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	6.9375
ADASYN	2.9688
SMOTE	4.3281
Bord	5.25
NCL	5.0625
SMOTE+TL	3.875
SMOTE+ENN	5.3906
CCR	2.1875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 83.872396.

P-value computed by Friedman Test: 5.5447091362736955E-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	7.756718	0	0.001786
27	Base vs. ADASYN	6.480942	0	0.002381
26	SMOTE+ENN vs. CCR	5.230681	0	0.002381
25	Base vs. SMOTE+TL	5.001042	0.000001	0.002381
24	Bord vs. CCR	5.001042	0.000001	0.002381
23	NCL vs. CCR	4.694855	0.000003	0.002381
22	Base vs. SMOTE	4.261092	0.00002	0.002381
21	ADASYN vs. SMOTE+ENN	3.954905	0.000077	0.002381
20	ADASYN vs. Bord	3.725266	0.000195	0.003125
19	SMOTE vs. CCR	3.495626	0.000473	0.003125
18	ADASYN vs. NCL	3.419079	0.000628	0.003125
17	Base vs. NCL	3.061862	0.0022	0.003125
16	Base vs. Bord	2.755676	0.005857	0.003125
15	SMOTE+TL vs. CCR	2.755676	0.005857	0.003333
14	Base vs. SMOTE+ENN	2.526036	0.011536	0.003571
13	SMOTE+TL vs. SMOTE+ENN	2.475005	0.013323	0.003846
12	Bord vs. SMOTE+TL	2.245366	0.024745	0.004167
11	ADASYN vs. SMOTE	2.21985	0.026429	0.004545
10	NCL vs. SMOTE+TL	1.939179	0.052479	0.005
9	SMOTE vs. SMOTE+ENN	1.735055	0.082731	0.005556
8	SMOTE vs. Bord	1.505416	0.132217	0.00625
7	ADASYN vs. SMOTE+TL	1.4799	0.1389	0.007143
6	ADASYN vs. CCR	1.275776	0.202035	0.008333
5	SMOTE vs. NCL	1.199229	0.230439	0.01
4	SMOTE vs. SMOTE+TL	0.73995	0.45933	0.0125
3	NCL vs. SMOTE+ENN	0.535826	0.592079	0.016667
2	Bord vs. NCL	0.306186	0.759463	0.025
1	Bord vs. SMOTE+ENN	0.22964	0.818372	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	7.756718	0	0.003571
27	Base vs. ADASYN	6.480942	0	0.004762
26	SMOTE+ENN vs. CCR	5.230681	0	0.004762
25	Base vs. SMOTE+TL	5.001042	0.000001	0.004762
24	Bord vs. CCR	5.001042	0.000001	0.004762
23	NCL vs. CCR	4.694855	0.000003	0.004762
22	Base vs. SMOTE	4.261092	0.00002	0.004762
21	ADASYN vs. SMOTE+ENN	3.954905	0.000077	0.004762
20	ADASYN vs. Bord	3.725266	0.000195	0.00625
19	SMOTE vs. CCR	3.495626	0.000473	0.00625
18	ADASYN vs. NCL	3.419079	0.000628	0.00625
17	Base vs. NCL	3.061862	0.0022	0.00625
16	Base vs. Bord	2.755676	0.005857	0.00625
15	SMOTE+TL vs. CCR	2.755676	0.005857	0.006667
14	Base vs. SMOTE+ENN	2.526036	0.011536	0.007692
13	SMOTE+TL vs. SMOTE+ENN	2.475005	0.013323	0.007692
12	Bord vs. SMOTE+TL	2.245366	0.024745	0.008333
11	ADASYN vs. SMOTE	2.21985	0.026429	0.009091
10	NCL vs. SMOTE+TL	1.939179	0.052479	0.01
9	SMOTE vs. SMOTE+ENN	1.735055	0.082731	0.011111
8	SMOTE vs. Bord	1.505416	0.132217	0.0125
7	ADASYN vs. SMOTE+TL	1.4799	0.1389	0.014286
6	ADASYN vs. CCR	1.275776	0.202035	0.016667
5	SMOTE vs. NCL	1.199229	0.230439	0.02
4	SMOTE vs. SMOTE+TL	0.73995	0.45933	0.025
3	NCL vs. SMOTE+ENN	0.535826	0.592079	0.033333
2	Bord vs. NCL	0.306186	0.759463	0.05
1	Bord vs. SMOTE+ENN	0.22964	0.818372	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	0.000004
4	Base vs .SMOTE+TL	0.000001	0.000012
5	Bord vs .CCR	0.000001	0.000012
6	NCL vs .CCR	0.000003	0.000056
7	Base vs .SMOTE	0.00002	0.000427
8	ADASYN vs .SMOTE+ENN	0.000077	0.001608
9	ADASYN vs .Bord	0.000195	0.003122
10	SMOTE vs .CCR	0.000473	0.007567
11	ADASYN vs .NCL	0.000628	0.010053
12	Base vs .NCL	0.0022	0.035194
13	Base vs .Bord	0.005857	0.093714
14	SMOTE+TL vs .CCR	0.005857	0.093714
15	Base vs .SMOTE+ENN	0.011536	0.149965
16	SMOTE+TL vs .SMOTE+ENN	0.013323	0.173204
17	Bord vs .SMOTE+TL	0.024745	0.296936
18	ADASYN vs .SMOTE	0.026429	0.296936
19	NCL vs .SMOTE+TL	0.052479	0.524795
20	SMOTE vs .SMOTE+ENN	0.082731	0.744579
21	SMOTE vs .Bord	0.132217	1.057738
22	ADASYN vs .SMOTE+TL	0.1389	1.057738
23	ADASYN vs .CCR	0.202035	1.212208
24	SMOTE vs .NCL	0.230439	1.212208
25	SMOTE vs .SMOTE+TL	0.45933	1.837321
26	NCL vs .SMOTE+ENN	0.592079	1.837321
27	Bord vs .NCL	0.759463	1.837321
28	Bord vs .SMOTE+ENN	0.818372	1.837321

Table 4: Adjusted p-values