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	5.1875
ADASYN	6.0938
SMOTE	4
Bord	4.4688
NCL	4.9375
SMOTE+TL	4.25
SMOTE+ENN	3.6875
CCR	3.375

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 29.03125.

P-value computed by Friedman Test: 1.4280071109296077E-4.

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	ADASYN vs. CCR	4.4397	0.000009	0.001786
27	ADASYN vs. SMOTE+ENN	3.92939	0.000085	0.002381
26	ADASYN vs. SMOTE	3.419079	0.000628	0.002381
25	ADASYN vs. SMOTE+TL	3.010831	0.002605	0.002381
24	Base vs. CCR	2.9598	0.003078	0.002381
23	ADASYN vs. Bord	2.653614	0.007963	0.002381
22	NCL vs. CCR	2.551552	0.010724	0.002381
21	Base vs. SMOTE+ENN	2.44949	0.014306	0.002381
20	NCL vs. SMOTE+ENN	2.041241	0.041227	0.0025
19	Base vs. SMOTE	1.939179	0.052479	0.002632
18	ADASYN vs. NCL	1.888148	0.059006	0.002778
17	Bord vs. CCR	1.786086	0.074085	0.002941
16	Base vs. SMOTE+TL	1.530931	0.125786	0.003125
15	SMOTE vs. NCL	1.530931	0.125786	0.003333
14	Base vs. ADASYN	1.4799	0.1389	0.003571
13	SMOTE+TL vs. CCR	1.428869	0.153042	0.003846
12	Bord vs. SMOTE+ENN	1.275776	0.202035	0.004167
11	Base vs. Bord	1.173714	0.24051	0.004545
10	NCL vs. SMOTE+TL	1.122683	0.261572	0.005
9	SMOTE vs. CCR	1.020621	0.307434	0.005556
8	SMOTE+TL vs. SMOTE+ENN	0.918559	0.358326	0.00625
7	SMOTE vs. Bord	0.765466	0.443994	0.007143
6	Bord vs. NCL	0.765466	0.443994	0.008333
5	SMOTE vs. SMOTE+ENN	0.51031	0.609834	0.01
4	SMOTE+ENN vs. CCR	0.51031	0.609834	0.0125
3	Base vs. NCL	0.408248	0.683091	0.016667
2	SMOTE vs. SMOTE+TL	0.408248	0.683091	0.025
1	Bord 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	ADASYN vs. CCR	4.4397	0.000009	0.003571
27	ADASYN vs. SMOTE+ENN	3.92939	0.000085	0.004762
26	ADASYN vs. SMOTE	3.419079	0.000628	0.004762
25	ADASYN vs. SMOTE+TL	3.010831	0.002605	0.004762
24	Base vs. CCR	2.9598	0.003078	0.004762
23	ADASYN vs. Bord	2.653614	0.007963	0.004762
22	NCL vs. CCR	2.551552	0.010724	0.004762
21	Base vs. SMOTE+ENN	2.44949	0.014306	0.004762
20	NCL vs. SMOTE+ENN	2.041241	0.041227	0.005
19	Base vs. SMOTE	1.939179	0.052479	0.005263
18	ADASYN vs. NCL	1.888148	0.059006	0.005556
17	Bord vs. CCR	1.786086	0.074085	0.005882
16	Base vs. SMOTE+TL	1.530931	0.125786	0.00625
15	SMOTE vs. NCL	1.530931	0.125786	0.006667
14	Base vs. ADASYN	1.4799	0.1389	0.007143
13	SMOTE+TL vs. CCR	1.428869	0.153042	0.007692
12	Bord vs. SMOTE+ENN	1.275776	0.202035	0.008333
11	Base vs. Bord	1.173714	0.24051	0.009091
10	NCL vs. SMOTE+TL	1.122683	0.261572	0.01
9	SMOTE vs. CCR	1.020621	0.307434	0.011111
8	SMOTE+TL vs. SMOTE+ENN	0.918559	0.358326	0.0125
7	SMOTE vs. Bord	0.765466	0.443994	0.014286
6	Bord vs. NCL	0.765466	0.443994	0.016667
5	SMOTE vs. SMOTE+ENN	0.51031	0.609834	0.02
4	SMOTE+ENN vs. CCR	0.51031	0.609834	0.025
3	Base vs. NCL	0.408248	0.683091	0.033333
2	SMOTE vs. SMOTE+TL	0.408248	0.683091	0.05
1	Bord 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	ADASYN vs .CCR	0.000009	0.000252
2	ADASYN vs .SMOTE+ENN	0.000085	0.001788
3	ADASYN vs .SMOTE	0.000628	0.013195
4	ADASYN vs .SMOTE+TL	0.002605	0.054712
5	Base vs .CCR	0.003078	0.064646
6	ADASYN vs .Bord	0.007963	0.167233
7	NCL vs .CCR	0.010724	0.225213
8	Base vs .SMOTE+ENN	0.014306	0.300423
9	NCL vs .SMOTE+ENN	0.041227	0.659629
10	Base vs .SMOTE	0.052479	0.839672
11	ADASYN vs .NCL	0.059006	0.944097
12	Bord vs .CCR	0.074085	1.185365
13	Base vs .SMOTE+TL	0.125786	2.012583
14	SMOTE vs .NCL	0.125786	2.012583
15	Base vs .ADASYN	0.1389	2.012583
16	SMOTE+TL vs .CCR	0.153042	2.012583
17	Bord vs .SMOTE+ENN	0.202035	2.424417
18	Base vs .Bord	0.24051	2.645606
19	NCL vs .SMOTE+TL	0.261572	2.645606
20	SMOTE vs .CCR	0.307434	2.766907
21	SMOTE+TL vs .SMOTE+ENN	0.358326	2.866612
22	SMOTE vs .Bord	0.443994	3.107961
23	Bord vs .NCL	0.443994	3.107961
24	SMOTE vs .SMOTE+ENN	0.609834	3.107961
25	SMOTE+ENN vs .CCR	0.609834	3.107961
26	Base vs .NCL	0.683091	3.107961
27	SMOTE vs .SMOTE+TL	0.683091	3.107961
28	Bord vs .SMOTE+TL	0.720929	3.107961

Table 4: Adjusted p-values