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	7.9062
ADASYN	3.6562
SMOTE	3.2969
Bord	4
NCL	6.5469
SMOTE+TL	3.5938
SMOTE+ENN	4.5156
CCR	2.4844

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 123.125.

P-value computed by Friedman Test: 7.948619540343316E-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	8.853885	0	0.001786
27	Base vs. SMOTE	7.527078	0	0.002381
26	Base vs. SMOTE+TL	7.042283	0	0.002381
25	Base vs. ADASYN	6.940221	0	0.002381
24	NCL vs. CCR	6.634035	0	0.002381
23	Base vs. Bord	6.37888	0	0.002381
22	Base vs. SMOTE+ENN	5.536867	0	0.002381
21	SMOTE vs. NCL	5.307228	0	0.002381
20	NCL vs. SMOTE+TL	4.822433	0.000001	0.003125
19	ADASYN vs. NCL	4.720371	0.000002	0.003125
18	Bord vs. NCL	4.159029	0.000032	0.003125
17	NCL vs. SMOTE+ENN	3.317017	0.00091	0.003125
16	SMOTE+ENN vs. CCR	3.317017	0.00091	0.003125
15	Bord vs. CCR	2.475005	0.013323	0.003333
14	Base vs. NCL	2.21985	0.026429	0.003571
13	SMOTE vs. SMOTE+ENN	1.99021	0.046568	0.003846
12	ADASYN vs. CCR	1.913664	0.055663	0.004167
11	SMOTE+TL vs. CCR	1.811602	0.070048	0.004545
10	SMOTE+TL vs. SMOTE+ENN	1.505416	0.132217	0.005
9	ADASYN vs. SMOTE+ENN	1.403353	0.160511	0.005556
8	SMOTE vs. CCR	1.326807	0.184573	0.00625
7	SMOTE vs. Bord	1.148198	0.250887	0.007143
6	Bord vs. SMOTE+ENN	0.842012	0.399781	0.008333
5	Bord vs. SMOTE+TL	0.663403	0.507072	0.01
4	ADASYN vs. SMOTE	0.586857	0.5573	0.0125
3	ADASYN vs. Bord	0.561341	0.574565	0.016667
2	SMOTE vs. SMOTE+TL	0.484795	0.627822	0.025
1	ADASYN vs. SMOTE+TL	0.102062	0.918707	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	8.853885	0	0.003571
27	Base vs. SMOTE	7.527078	0	0.004762
26	Base vs. SMOTE+TL	7.042283	0	0.004762
25	Base vs. ADASYN	6.940221	0	0.004762
24	NCL vs. CCR	6.634035	0	0.004762
23	Base vs. Bord	6.37888	0	0.004762
22	Base vs. SMOTE+ENN	5.536867	0	0.004762
21	SMOTE vs. NCL	5.307228	0	0.004762
20	NCL vs. SMOTE+TL	4.822433	0.000001	0.00625
19	ADASYN vs. NCL	4.720371	0.000002	0.00625
18	Bord vs. NCL	4.159029	0.000032	0.00625
17	NCL vs. SMOTE+ENN	3.317017	0.00091	0.00625
16	SMOTE+ENN vs. CCR	3.317017	0.00091	0.00625
15	Bord vs. CCR	2.475005	0.013323	0.006667
14	Base vs. NCL	2.21985	0.026429	0.007143
13	SMOTE vs. SMOTE+ENN	1.99021	0.046568	0.007692
12	ADASYN vs. CCR	1.913664	0.055663	0.008333
11	SMOTE+TL vs. CCR	1.811602	0.070048	0.009091
10	SMOTE+TL vs. SMOTE+ENN	1.505416	0.132217	0.01
9	ADASYN vs. SMOTE+ENN	1.403353	0.160511	0.011111
8	SMOTE vs. CCR	1.326807	0.184573	0.0125
7	SMOTE vs. Bord	1.148198	0.250887	0.014286
6	Bord vs. SMOTE+ENN	0.842012	0.399781	0.016667
5	Bord vs. SMOTE+TL	0.663403	0.507072	0.02
4	ADASYN vs. SMOTE	0.586857	0.5573	0.025
3	ADASYN vs. Bord	0.561341	0.574565	0.033333
2	SMOTE vs. SMOTE+TL	0.484795	0.627822	0.05
1	ADASYN vs. SMOTE+TL	0.102062	0.918707	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 .SMOTE	0	0
3	Base vs .SMOTE+TL	0	0
4	Base vs .ADASYN	0	0
5	NCL vs .CCR	0	0
6	Base vs .Bord	0	0
7	Base vs .SMOTE+ENN	0	0.000001
8	SMOTE vs .NCL	0	0.000002
9	NCL vs .SMOTE+TL	0.000001	0.000023
10	ADASYN vs .NCL	0.000002	0.000038
11	Bord vs .NCL	0.000032	0.000511
12	NCL vs .SMOTE+ENN	0.00091	0.014557
13	SMOTE+ENN vs .CCR	0.00091	0.014557
14	Bord vs .CCR	0.013323	0.199851
15	Base vs .NCL	0.026429	0.343576
16	SMOTE vs .SMOTE+ENN	0.046568	0.605381
17	ADASYN vs .CCR	0.055663	0.667957
18	SMOTE+TL vs .CCR	0.070048	0.770525
19	SMOTE+TL vs .SMOTE+ENN	0.132217	1.322173
20	ADASYN vs .SMOTE+ENN	0.160511	1.444603
21	SMOTE vs .CCR	0.184573	1.47658
22	SMOTE vs .Bord	0.250887	1.756207
23	Bord vs .SMOTE+ENN	0.399781	2.398687
24	Bord vs .SMOTE+TL	0.507072	2.535361
25	ADASYN vs .SMOTE	0.5573	2.535361
26	ADASYN vs .Bord	0.574565	2.535361
27	SMOTE vs .SMOTE+TL	0.627822	2.535361
28	ADASYN vs .SMOTE+TL	0.918707	2.535361

Table 4: Adjusted p-values