. NCL	1.99021	0.046568	0.002941
16	ADASYN vs. SMOTE	1.70954	0.087351	0.003125
15	NCL vs. SMOTE+TL	1.658509	0.097215	0.003333
14	ADASYN vs. SMOTE+ENN	1.581962	0.113658	0.003571
13	ADASYN vs. CCR	1.530931	0.125786	0.003846
12	SMOTE vs. Bord	1.199229	0.230439	0.004167
11	ADASYN vs. SMOTE+TL	1.148198	0.250887	0.004545
10	Bord vs. SMOTE+ENN	1.071652	0.283876	0.005
9	Bord vs. NCL	1.020621	0.307434	0.005556
8	NCL vs. CCR	1.020621	0.307434	0.00625
7	Base vs. CCR	0.96959	0.332251	0.007143
6	Bord vs. SMOTE+TL	0.637888	0.523547	0.008333
5	SMOTE vs. SMOTE+TL	0.561341	0.574565	0.01
4	ADASYN vs. Bord	0.51031	0.609834	0.0125
3	ADASYN vs. NCL	0.51031	0.609834	0.016667
2	SMOTE+TL vs. SMOTE+ENN	0.433764	0.66446	0.025
1	SMOTE vs. SMOTE+ENN	0.127578	0.898483	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	Base vs. SMOTE	4.21006	0.000026	0.003571
27	Base vs. SMOTE+ENN	4.082483	0.000045	0.004762
26	Base vs. SMOTE+TL	3.648719	0.000264	0.004762
25	SMOTE vs. CCR	3.240471	0.001193	0.004762
24	SMOTE+ENN vs. CCR	3.112893	0.001853	0.004762
23	Base vs. Bord	3.010831	0.002605	0.004762
22	SMOTE+TL vs. CCR	2.679129	0.007381	0.004762
21	Base vs. ADASYN	2.500521	0.012401	0.004762
20	SMOTE vs. NCL	2.21985	0.026429	0.005
19	SMOTE vs. SMOTE+ENN	2.092272	0.036414	0.005263
18	Bord vs. CCR	2.041241	0.041227	0.005556
17	Base vs. NCL	1.99021	0.046568	0.005882
16	ADASYN vs. SMOTE	1.70954	0.087351	0.00625
15	NCL vs. SMOTE+TL	1.658509	0.097215	0.006667
14	ADASYN vs. SMOTE+ENN	1.581962	0.113658	0.007143
13	ADASYN vs. CCR	1.530931	0.125786	0.007692
12	SMOTE vs. Bord	1.199229	0.230439	0.008333
11	ADASYN vs. SMOTE+TL	1.148198	0.250887	0.009091
10	Bord vs. SMOTE+ENN	1.071652	0.283876	0.01
9	Bord vs. NCL	1.020621	0.307434	0.01111
8	NCL vs. CCR	1.020621	0.307434	0.0125
7	Base vs. CCR	0.96959	0.332251	0.014286
6	Bord vs. SMOTE+TL	0.637888	0.523547	0.016667
5	SMOTE vs. SMOTE+TL	0.561341	0.574565	0.02
4	ADASYN vs. Bord	0.51031	0.609834	0.025
3	ADASYN vs. NCL	0.51031	0.609834	0.033333
2	SMOTE+TL vs. SMOTE+ENN	0.433764	0.66446	0.05
1	SMOTE vs. SMOTE+ENN	0.127578	0.898483	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_{Shaf}
1	Base vs .SMOTE	0.00026	0.000715
2	Base vs .SMOTE+ENN	0.00045	0.000936
3	Base vs .SMOTE+TL	0.00264	0.005535
4	SMOTE vs .CCR	0.001193	0.02506
5	SMOTE+ENN vs .CCR	0.001853	0.038905
6	Base vs .Bord	0.002605	0.054712
7	SMOTE+TL vs .CCR	0.007381	0.155009
8	Base vs .ADASYN	0.012401	0.260423
9	SMOTE vs .NCL	0.026429	0.422863
10	NCL vs .SMOTE+ENN	0.036414	0.582626
11	Bord vs .CCR	0.041227	0.659629
12	Base vs .NCL	0.046568	0.745084
13	ADASYN vs .SMOTE	0.087351	1.397616
14	NCL vs .SMOTE+TL	0.097215	1.458223
15	ADASYN vs .SMOTE+ENN	0.113658	1.477557
16	ADASYN vs .CCR	0.125786	1.635224
17	SMOTE vs .Bord	0.230439	2.765265
18	ADASYN vs .SMOTE+TL	0.250887	2.765265
19	Bord vs .SMOTE+ENN	0.283876	2.838765
20	Bord vs .NCL	0.307434	2.838765
21	NCL vs .CCR	0.307434	2.838765
22	Base vs .CCR	0.332251	2.838765
23	Bord vs .SMOTE+TL	0.523547	3.14128
24	SMOTE vs .SMOTE+TL	0.574565	3.14128
25	ADASYN vs .Bord	0.609834	3.14128
26	ADASYN vs .NCL	0.609834	3.14128
27	SMOTE+TL vs .SMOTE+ENN	0.66446	3.14128
28	SMOTE vs .SMOTE+ENN	0.898483	3.14128

Table 4: Adjusted p -values