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	2.25
ADASYN	5.625
SMOTE	4.7344
Bord	4.2812
NCL	4.3125
SMOTE+TL	4.1875
SMOTE+ENN	3.7031
CCR	6.9062

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 69.273438.

P-value computed by Friedman Test: 5.100142530523044E-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	7.603624	0	0.001786
27	Base vs. ADASYN	5.511352	0	0.002381
26	SMOTE+ENN vs. CCR	5.230681	0	0.002381
25	SMOTE+TL vs. CCR	4.4397	0.000009	0.002381
24	Bord vs. CCR	4.286607	0.000018	0.002381
23	NCL vs. CCR	4.235576	0.000023	0.002381
22	Base vs. SMOTE	4.056967	0.00005	0.002381
21	SMOTE vs. CCR	3.546657	0.00039	0.002381
20	Base vs. NCL	3.368048	0.000757	0.003125
19	Base vs. Bord	3.317017	0.00091	0.003125
18	Base vs. SMOTE+TL	3.163924	0.001557	0.003125
17	ADASYN vs. SMOTE+ENN	3.138409	0.001699	0.003125
16	Base vs. SMOTE+ENN	2.372943	0.017647	0.003125
15	ADASYN vs. SMOTE+TL	2.347428	0.018904	0.003333
14	ADASYN vs. Bord	2.194335	0.028211	0.003571
13	ADASYN vs. NCL	2.143304	0.032089	0.003846
12	ADASYN vs. CCR	2.092272	0.036414	0.004167
11	SMOTE vs. SMOTE+ENN	1.684024	0.092177	0.004545
10	ADASYN vs. SMOTE	1.454385	0.14584	0.005
9	NCL vs. SMOTE+ENN	0.995105	0.319685	0.005556
8	Bord vs. SMOTE+ENN	0.944074	0.345132	0.00625
7	SMOTE vs. SMOTE+TL	0.893043	0.371834	0.007143
6	SMOTE+TL vs. SMOTE+ENN	0.790981	0.428955	0.008333
5	SMOTE vs. Bord	0.73995	0.45933	0.01
4	SMOTE vs. NCL	0.688919	0.490874	0.0125
3	NCL vs. SMOTE+TL	0.204124	0.838256	0.016667
2	Bord vs. SMOTE+TL	0.153093	0.878325	0.025
1	Bord vs. NCL	0.051031	0.959301	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	7.603624	0	0.003571
27	Base vs. ADASYN	5.511352	0	0.004762
26	SMOTE+ENN vs. CCR	5.230681	0	0.004762
25	SMOTE+TL vs. CCR	4.4397	0.000009	0.004762
24	Bord vs. CCR	4.286607	0.000018	0.004762
23	NCL vs. CCR	4.235576	0.000023	0.004762
22	Base vs. SMOTE	4.056967	0.00005	0.004762
21	SMOTE vs. CCR	3.546657	0.00039	0.004762
20	Base vs. NCL	3.368048	0.000757	0.00625
19	Base vs. Bord	3.317017	0.00091	0.00625
18	Base vs. SMOTE+TL	3.163924	0.001557	0.00625
17	ADASYN vs. SMOTE+ENN	3.138409	0.001699	0.00625
16	Base vs. SMOTE+ENN	2.372943	0.017647	0.00625
15	ADASYN vs. SMOTE+TL	2.347428	0.018904	0.006667
14	ADASYN vs. Bord	2.194335	0.028211	0.007143
13	ADASYN vs. NCL	2.143304	0.032089	0.007692
12	ADASYN vs. CCR	2.092272	0.036414	0.008333
11	SMOTE vs. SMOTE+ENN	1.684024	0.092177	0.009091
10	ADASYN vs. SMOTE	1.454385	0.14584	0.01
9	NCL vs. SMOTE+ENN	0.995105	0.319685	0.011111
8	Bord vs. SMOTE+ENN	0.944074	0.345132	0.0125
7	SMOTE vs. SMOTE+TL	0.893043	0.371834	0.014286
6	SMOTE+TL vs. SMOTE+ENN	0.790981	0.428955	0.016667
5	SMOTE vs. Bord	0.73995	0.45933	0.02
4	SMOTE vs. NCL	0.688919	0.490874	0.025
3	NCL vs. SMOTE+TL	0.204124	0.838256	0.033333
2	Bord vs. SMOTE+TL	0.153093	0.878325	0.05
1	Bord vs. NCL	0.051031	0.959301	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	0.000001
3	SMOTE+ENN vs .CCR	0	0.000004
4	SMOTE+TL vs .CCR	0.000009	0.000189
5	Bord vs .CCR	0.000018	0.000381
6	NCL vs .CCR	0.000023	0.000479
7	Base vs .SMOTE	0.00005	0.001044
8	SMOTE vs .CCR	0.00039	0.008193
9	Base vs .NCL	0.000757	0.012112
10	Base vs .Bord	0.00091	0.014557
11	Base vs .SMOTE+TL	0.001557	0.024905
12	ADASYN vs .SMOTE+ENN	0.001699	0.027179
13	Base vs .SMOTE+ENN	0.017647	0.282352
14	ADASYN vs .SMOTE+TL	0.018904	0.283553
15	ADASYN vs .Bord	0.028211	0.366748
16	ADASYN vs .NCL	0.032089	0.417154
17	ADASYN vs .CCR	0.036414	0.43697
18	SMOTE vs .SMOTE+ENN	0.092177	1.013947
19	ADASYN vs .SMOTE	0.14584	1.458397
20	NCL vs .SMOTE+ENN	0.319685	2.877166
21	Bord vs .SMOTE+ENN	0.345132	2.877166
22	SMOTE vs .SMOTE+TL	0.371834	2.877166
23	SMOTE+TL vs .SMOTE+ENN	0.428955	2.877166
24	SMOTE vs .Bord	0.45933	2.877166
25	SMOTE vs .NCL	0.490874	2.877166
26	NCL vs .SMOTE+TL	0.838256	2.877166
27	Bord vs .SMOTE+TL	0.878325	2.877166
28	Bord vs .NCL	0.959301	2.877166

Table 4: Adjusted p-values