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	7.1875
ADASYN	2.8906
SMOTE	4.875
Bord	5.1094
NCL	3.8594
SMOTE+TL	4.6719
SMOTE+ENN	5.5156
CCR	1.8906

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 99.226562.

P-value computed by Friedman Test: 7.281042435636209E-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	8.649761	0	0.001786
27	Base vs. ADASYN	7.016767	0	0.002381
26	SMOTE+ENN vs. CCR	5.9196	0	0.002381
25	Base vs. NCL	5.434805	0	0.002381
24	Bord vs. CCR	5.256197	0	0.002381
23	SMOTE vs. CCR	4.873464	0.000001	0.002381
22	SMOTE+TL vs. CCR	4.541762	0.000006	0.002381
21	ADASYN vs. SMOTE+ENN	4.286607	0.000018	0.002381
20	Base vs. SMOTE+TL	4.107998	0.00004	0.003125
19	Base vs. SMOTE	3.776297	0.000159	0.003125
18	ADASYN vs. Bord	3.623204	0.000291	0.003125
17	Base vs. Bord	3.393564	0.00069	0.003125
16	ADASYN vs. SMOTE	3.240471	0.001193	0.003125
15	NCL vs. CCR	3.214955	0.001305	0.003333
14	ADASYN vs. SMOTE+TL	2.908769	0.003629	0.003846
13	Base vs. SMOTE+ENN	2.73016	0.00633	0.003846
12	NCL vs. SMOTE+ENN	2.704645	0.006838	0.004167
11	Bord vs. NCL	2.041241	0.041227	0.004545
10	SMOTE vs. NCL	1.658509	0.097215	0.005
9	ADASYN vs. CCR	1.632993	0.10247	0.005556
8	ADASYN vs. NCL	1.581962	0.113658	0.00625
7	SMOTE+TL vs. SMOTE+ENN	1.377838	0.168253	0.007143
6	NCL vs. SMOTE+TL	1.326807	0.184573	0.008333
5	SMOTE vs. SMOTE+ENN	1.046136	0.295498	0.01
4	Bord vs. SMOTE+TL	0.714435	0.474959	0.0125
3	Bord vs. SMOTE+ENN	0.663403	0.507072	0.016667
2	SMOTE vs. Bord	0.382733	0.701918	0.025
1	SMOTE vs. SMOTE+TL	0.331702	0.740114	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	8.649761	0	0.003571
27	Base vs. ADASYN	7.016767	0	0.004762
26	SMOTE+ENN vs. CCR	5.9196	0	0.004762
25	Base vs. NCL	5.434805	0	0.004762
24	Bord vs. CCR	5.256197	0	0.004762
23	SMOTE vs. CCR	4.873464	0.000001	0.004762
22	SMOTE+TL vs. CCR	4.541762	0.000006	0.004762
21	ADASYN vs. SMOTE+ENN	4.286607	0.000018	0.004762
20	Base vs. SMOTE+TL	4.107998	0.00004	0.00625
19	Base vs. SMOTE	3.776297	0.000159	0.00625
18	ADASYN vs. Bord	3.623204	0.000291	0.00625
17	Base vs. Bord	3.393564	0.00069	0.00625
16	ADASYN vs. SMOTE	3.240471	0.001193	0.00625
15	NCL vs. CCR	3.214955	0.001305	0.006667
14	ADASYN vs. SMOTE+TL	2.908769	0.003629	0.007692
13	Base vs. SMOTE+ENN	2.73016	0.00633	0.007692
12	NCL vs. SMOTE+ENN	2.704645	0.006838	0.008333
11	Bord vs. NCL	2.041241	0.041227	0.009091
10	SMOTE vs. NCL	1.658509	0.097215	0.01
9	ADASYN vs. CCR	1.632993	0.10247	0.011111
8	ADASYN vs. NCL	1.581962	0.113658	0.0125
7	SMOTE+TL vs. SMOTE+ENN	1.377838	0.168253	0.014286
6	NCL vs. SMOTE+TL	1.326807	0.184573	0.016667
5	SMOTE vs. SMOTE+ENN	1.046136	0.295498	0.02
4	Bord vs. SMOTE+TL	0.714435	0.474959	0.025
3	Bord vs. SMOTE+ENN	0.663403	0.507072	0.033333
2	SMOTE vs. Bord	0.382733	0.701918	0.05
1	SMOTE vs. SMOTE+TL	0.331702	0.740114	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	Base vs .NCL	0	0.000001
5	Bord vs .CCR	0	0.000003
6	SMOTE vs .CCR	0.000001	0.000023
7	SMOTE+TL vs .CCR	0.000006	0.000117
8	ADASYN vs .SMOTE+ENN	0.000018	0.000381
9	Base vs .SMOTE+TL	0.00004	0.000639
10	Base vs .SMOTE	0.000159	0.002547
11	ADASYN vs .Bord	0.000291	0.004656
12	Base vs .Bord	0.00069	0.011038
13	ADASYN vs .SMOTE	0.001193	0.019093
14	NCL vs .CCR	0.001305	0.01957
15	ADASYN vs .SMOTE+TL	0.003629	0.047171
16	Base vs .SMOTE+ENN	0.00633	0.082295
17	NCL vs .SMOTE+ENN	0.006838	0.082295
18	Bord vs .NCL	0.041227	0.453495
19	SMOTE vs .NCL	0.097215	0.972148
20	ADASYN vs .CCR	0.10247	0.972148
21	ADASYN vs .NCL	0.113658	0.972148
22	SMOTE+TL vs .SMOTE+ENN	0.168253	1.177773
23	NCL vs .SMOTE+TL	0.184573	1.177773
24	SMOTE vs .SMOTE+ENN	0.295498	1.477491
25	Bord vs .SMOTE+TL	0.474959	1.899834
26	Bord vs .SMOTE+ENN	0.507072	1.899834
27	SMOTE vs .Bord	0.701918	1.899834
28	SMOTE vs .SMOTE+TL	0.740114	1.899834

Table 4: Adjusted p-values