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	7.4375
ADASYN	4.375
SMOTE	3.25
Bord	3.4375
NCL	6.375
SMOTE+TL	3.4219
SMOTE+ENN	4.0156
CCR	3.6875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 90.179688.

P-value computed by Friedman Test: 4.444244972034994E-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	6.838159	0	0.001786
27	Base vs. SMOTE+TL	6.557488	0	0.002381
26	Base vs. Bord	6.531973	0	0.002381
25	Base vs. CCR	6.123724	0	0.002381
24	Base vs. SMOTE+ENN	5.587898	0	0.002381
23	SMOTE vs. NCL	5.103104	0	0.002381
22	Base vs. ADASYN	5.001042	0.000001	0.002381
21	NCL vs. SMOTE+TL	4.822433	0.000001	0.002381
20	Bord vs. NCL	4.796917	0.000002	0.003125
19	NCL vs. CCR	4.388669	0.000011	0.003125
18	NCL vs. SMOTE+ENN	3.852843	0.000117	0.003125
17	ADASYN vs. NCL	3.265986	0.001091	0.003125
16	ADASYN vs. SMOTE	1.837117	0.066193	0.003125
15	Base vs. NCL	1.735055	0.082731	0.003333
14	ADASYN vs. SMOTE+TL	1.556447	0.119602	0.003571
13	ADASYN vs. Bord	1.530931	0.125786	0.003846
12	SMOTE vs. SMOTE+ENN	1.25026	0.211204	0.004167
11	ADASYN vs. CCR	1.122683	0.261572	0.004545
10	SMOTE+TL vs. SMOTE+ENN	0.96959	0.332251	0.005
9	Bord vs. SMOTE+ENN	0.944074	0.345132	0.005556
8	SMOTE vs. CCR	0.714435	0.474959	0.00625
7	ADASYN vs. SMOTE+ENN	0.586857	0.5573	0.007143
6	SMOTE+ENN vs. CCR	0.535826	0.592079	0.008333
5	SMOTE+TL vs. CCR	0.433764	0.66446	0.01
4	Bord vs. CCR	0.408248	0.683091	0.0125
3	SMOTE vs. Bord	0.306186	0.759463	0.016667
2	SMOTE vs. SMOTE+TL	0.280671	0.778963	0.025
1	Bord vs. SMOTE+TL	0.025516	0.979644	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	6.838159	0	0.003571
27	Base vs. SMOTE+TL	6.557488	0	0.004762
26	Base vs. Bord	6.531973	0	0.004762
25	Base vs. CCR	6.123724	0	0.004762
24	Base vs. SMOTE+ENN	5.587898	0	0.004762
23	SMOTE vs. NCL	5.103104	0	0.004762
22	Base vs. ADASYN	5.001042	0.000001	0.004762
21	NCL vs. SMOTE+TL	4.822433	0.000001	0.004762
20	Bord vs. NCL	4.796917	0.000002	0.00625
19	NCL vs. CCR	4.388669	0.000011	0.00625
18	NCL vs. SMOTE+ENN	3.852843	0.000117	0.00625
17	ADASYN vs. NCL	3.265986	0.001091	0.00625
16	ADASYN vs. SMOTE	1.837117	0.066193	0.00625
15	Base vs. NCL	1.735055	0.082731	0.006667
14	ADASYN vs. SMOTE+TL	1.556447	0.119602	0.007143
13	ADASYN vs. Bord	1.530931	0.125786	0.007692
12	SMOTE vs. SMOTE+ENN	1.25026	0.211204	0.008333
11	ADASYN vs. CCR	1.122683	0.261572	0.009091
10	SMOTE+TL vs. SMOTE+ENN	0.96959	0.332251	0.01
9	Bord vs. SMOTE+ENN	0.944074	0.345132	0.011111
8	SMOTE vs. CCR	0.714435	0.474959	0.0125
7	ADASYN vs. SMOTE+ENN	0.586857	0.5573	0.014286
6	SMOTE+ENN vs. CCR	0.535826	0.592079	0.016667
5	SMOTE+TL vs. CCR	0.433764	0.66446	0.02
4	Bord vs. CCR	0.408248	0.683091	0.025
3	SMOTE vs. Bord	0.306186	0.759463	0.033333
2	SMOTE vs. SMOTE+TL	0.280671	0.778963	0.05
1	Bord vs. SMOTE+TL	0.025516	0.979644	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	0
2	Base vs .SMOTE+TL	0	0
3	Base vs .Bord	0	0
4	Base vs .CCR	0	0
5	Base vs .SMOTE+ENN	0	0
6	SMOTE vs .NCL	0	0.000007
7	Base vs .ADASYN	0.000001	0.000012
8	NCL vs .SMOTE+TL	0.000001	0.00003
9	Bord vs .NCL	0.000002	0.00003
10	NCL vs .CCR	0.000011	0.000182
11	NCL vs .SMOTE+ENN	0.000117	0.001868
12	ADASYN vs .NCL	0.001091	0.017453
13	ADASYN vs .SMOTE	0.066193	1.059081
14	Base vs .NCL	0.082731	1.240965
15	ADASYN vs .SMOTE+TL	0.119602	1.554825
16	ADASYN vs .Bord	0.125786	1.635224
17	SMOTE vs .SMOTE+ENN	0.211204	2.534453
18	ADASYN vs .CCR	0.261572	2.877295
19	SMOTE+TL vs .SMOTE+ENN	0.332251	3.322511
20	Bord vs .SMOTE+ENN	0.345132	3.322511
21	SMOTE vs .CCR	0.474959	3.799668
22	ADASYN vs .SMOTE+ENN	0.5573	3.901099
23	SMOTE+ENN vs .CCR	0.592079	3.901099
24	SMOTE+TL vs .CCR	0.66446	3.901099
25	Bord vs .CCR	0.683091	3.901099
26	SMOTE vs .Bord	0.759463	3.901099
27	SMOTE vs .SMOTE+TL	0.778963	3.901099
28	Bord vs .SMOTE+TL	0.979644	3.901099

Table 4: Adjusted p-values