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	7.3281
ADASYN	2.7969
SMOTE	4.4844
Bord	5.2656
NCL	4.9844
SMOTE+TL	4.1094
SMOTE+ENN	5.375
CCR	1.6562

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 110.533854.

P-value computed by Friedman Test: 8.233291826087452E-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	9.262133	0	0.001786
27	Base vs. ADASYN	7.3995	0	0.002381
26	SMOTE+ENN vs. CCR	6.072693	0	0.002381
25	Bord vs. CCR	5.894085	0	0.002381
24	NCL vs. CCR	5.434805	0	0.002381
23	Base vs. SMOTE+TL	5.256197	0	0.002381
22	Base vs. SMOTE	4.643824	0.000003	0.002381
21	SMOTE vs. CCR	4.618309	0.000004	0.002381
20	ADASYN vs. SMOTE+ENN	4.21006	0.000026	0.003125
19	ADASYN vs. Bord	4.031452	0.000055	0.003125
18	SMOTE+TL vs. CCR	4.005936	0.000062	0.003125
17	Base vs. NCL	3.827328	0.00013	0.003125
16	ADASYN vs. NCL	3.572173	0.000354	0.003125
15	Base vs. Bord	3.368048	0.000757	0.003333
14	Base vs. SMOTE+ENN	3.18944	0.001425	0.003846
13	ADASYN vs. SMOTE	2.755676	0.005857	0.003846
12	ADASYN vs. SMOTE+TL	2.143304	0.032089	0.004167
11	SMOTE+TL vs. SMOTE+ENN	2.066757	0.038757	0.004545
10	Bord vs. SMOTE+TL	1.888148	0.059006	0.005
9	ADASYN vs. CCR	1.862633	0.062514	0.005556
8	SMOTE vs. SMOTE+ENN	1.454385	0.14584	0.00625
7	NCL vs. SMOTE+TL	1.428869	0.153042	0.007143
6	SMOTE vs. Bord	1.275776	0.202035	0.008333
5	SMOTE vs. NCL	0.816497	0.414216	0.01
4	NCL vs. SMOTE+ENN	0.637888	0.523547	0.0125
3	SMOTE vs. SMOTE+TL	0.612372	0.540291	0.016667
2	Bord vs. NCL	0.459279	0.646034	0.025
1	Bord vs. SMOTE+ENN	0.178609	0.858245	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	9.262133	0	0.003571
27	Base vs. ADASYN	7.3995	0	0.004762
26	SMOTE+ENN vs. CCR	6.072693	0	0.004762
25	Bord vs. CCR	5.894085	0	0.004762
24	NCL vs. CCR	5.434805	0	0.004762
23	Base vs. SMOTE+TL	5.256197	0	0.004762
22	Base vs. SMOTE	4.643824	0.000003	0.004762
21	SMOTE vs. CCR	4.618309	0.000004	0.004762
20	ADASYN vs. SMOTE+ENN	4.21006	0.000026	0.00625
19	ADASYN vs. Bord	4.031452	0.000055	0.00625
18	SMOTE+TL vs. CCR	4.005936	0.000062	0.00625
17	Base vs. NCL	3.827328	0.00013	0.00625
16	ADASYN vs. NCL	3.572173	0.000354	0.00625
15	Base vs. Bord	3.368048	0.000757	0.006667
14	Base vs. SMOTE+ENN	3.18944	0.001425	0.007692
13	ADASYN vs. SMOTE	2.755676	0.005857	0.007692
12	ADASYN vs. SMOTE+TL	2.143304	0.032089	0.008333
11	SMOTE+TL vs. SMOTE+ENN	2.066757	0.038757	0.009091
10	Bord vs. SMOTE+TL	1.888148	0.059006	0.01
9	ADASYN vs. CCR	1.862633	0.062514	0.011111
8	SMOTE vs. SMOTE+ENN	1.454385	0.14584	0.0125
7	NCL vs. SMOTE+TL	1.428869	0.153042	0.014286
6	SMOTE vs. Bord	1.275776	0.202035	0.016667
5	SMOTE vs. NCL	0.816497	0.414216	0.02
4	NCL vs. SMOTE+ENN	0.637888	0.523547	0.025
3	SMOTE vs. SMOTE+TL	0.612372	0.540291	0.033333
2	Bord vs. NCL	0.459279	0.646034	0.05
1	Bord vs. SMOTE+ENN	0.178609	0.858245	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	SMOTE+ENN vs .CCR	0	0
4	Bord vs .CCR	0	0
5	NCL vs .CCR	0	0.000001
6	Base vs .SMOTE+TL	0	0.000003
7	Base vs .SMOTE	0.000003	0.000072
8	SMOTE vs .CCR	0.000004	0.000081
9	ADASYN vs .SMOTE+ENN	0.000026	0.000408
10	ADASYN vs .Bord	0.000055	0.000887
11	SMOTE+TL vs .CCR	0.000062	0.000988
12	Base vs .NCL	0.00013	0.002073
13	ADASYN vs .NCL	0.000354	0.005665
14	Base vs .Bord	0.000757	0.011355
15	Base vs .SMOTE+ENN	0.001425	0.018531
16	ADASYN vs .SMOTE	0.005857	0.076142
17	ADASYN vs .SMOTE+TL	0.032089	0.385065
18	SMOTE+TL vs .SMOTE+ENN	0.038757	0.426328
19	Bord vs .SMOTE+TL	0.059006	0.59006
20	ADASYN vs .CCR	0.062514	0.59006
21	SMOTE vs .SMOTE+ENN	0.14584	1.166718
22	NCL vs .SMOTE+TL	0.153042	1.166718
23	SMOTE vs .Bord	0.202035	1.212208
24	SMOTE vs .NCL	0.414216	2.071081
25	NCL vs .SMOTE+ENN	0.523547	2.094186
26	SMOTE vs .SMOTE+TL	0.540291	2.094186
27	Bord vs .NCL	0.646034	2.094186
28	Bord vs .SMOTE+ENN	0.858245	2.094186

Table 4: Adjusted p-values