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	2.7344
ADASYN	5.1406
SMOTE	4.4062
Bord	4.1875
NCL	3.8438
SMOTE+TL	4.3125
SMOTE+ENN	4.5
CCR	6.875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 51.950521.

P-value computed by Friedman Test: 6.028686660997096E-9.

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. CCR	6.761612	0	0.001786
27	NCL vs. CCR	4.950011	0.000001	0.002381
26	Bord vs. CCR	4.388669	0.000011	0.002381
25	SMOTE+TL vs. CCR	4.184545	0.000029	0.002381
24	SMOTE vs. CCR	4.031452	0.000055	0.002381
23	Base vs. ADASYN	3.92939	0.000085	0.002381
22	SMOTE+ENN vs. CCR	3.878359	0.000105	0.002381
21	Base vs. SMOTE+ENN	2.883254	0.003936	0.002381
20	ADASYN vs. CCR	2.832223	0.004623	0.0025
19	Base vs. SMOTE	2.73016	0.00633	0.002632
18	Base vs. SMOTE+TL	2.577067	0.009964	0.002778
17	Base vs. Bord	2.372943	0.017647	0.002941
16	ADASYN vs. NCL	2.117788	0.034193	0.003125
15	Base vs. NCL	1.811602	0.070048	0.003333
14	ADASYN vs. Bord	1.556447	0.119602	0.003571
13	ADASYN vs. SMOTE+TL	1.352322	0.176272	0.003846
12	ADASYN vs. SMOTE	1.199229	0.230439	0.004167
11	NCL vs. SMOTE+ENN	1.071652	0.283876	0.004545
10	ADASYN vs. SMOTE+ENN	1.046136	0.295498	0.005
9	SMOTE vs. NCL	0.918559	0.358326	0.005556
8	NCL vs. SMOTE+TL	0.765466	0.443994	0.00625
7	Bord vs. NCL	0.561341	0.574565	0.007143
6	Bord vs. SMOTE+ENN	0.51031	0.609834	0.008333
5	SMOTE vs. Bord	0.357217	0.720929	0.01
4	SMOTE+TL vs. SMOTE+ENN	0.306186	0.759463	0.0125
3	Bord vs. SMOTE+TL	0.204124	0.838256	0.016667
2	SMOTE vs. SMOTE+TL	0.153093	0.878325	0.025
1	SMOTE vs. SMOTE+ENN	0.153093	0.878325	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. CCR	6.761612	0	0.003571
27	NCL vs. CCR	4.950011	0.000001	0.004762
26	Bord vs. CCR	4.388669	0.000011	0.004762
25	SMOTE+TL vs. CCR	4.184545	0.000029	0.004762
24	SMOTE vs. CCR	4.031452	0.000055	0.004762
23	Base vs. ADASYN	3.92939	0.000085	0.004762
22	SMOTE+ENN vs. CCR	3.878359	0.000105	0.004762
21	Base vs. SMOTE+ENN	2.883254	0.003936	0.004762
20	ADASYN vs. CCR	2.832223	0.004623	0.00625
19	Base vs. SMOTE	2.73016	0.00633	0.00625
18	Base vs. SMOTE+TL	2.577067	0.009964	0.00625
17	Base vs. Bord	2.372943	0.017647	0.00625
16	ADASYN vs. NCL	2.117788	0.034193	0.00625
15	Base vs. NCL	1.811602	0.070048	0.006667
14	ADASYN vs. Bord	1.556447	0.119602	0.007143
13	ADASYN vs. SMOTE+TL	1.352322	0.176272	0.007692
12	ADASYN vs. SMOTE	1.199229	0.230439	0.008333
11	NCL vs. SMOTE+ENN	1.071652	0.283876	0.009091
10	ADASYN vs. SMOTE+ENN	1.046136	0.295498	0.01
9	SMOTE vs. NCL	0.918559	0.358326	0.011111
8	NCL vs. SMOTE+TL	0.765466	0.443994	0.0125
7	Bord vs. NCL	0.561341	0.574565	0.014286
6	Bord vs. SMOTE+ENN	0.51031	0.609834	0.016667
5	SMOTE vs. Bord	0.357217	0.720929	0.02
4	SMOTE+TL vs. SMOTE+ENN	0.306186	0.759463	0.025
3	Bord vs. SMOTE+TL	0.204124	0.838256	0.033333
2	SMOTE vs. SMOTE+TL	0.153093	0.878325	0.05
1	SMOTE vs. SMOTE+ENN	0.153093	0.878325	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 .CCR	0	0
2	NCL vs .CCR	0.000001	0.000016
3	Bord vs .CCR	0.000011	0.000239
4	SMOTE+TL vs .CCR	0.000029	0.0006
5	SMOTE vs .CCR	0.000055	0.001164
6	Base vs .ADASYN	0.000085	0.001788
7	SMOTE+ENN vs .CCR	0.000105	0.002208
8	Base vs .SMOTE+ENN	0.003936	0.082654
9	ADASYN vs .CCR	0.004623	0.082654
10	Base vs .SMOTE	0.00633	0.101286
11	Base vs .SMOTE+TL	0.009964	0.159428
12	Base vs .Bord	0.017647	0.282352
13	ADASYN vs .NCL	0.034193	0.547088
14	Base vs .NCL	0.070048	1.050716
15	ADASYN vs .Bord	0.119602	1.554825
16	ADASYN vs .SMOTE+TL	0.176272	2.291538
17	ADASYN vs .SMOTE	0.230439	2.765265
18	NCL vs .SMOTE+ENN	0.283876	3.122641
19	ADASYN vs .SMOTE+ENN	0.295498	3.122641
20	SMOTE vs .NCL	0.358326	3.224938
21	NCL vs .SMOTE+TL	0.443994	3.551955
22	Bord vs .NCL	0.574565	4.021954
23	Bord vs .SMOTE+ENN	0.609834	4.021954
24	SMOTE vs .Bord	0.720929	4.021954
25	SMOTE+TL vs .SMOTE+ENN	0.759463	4.021954
26	Bord vs .SMOTE+TL	0.838256	4.021954
27	SMOTE vs .SMOTE+TL	0.878325	4.021954
28	SMOTE vs .SMOTE+ENN	0.878325	4.021954

Table 4: Adjusted p-values