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	3.875
ADASYN	6.5
SMOTE	4.4062
Bord	5.1562
NCL	4.5938
SMOTE+TL	4.7344
SMOTE+ENN	3.6719
CCR	3.0625

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 40.778646.

P-value computed by Friedman Test: 8.928281360898183E-7.

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	ADASYN vs. CCR	5.613414	0	0.001786
27	ADASYN vs. SMOTE+ENN	4.618309	0.000004	0.002381
26	Base vs. ADASYN	4.286607	0.000018	0.002381
25	ADASYN vs. SMOTE	3.419079	0.000628	0.002381
24	Bord vs. CCR	3.419079	0.000628	0.002381
23	ADASYN vs. NCL	3.112893	0.001853	0.002381
22	ADASYN vs. SMOTE+TL	2.883254	0.003936	0.002381
21	SMOTE+TL vs. CCR	2.73016	0.00633	0.002381
20	NCL vs. CCR	2.500521	0.012401	0.0025
19	Bord vs. SMOTE+ENN	2.423974	0.015352	0.002632
18	ADASYN vs. Bord	2.194335	0.028211	0.002778
17	SMOTE vs. CCR	2.194335	0.028211	0.002941
16	Base vs. Bord	2.092272	0.036414	0.003125
15	SMOTE+TL vs. SMOTE+ENN	1.735055	0.082731	0.003333
14	NCL vs. SMOTE+ENN	1.505416	0.132217	0.003571
13	Base vs. SMOTE+TL	1.403353	0.160511	0.003846
12	Base vs. CCR	1.326807	0.184573	0.004167
11	SMOTE vs. Bord	1.224745	0.220671	0.004545
10	SMOTE vs. SMOTE+ENN	1.199229	0.230439	0.005
9	Base vs. NCL	1.173714	0.24051	0.005556
8	SMOTE+ENN vs. CCR	0.995105	0.319685	0.00625
7	Bord vs. NCL	0.918559	0.358326	0.007143
6	Base vs. SMOTE	0.867528	0.385653	0.008333
5	Bord vs. SMOTE+TL	0.688919	0.490874	0.01
4	SMOTE vs. SMOTE+TL	0.535826	0.592079	0.0125
3	Base vs. SMOTE+ENN	0.331702	0.740114	0.016667
2	SMOTE vs. NCL	0.306186	0.759463	0.025
1	NCL vs. SMOTE+TL	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	ADASYN vs. CCR	5.613414	0	0.003571
27	ADASYN vs. SMOTE+ENN	4.618309	0.000004	0.004762
26	Base vs. ADASYN	4.286607	0.000018	0.004762
25	ADASYN vs. SMOTE	3.419079	0.000628	0.004762
24	Bord vs. CCR	3.419079	0.000628	0.004762
23	ADASYN vs. NCL	3.112893	0.001853	0.004762
22	ADASYN vs. SMOTE+TL	2.883254	0.003936	0.004762
21	SMOTE+TL vs. CCR	2.73016	0.00633	0.004762
20	NCL vs. CCR	2.500521	0.012401	0.005
19	Bord vs. SMOTE+ENN	2.423974	0.015352	0.005263
18	ADASYN vs. Bord	2.194335	0.028211	0.005556
17	SMOTE vs. CCR	2.194335	0.028211	0.005882
16	Base vs. Bord	2.092272	0.036414	0.00625
15	SMOTE+TL vs. SMOTE+ENN	1.735055	0.082731	0.006667
14	NCL vs. SMOTE+ENN	1.505416	0.132217	0.007143
13	Base vs. SMOTE+TL	1.403353	0.160511	0.007692
12	Base vs. CCR	1.326807	0.184573	0.008333
11	SMOTE vs. Bord	1.224745	0.220671	0.009091
10	SMOTE vs. SMOTE+ENN	1.199229	0.230439	0.01
9	Base vs. NCL	1.173714	0.24051	0.011111
8	SMOTE+ENN vs. CCR	0.995105	0.319685	0.0125
7	Bord vs. NCL	0.918559	0.358326	0.014286
6	Base vs. SMOTE	0.867528	0.385653	0.016667
5	Bord vs. SMOTE+TL	0.688919	0.490874	0.02
4	SMOTE vs. SMOTE+TL	0.535826	0.592079	0.025
3	Base vs. SMOTE+ENN	0.331702	0.740114	0.033333
2	SMOTE vs. NCL	0.306186	0.759463	0.05
1	NCL vs. SMOTE+TL	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	ADASYN vs .CCR	0	0.000001
2	ADASYN vs .SMOTE+ENN	0.000004	0.000081
3	Base vs .ADASYN	0.000018	0.000381
4	ADASYN vs .SMOTE	0.000628	0.013195
5	Bord vs .CCR	0.000628	0.013195
6	ADASYN vs .NCL	0.001853	0.038905
7	ADASYN vs .SMOTE+TL	0.003936	0.082654
8	SMOTE+TL vs .CCR	0.00633	0.132937
9	NCL vs .CCR	0.012401	0.198417
10	Bord vs .SMOTE+ENN	0.015352	0.245627
11	ADASYN vs .Bord	0.028211	0.451382
12	SMOTE vs .CCR	0.028211	0.451382
13	Base vs .Bord	0.036414	0.582626
14	SMOTE+TL vs .SMOTE+ENN	0.082731	1.240965
15	NCL vs .SMOTE+ENN	0.132217	1.718824
16	Base vs .SMOTE+TL	0.160511	2.086649
17	Base vs .CCR	0.184573	2.214871
18	SMOTE vs .Bord	0.220671	2.427385
19	SMOTE vs .SMOTE+ENN	0.230439	2.427385
20	Base vs .NCL	0.24051	2.427385
21	SMOTE+ENN vs .CCR	0.319685	2.557481
22	Bord vs .NCL	0.358326	2.557481
23	Base vs .SMOTE	0.385653	2.557481
24	Bord vs .SMOTE+TL	0.490874	2.557481
25	SMOTE vs .SMOTE+TL	0.592079	2.557481
26	Base vs .SMOTE+ENN	0.740114	2.557481
27	SMOTE vs .NCL	0.759463	2.557481
28	NCL vs .SMOTE+TL	0.818372	2.557481

Table 4: Adjusted p-values