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	1.9219
ADASYN	5.8438
SMOTE	5.5312
Bord	5.0312
NCL	2.7031
SMOTE+TL	4.8125
SMOTE+ENN	3.8125
CCR	6.3438

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 90.648438.

P-value computed by Friedman Test: 5.7938431829995807E-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	7.220892	0	0.001786
27	Base vs. ADASYN	6.404395	0	0.002381
26	NCL vs. CCR	5.945116	0	0.002381
25	Base vs. SMOTE	5.894085	0	0.002381
24	ADASYN vs. NCL	5.128619	0	0.002381
23	Base vs. Bord	5.077588	0	0.002381
22	Base vs. SMOTE+TL	4.720371	0.000002	0.002381
21	SMOTE vs. NCL	4.618309	0.000004	0.002381
20	SMOTE+ENN vs. CCR	4.133514	0.000036	0.003125
19	Bord vs. NCL	3.801812	0.000144	0.003125
18	NCL vs. SMOTE+TL	3.444595	0.000572	0.003125
17	ADASYN vs. SMOTE+ENN	3.317017	0.00091	0.003125
16	Base vs. SMOTE+ENN	3.087378	0.002019	0.003125
15	SMOTE vs. SMOTE+ENN	2.806707	0.005005	0.003333
14	SMOTE+TL vs. CCR	2.500521	0.012401	0.003571
13	Bord vs. CCR	2.143304	0.032089	0.003846
12	Bord vs. SMOTE+ENN	1.99021	0.046568	0.004167
11	NCL vs. SMOTE+ENN	1.811602	0.070048	0.004545
10	ADASYN vs. SMOTE+TL	1.684024	0.092177	0.005
9	SMOTE+TL vs. SMOTE+ENN	1.632993	0.10247	0.005556
8	ADASYN vs. Bord	1.326807	0.184573	0.00625
7	SMOTE vs. CCR	1.326807	0.184573	0.007143
6	Base vs. NCL	1.275776	0.202035	0.008333
5	SMOTE vs. SMOTE+TL	1.173714	0.24051	0.01
4	ADASYN vs. CCR	0.816497	0.414216	0.0125
3	SMOTE vs. Bord	0.816497	0.414216	0.016667
2	ADASYN vs. SMOTE	0.51031	0.609834	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	Base vs. CCR	7.220892	0	0.003571
27	Base vs. ADASYN	6.404395	0	0.004762
26	NCL vs. CCR	5.945116	0	0.004762
25	Base vs. SMOTE	5.894085	0	0.004762
24	ADASYN vs. NCL	5.128619	0	0.004762
23	Base vs. Bord	5.077588	0	0.004762
22	Base vs. SMOTE+TL	4.720371	0.000002	0.004762
21	SMOTE vs. NCL	4.618309	0.000004	0.004762
20	SMOTE+ENN vs. CCR	4.133514	0.000036	0.00625
19	Bord vs. NCL	3.801812	0.000144	0.00625
18	NCL vs. SMOTE+TL	3.444595	0.000572	0.00625
17	ADASYN vs. SMOTE+ENN	3.317017	0.00091	0.00625
16	Base vs. SMOTE+ENN	3.087378	0.002019	0.00625
15	SMOTE vs. SMOTE+ENN	2.806707	0.005005	0.006667
14	SMOTE+TL vs. CCR	2.500521	0.012401	0.007692
13	Bord vs. CCR	2.143304	0.032089	0.007692
12	Bord vs. SMOTE+ENN	1.99021	0.046568	0.008333
11	NCL vs. SMOTE+ENN	1.811602	0.070048	0.009091
10	ADASYN vs. SMOTE+TL	1.684024	0.092177	0.01
9	SMOTE+TL vs. SMOTE+ENN	1.632993	0.10247	0.011111
8	ADASYN vs. Bord	1.326807	0.184573	0.0125
7	SMOTE vs. CCR	1.326807	0.184573	0.014286
6	Base vs. NCL	1.275776	0.202035	0.016667
5	SMOTE vs. SMOTE+TL	1.173714	0.24051	0.02
4	ADASYN vs. CCR	0.816497	0.414216	0.025
3	SMOTE vs. Bord	0.816497	0.414216	0.033333
2	ADASYN vs. SMOTE	0.51031	0.609834	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	Base vs .CCR	0	0
2	Base vs .ADASYN	0	0
3	NCL vs .CCR	0	0
4	Base vs .SMOTE	0	0
5	ADASYN vs .NCL	0	0.000006
6	Base vs .Bord	0	0.000008
7	Base vs .SMOTE+TL	0.000002	0.000049
8	SMOTE vs .NCL	0.000004	0.000081
9	SMOTE+ENN vs .CCR	0.000036	0.000572
10	Bord vs .NCL	0.000144	0.002298
11	NCL vs .SMOTE+TL	0.000572	0.009151
12	ADASYN vs .SMOTE+ENN	0.00091	0.014557
13	Base vs .SMOTE+ENN	0.002019	0.032309
14	SMOTE vs .SMOTE+ENN	0.005005	0.075076
15	SMOTE+TL vs .CCR	0.012401	0.161214
16	Bord vs .CCR	0.032089	0.417154
17	Bord vs .SMOTE+ENN	0.046568	0.558813
18	NCL vs .SMOTE+ENN	0.070048	0.770525
19	ADASYN vs .SMOTE+TL	0.092177	0.92177
20	SMOTE+TL vs .SMOTE+ENN	0.10247	0.922234
21	ADASYN vs .Bord	0.184573	1.47658
22	SMOTE vs .CCR	0.184573	1.47658
23	Base vs .NCL	0.202035	1.47658
24	SMOTE vs .SMOTE+TL	0.24051	1.47658
25	ADASYN vs .CCR	0.414216	1.656865
26	SMOTE vs .Bord	0.414216	1.656865
27	ADASYN vs .SMOTE	0.609834	1.656865
28	Bord vs .SMOTE+TL	0.720929	1.656865

Table 4: Adjusted p-values