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	1.9688
ADASYN	5.5938
SMOTE	5.0625
Bord	4.7188
NCL	2.75
SMOTE+TL	4.8438
SMOTE+ENN	4.1875
CCR	6.875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 90.0625.

P-value computed by Friedman Test: 8.895406633513403E-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	8.011873	0	0.001786
27	NCL vs. CCR	6.736097	0	0.002381
26	Base vs. ADASYN	5.9196	0	0.002381
25	Base vs. SMOTE	5.052073	0	0.002381
24	Base vs. SMOTE+TL	4.694855	0.000003	0.002381
23	ADASYN vs. NCL	4.643824	0.000003	0.002381
22	Base vs. Bord	4.490731	0.000007	0.002381
21	SMOTE+ENN vs. CCR	4.388669	0.000011	0.002381
20	SMOTE vs. NCL	3.776297	0.000159	0.003125
19	Base vs. SMOTE+ENN	3.623204	0.000291	0.003125
18	Bord vs. CCR	3.521142	0.00043	0.003125
17	NCL vs. SMOTE+TL	3.419079	0.000628	0.003125
16	SMOTE+TL vs. CCR	3.317017	0.00091	0.003125
15	Bord vs. NCL	3.214955	0.001305	0.003333
14	SMOTE vs. CCR	2.9598	0.003078	0.003846
13	NCL vs. SMOTE+ENN	2.347428	0.018904	0.003846
12	ADASYN vs. SMOTE+ENN	2.296397	0.021653	0.004167
11	ADASYN vs. CCR	2.092272	0.036414	0.004545
10	ADASYN vs. Bord	1.428869	0.153042	0.005
9	SMOTE vs. SMOTE+ENN	1.428869	0.153042	0.005556
8	Base vs. NCL	1.275776	0.202035	0.00625
7	ADASYN vs. SMOTE+TL	1.224745	0.220671	0.007143
6	SMOTE+TL vs. SMOTE+ENN	1.071652	0.283876	0.008333
5	ADASYN vs. SMOTE	0.867528	0.385653	0.01
4	Bord vs. SMOTE+ENN	0.867528	0.385653	0.0125
3	SMOTE vs. Bord	0.561341	0.574565	0.016667
2	SMOTE vs. SMOTE+TL	0.357217	0.720929	0.025
1	Bord vs. SMOTE+TL	0.204124	0.838256	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	8.011873	0	0.003571
27	NCL vs. CCR	6.736097	0	0.004762
26	Base vs. ADASYN	5.9196	0	0.004762
25	Base vs. SMOTE	5.052073	0	0.004762
24	Base vs. SMOTE+TL	4.694855	0.000003	0.004762
23	ADASYN vs. NCL	4.643824	0.000003	0.004762
22	Base vs. Bord	4.490731	0.000007	0.004762
21	SMOTE+ENN vs. CCR	4.388669	0.000011	0.004762
20	SMOTE vs. NCL	3.776297	0.000159	0.00625
19	Base vs. SMOTE+ENN	3.623204	0.000291	0.00625
18	Bord vs. CCR	3.521142	0.00043	0.00625
17	NCL vs. SMOTE+TL	3.419079	0.000628	0.00625
16	SMOTE+TL vs. CCR	3.317017	0.00091	0.00625
15	Bord vs. NCL	3.214955	0.001305	0.006667
14	SMOTE vs. CCR	2.9598	0.003078	0.007692
13	NCL vs. SMOTE+ENN	2.347428	0.018904	0.007692
12	ADASYN vs. SMOTE+ENN	2.296397	0.021653	0.008333
11	ADASYN vs. CCR	2.092272	0.036414	0.009091
10	ADASYN vs. Bord	1.428869	0.153042	0.01
9	SMOTE vs. SMOTE+ENN	1.428869	0.153042	0.011111
8	Base vs. NCL	1.275776	0.202035	0.0125
7	ADASYN vs. SMOTE+TL	1.224745	0.220671	0.014286
6	SMOTE+TL vs. SMOTE+ENN	1.071652	0.283876	0.016667
5	ADASYN vs. SMOTE	0.867528	0.385653	0.02
4	Bord vs. SMOTE+ENN	0.867528	0.385653	0.025
3	SMOTE vs. Bord	0.561341	0.574565	0.033333
2	SMOTE vs. SMOTE+TL	0.357217	0.720929	0.05
1	Bord vs. SMOTE+TL	0.204124	0.838256	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	NCL vs .CCR	0	0
3	Base vs .ADASYN	0	0
4	Base vs .SMOTE	0	0.000009
5	Base vs .SMOTE+TL	0.000003	0.000056
6	ADASYN vs .NCL	0.000003	0.000072
7	Base vs .Bord	0.000007	0.000149
8	SMOTE+ENN vs .CCR	0.000011	0.000239
9	SMOTE vs .NCL	0.000159	0.002547
10	Base vs .SMOTE+ENN	0.000291	0.004656
11	Bord vs .CCR	0.00043	0.006875
12	NCL vs .SMOTE+TL	0.000628	0.010053
13	SMOTE+TL vs .CCR	0.00091	0.014557
14	Bord vs .NCL	0.001305	0.01957
15	SMOTE vs .CCR	0.003078	0.040019
16	NCL vs .SMOTE+ENN	0.018904	0.245746
17	ADASYN vs .SMOTE+ENN	0.021653	0.259839
18	ADASYN vs .CCR	0.036414	0.400556
19	ADASYN vs .Bord	0.153042	1.530419
20	SMOTE vs .SMOTE+ENN	0.153042	1.530419
21	Base vs .NCL	0.202035	1.616278
22	ADASYN vs .SMOTE+TL	0.220671	1.616278
23	SMOTE+TL vs .SMOTE+ENN	0.283876	1.703259
24	ADASYN vs .SMOTE	0.385653	1.928265
25	Bord vs .SMOTE+ENN	0.385653	1.928265
26	SMOTE vs .Bord	0.574565	1.928265
27	SMOTE vs .SMOTE+TL	0.720929	1.928265
28	Bord vs .SMOTE+TL	0.838256	1.928265

Table 4: Adjusted p-values