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	6.875
ADASYN	3.4062
SMOTE	4.8125
Bord	5.0938
NCL	3.8125
SMOTE+TL	4.5
SMOTE+ENN	5.3125
CCR	2.1875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 73.427083.

P-value computed by Friedman Test: 5.868816543852517E-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. CCR	7.654655	0	0.001786
27	Base vs. ADASYN	5.664445	0	0.002381
26	SMOTE+ENN vs. CCR	5.103104	0	0.002381
25	Base vs. NCL	5.001042	0.000001	0.002381
24	Bord vs. CCR	4.745886	0.000002	0.002381
23	SMOTE vs. CCR	4.286607	0.000018	0.002381
22	Base vs. SMOTE+TL	3.878359	0.000105	0.002381
21	SMOTE+TL vs. CCR	3.776297	0.000159	0.002381
20	Base vs. SMOTE	3.368048	0.000757	0.003125
19	ADASYN vs. SMOTE+ENN	3.112893	0.001853	0.003125
18	Base vs. Bord	2.908769	0.003629	0.003125
17	ADASYN vs. Bord	2.755676	0.005857	0.003125
16	NCL vs. CCR	2.653614	0.007963	0.003125
15	Base vs. SMOTE+ENN	2.551552	0.010724	0.003333
14	NCL vs. SMOTE+ENN	2.44949	0.014306	0.003571
13	ADASYN vs. SMOTE	2.296397	0.021653	0.003846
12	Bord vs. NCL	2.092272	0.036414	0.004167
11	ADASYN vs. CCR	1.99021	0.046568	0.004545
10	ADASYN vs. SMOTE+TL	1.786086	0.074085	0.005
9	SMOTE vs. NCL	1.632993	0.10247	0.005556
8	SMOTE+TL vs. SMOTE+ENN	1.326807	0.184573	0.00625
7	NCL vs. SMOTE+TL	1.122683	0.261572	0.007143
6	Bord vs. SMOTE+TL	0.96959	0.332251	0.008333
5	SMOTE vs. SMOTE+ENN	0.816497	0.414216	0.01
4	ADASYN vs. NCL	0.663403	0.507072	0.0125
3	SMOTE vs. SMOTE+TL	0.51031	0.609834	0.016667
2	SMOTE vs. Bord	0.459279	0.646034	0.025
1	Bord vs. SMOTE+ENN	0.357217	0.720929	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	7.654655	0	0.003571
27	Base vs. ADASYN	5.664445	0	0.004762
26	SMOTE+ENN vs. CCR	5.103104	0	0.004762
25	Base vs. NCL	5.001042	0.000001	0.004762
24	Bord vs. CCR	4.745886	0.000002	0.004762
23	SMOTE vs. CCR	4.286607	0.000018	0.004762
22	Base vs. SMOTE+TL	3.878359	0.000105	0.004762
21	SMOTE+TL vs. CCR	3.776297	0.000159	0.004762
20	Base vs. SMOTE	3.368048	0.000757	0.00625
19	ADASYN vs. SMOTE+ENN	3.112893	0.001853	0.00625
18	Base vs. Bord	2.908769	0.003629	0.00625
17	ADASYN vs. Bord	2.755676	0.005857	0.00625
16	NCL vs. CCR	2.653614	0.007963	0.00625
15	Base vs. SMOTE+ENN	2.551552	0.010724	0.006667
14	NCL vs. SMOTE+ENN	2.44949	0.014306	0.007143
13	ADASYN vs. SMOTE	2.296397	0.021653	0.007692
12	Bord vs. NCL	2.092272	0.036414	0.008333
11	ADASYN vs. CCR	1.99021	0.046568	0.009091
10	ADASYN vs. SMOTE+TL	1.786086	0.074085	0.01
9	SMOTE vs. NCL	1.632993	0.10247	0.011111
8	SMOTE+TL vs. SMOTE+ENN	1.326807	0.184573	0.0125
7	NCL vs. SMOTE+TL	1.122683	0.261572	0.014286
6	Bord vs. SMOTE+TL	0.96959	0.332251	0.016667
5	SMOTE vs. SMOTE+ENN	0.816497	0.414216	0.02
4	ADASYN vs. NCL	0.663403	0.507072	0.025
3	SMOTE vs. SMOTE+TL	0.51031	0.609834	0.033333
2	SMOTE vs. Bord	0.459279	0.646034	0.05
1	Bord vs. SMOTE+ENN	0.357217	0.720929	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	Base vs .ADASYN	0	0
3	SMOTE+ENN vs .CCR	0	0.000007
4	Base vs .NCL	0.000001	0.000012
5	Bord vs .CCR	0.000002	0.000044
6	SMOTE vs .CCR	0.000018	0.000381
7	Base vs .SMOTE+TL	0.000105	0.002208
8	SMOTE+TL vs .CCR	0.000159	0.003343
9	Base vs .SMOTE	0.000757	0.012112
10	ADASYN vs .SMOTE+ENN	0.001853	0.029642
11	Base vs .Bord	0.003629	0.058057
12	ADASYN vs .Bord	0.005857	0.093714
13	NCL vs .CCR	0.007963	0.127416
14	Base vs .SMOTE+ENN	0.010724	0.160867
15	NCL vs .SMOTE+ENN	0.014306	0.185976
16	ADASYN vs .SMOTE	0.021653	0.281492
17	Bord vs .NCL	0.036414	0.43697
18	ADASYN vs .CCR	0.046568	0.512245
19	ADASYN vs .SMOTE+TL	0.074085	0.740853
20	SMOTE vs .NCL	0.10247	0.922234
21	SMOTE+TL vs .SMOTE+ENN	0.184573	1.47658
22	NCL vs .SMOTE+TL	0.261572	1.831006
23	Bord vs .SMOTE+TL	0.332251	1.993506
24	SMOTE vs .SMOTE+ENN	0.414216	2.071081
25	ADASYN vs .NCL	0.507072	2.071081
26	SMOTE vs .SMOTE+TL	0.609834	2.071081
27	SMOTE vs .Bord	0.646034	2.071081
28	Bord vs .SMOTE+ENN	0.720929	2.071081

Table 4: Adjusted p-values