

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	7.4062
ADASYN	3.5625
SMOTE	3.3594
Bord	3.9062
NCL	6.2812
SMOTE+TL	3.6719
SMOTE+ENN	3.9062
CCR	3.9062

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 82.893229.

P-value computed by Friedman Test: 6.82044420940997E-11.

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	6.608519	0	0.001786
27	Base vs. ADASYN	6.276817	0	0.002381
26	Base vs. SMOTE+TL	6.098209	0	0.002381
25	Base vs. Bord	5.715476	0	0.002381
24	Base vs. SMOTE+ENN	5.715476	0	0.002381
23	Base vs. CCR	5.715476	0	0.002381
22	SMOTE vs. NCL	4.771402	0.000002	0.002381
21	ADASYN vs. NCL	4.4397	0.000009	0.002381
20	NCL vs. SMOTE+TL	4.261092	0.00002	0.003125
19	Bord vs. NCL	3.878359	0.000105	0.003125
18	NCL vs. SMOTE+ENN	3.878359	0.000105	0.003125
17	NCL vs. CCR	3.878359	0.000105	0.003125
16	Base vs. NCL	1.837117	0.066193	0.003125
15	SMOTE vs. Bord	0.893043	0.371834	0.003333
14	SMOTE vs. SMOTE+ENN	0.893043	0.371834	0.003571
13	SMOTE vs. CCR	0.893043	0.371834	0.003846
12	ADASYN vs. Bord	0.561341	0.574565	0.004167
11	ADASYN vs. SMOTE+ENN	0.561341	0.574565	0.004545
10	ADASYN vs. CCR	0.561341	0.574565	0.005
9	SMOTE vs. SMOTE+TL	0.51031	0.609834	0.005556
8	Bord vs. SMOTE+TL	0.382733	0.701918	0.00625
7	SMOTE+TL vs. SMOTE+ENN	0.382733	0.701918	0.007143
6	SMOTE+TL vs. CCR	0.382733	0.701918	0.008333
5	ADASYN vs. SMOTE	0.331702	0.740114	0.01
4	ADASYN vs. SMOTE+TL	0.178609	0.858245	0.0125
3	Bord vs. SMOTE+ENN	0	1	0.016667
2	Bord vs. CCR	0	1	0.025
1	SMOTE+ENN vs. CCR	0	1	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	6.608519	0	0.003571
27	Base vs. ADASYN	6.276817	0	0.004762
26	Base vs. SMOTE+TL	6.098209	0	0.004762
25	Base vs. Bord	5.715476	0	0.004762
24	Base vs. SMOTE+ENN	5.715476	0	0.004762
23	Base vs. CCR	5.715476	0	0.004762
22	SMOTE vs. NCL	4.771402	0.000002	0.004762
21	ADASYN vs. NCL	4.4397	0.000009	0.004762
20	NCL vs. SMOTE+TL	4.261092	0.00002	0.00625
19	Bord vs. NCL	3.878359	0.000105	0.00625
18	NCL vs. SMOTE+ENN	3.878359	0.000105	0.00625
17	NCL vs. CCR	3.878359	0.000105	0.00625
16	Base vs. NCL	1.837117	0.066193	0.00625
15	SMOTE vs. Bord	0.893043	0.371834	0.006667
14	SMOTE vs. SMOTE+ENN	0.893043	0.371834	0.007143
13	SMOTE vs. CCR	0.893043	0.371834	0.007692
12	ADASYN vs. Bord	0.561341	0.574565	0.008333
11	ADASYN vs. SMOTE+ENN	0.561341	0.574565	0.009091
10	ADASYN vs. CCR	0.561341	0.574565	0.01
9	SMOTE vs. SMOTE+TL	0.51031	0.609834	0.01111
8	Bord vs. SMOTE+TL	0.382733	0.701918	0.0125
7	SMOTE+TL vs. SMOTE+ENN	0.382733	0.701918	0.014286
6	SMOTE+TL vs. CCR	0.382733	0.701918	0.016667
5	ADASYN vs. SMOTE	0.331702	0.740114	0.02
4	ADASYN vs. SMOTE+TL	0.178609	0.858245	0.025
3	Bord vs. SMOTE+ENN	0	1	0.033333
2	Bord vs. CCR	0	1	0.05
1	SMOTE+ENN vs. CCR	0	1	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	Base vs .SMOTE	0	0
2	Base vs .ADASYN	0	0
3	Base vs .SMOTE+TL	0	0
4	Base vs .Bord	0	0
5	Base vs .SMOTE+ENN	0	0
6	Base vs .CCR	0	0
7	SMOTE vs .NCL	0.000002	0.000038
8	ADASYN vs .NCL	0.000009	0.000189
9	NCL vs .SMOTE+TL	0.00002	0.000325
10	Bord vs .NCL	0.000105	0.001683
11	NCL vs .SMOTE+ENN	0.000105	0.001683
12	NCL vs .CCR	0.000105	0.001683
13	Base vs .NCL	0.066193	1.059081
14	SMOTE vs .Bord	0.371834	5.577511
15	SMOTE vs .SMOTE+ENN	0.371834	5.577511
16	SMOTE vs .CCR	0.371834	5.577511
17	ADASYN vs .Bord	0.574565	6.894778
18	ADASYN vs .SMOTE+ENN	0.574565	6.894778
19	ADASYN vs .CCR	0.574565	6.894778
20	SMOTE vs .SMOTE+TL	0.609834	6.894778
21	Bord vs .SMOTE+TL	0.701918	6.894778
22	SMOTE+TL vs .SMOTE+ENN	0.701918	6.894778
23	SMOTE+TL vs .CCR	0.701918	6.894778
24	ADASYN vs .SMOTE	0.740114	6.894778
25	ADASYN vs .SMOTE+TL	0.858245	6.894778
26	Bord vs .SMOTE+ENN	1	6.894778
27	Bord vs .CCR	1	6.894778
28	SMOTE+ENN vs .CCR	1	6.894778

Table 4: Adjusted p -values