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	2.8594
ADASYN	5.7188
SMOTE	4.2344
Bord	5.3125
NCL	3.4531
SMOTE+TL	4.4531
SMOTE+ENN	3.1562
CCR	6.8125

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 70.182292.

P-value computed by Friedman Test: 3.95428134680742E-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	6.455426	0	0.001786
27	SMOTE+ENN vs. CCR	5.970631	0	0.002381
26	NCL vs. CCR	5.485836	0	0.002381
25	Base vs. ADASYN	4.66934	0.000003	0.002381
24	SMOTE vs. CCR	4.21006	0.000026	0.002381
23	ADASYN vs. SMOTE+ENN	4.184545	0.000029	0.002381
22	Base vs. Bord	4.005936	0.000062	0.002381
21	SMOTE+TL vs. CCR	3.852843	0.000117	0.002381
20	ADASYN vs. NCL	3.69975	0.000216	0.003125
19	Bord vs. SMOTE+ENN	3.521142	0.00043	0.003125
18	Bord vs. NCL	3.036347	0.002395	0.003125
17	Base vs. SMOTE+TL	2.602583	0.009252	0.003125
16	Bord vs. CCR	2.44949	0.014306	0.003125
15	ADASYN vs. SMOTE	2.423974	0.015352	0.003333
14	Base vs. SMOTE	2.245366	0.024745	0.003571
13	SMOTE+TL vs. SMOTE+ENN	2.117788	0.034193	0.003846
12	ADASYN vs. SMOTE+TL	2.066757	0.038757	0.004167
11	ADASYN vs. CCR	1.786086	0.074085	0.004545
10	SMOTE vs. Bord	1.760571	0.078311	0.005
9	SMOTE vs. SMOTE+ENN	1.760571	0.078311	0.005556
8	NCL vs. SMOTE+TL	1.632993	0.10247	0.00625
7	Bord vs. SMOTE+TL	1.403353	0.160511	0.007143
6	SMOTE vs. NCL	1.275776	0.202035	0.008333
5	Base vs. NCL	0.96959	0.332251	0.01
4	ADASYN vs. Bord	0.663403	0.507072	0.0125
3	Base vs. SMOTE+ENN	0.484795	0.627822	0.016667
2	NCL vs. SMOTE+ENN	0.484795	0.627822	0.025
1	SMOTE vs. SMOTE+TL	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	6.455426	0	0.003571
27	SMOTE+ENN vs. CCR	5.970631	0	0.004762
26	NCL vs. CCR	5.485836	0	0.004762
25	Base vs. ADASYN	4.66934	0.000003	0.004762
24	SMOTE vs. CCR	4.21006	0.000026	0.004762
23	ADASYN vs. SMOTE+ENN	4.184545	0.000029	0.004762
22	Base vs. Bord	4.005936	0.000062	0.004762
21	SMOTE+TL vs. CCR	3.852843	0.000117	0.004762
20	ADASYN vs. NCL	3.69975	0.000216	0.00625
19	Bord vs. SMOTE+ENN	3.521142	0.00043	0.00625
18	Bord vs. NCL	3.036347	0.002395	0.00625
17	Base vs. SMOTE+TL	2.602583	0.009252	0.00625
16	Bord vs. CCR	2.44949	0.014306	0.00625
15	ADASYN vs. SMOTE	2.423974	0.015352	0.006667
14	Base vs. SMOTE	2.245366	0.024745	0.007143
13	SMOTE+TL vs. SMOTE+ENN	2.117788	0.034193	0.007692
12	ADASYN vs. SMOTE+TL	2.066757	0.038757	0.008333
11	ADASYN vs. CCR	1.786086	0.074085	0.009091
10	SMOTE vs. Bord	1.760571	0.078311	0.01
9	SMOTE vs. SMOTE+ENN	1.760571	0.078311	0.011111
8	NCL vs. SMOTE+TL	1.632993	0.10247	0.0125
7	Bord vs. SMOTE+TL	1.403353	0.160511	0.014286
6	SMOTE vs. NCL	1.275776	0.202035	0.016667
5	Base vs. NCL	0.96959	0.332251	0.02
4	ADASYN vs. Bord	0.663403	0.507072	0.025
3	Base vs. SMOTE+ENN	0.484795	0.627822	0.033333
2	NCL vs. SMOTE+ENN	0.484795	0.627822	0.05
1	SMOTE vs. SMOTE+TL	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	SMOTE+ENN vs .CCR	0	0
3	NCL vs .CCR	0	0.000001
4	Base vs .ADASYN	0.000003	0.000063
5	SMOTE vs .CCR	0.000026	0.000536
6	ADASYN vs .SMOTE+ENN	0.000029	0.0006
7	Base vs .Bord	0.000062	0.001297
8	SMOTE+TL vs .CCR	0.000117	0.002452
9	ADASYN vs .NCL	0.000216	0.003453
10	Bord vs .SMOTE+ENN	0.00043	0.006875
11	Bord vs .NCL	0.002395	0.038314
12	Base vs .SMOTE+TL	0.009252	0.148039
13	Bord vs .CCR	0.014306	0.228894
14	ADASYN vs .SMOTE	0.015352	0.230275
15	Base vs .SMOTE	0.024745	0.321681
16	SMOTE+TL vs .SMOTE+ENN	0.034193	0.444509
17	ADASYN vs .SMOTE+TL	0.038757	0.465085
18	ADASYN vs .CCR	0.074085	0.814938
19	SMOTE vs .Bord	0.078311	0.814938
20	SMOTE vs .SMOTE+ENN	0.078311	0.814938
21	NCL vs .SMOTE+TL	0.10247	0.819763
22	Bord vs .SMOTE+TL	0.160511	1.12358
23	SMOTE vs .NCL	0.202035	1.212208
24	Base vs .NCL	0.332251	1.661255
25	ADASYN vs .Bord	0.507072	2.028289
26	Base vs .SMOTE+ENN	0.627822	2.028289
27	NCL vs .SMOTE+ENN	0.627822	2.028289
28	SMOTE vs .SMOTE+TL	0.720929	2.028289

Table 4: Adjusted p-values