

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	3.0156
ADASYN	5.2031
SMOTE	4.8438
Bord	3.625
NCL	4.375
SMOTE+TL	4.5156
SMOTE+ENN	3.5469
CCR	6.875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 54.114583.

P-value computed by Friedman Test: 2.2787072229135674E-9.

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	6.302333	0	0.001786
27	SMOTE+ENN vs. CCR	5.434805	0	0.002381
26	Bord vs. CCR	5.307228	0	0.002381
25	NCL vs. CCR	4.082483	0.000045	0.002381
24	SMOTE+TL vs. CCR	3.852843	0.000117	0.002381
23	Base vs. ADASYN	3.572173	0.000354	0.002381
22	SMOTE vs. CCR	3.317017	0.00091	0.002381
21	Base vs. SMOTE	2.985316	0.002833	0.002381
20	ADASYN vs. CCR	2.73016	0.00633	0.0025
19	ADASYN vs. SMOTE+ENN	2.704645	0.006838	0.002632
18	ADASYN vs. Bord	2.577067	0.009964	0.002778
17	Base vs. SMOTE+TL	2.44949	0.014306	0.002941
16	Base vs. NCL	2.21985	0.026429	0.003125
15	SMOTE vs. SMOTE+ENN	2.117788	0.034193	0.003333
14	SMOTE vs. Bord	1.99021	0.046568	0.003571
13	SMOTE+TL vs. SMOTE+ENN	1.581962	0.113658	0.003846
12	Bord vs. SMOTE+TL	1.454385	0.14584	0.004167
11	ADASYN vs. NCL	1.352322	0.176272	0.004545
10	NCL vs. SMOTE+ENN	1.352322	0.176272	0.005
9	Bord vs. NCL	1.224745	0.220671	0.005556
8	ADASYN vs. SMOTE+TL	1.122683	0.261572	0.00625
7	Base vs. Bord	0.995105	0.319685	0.007143
6	Base vs. SMOTE+ENN	0.867528	0.385653	0.008333
5	SMOTE vs. NCL	0.765466	0.443994	0.01
4	ADASYN vs. SMOTE	0.586857	0.5573	0.0125
3	SMOTE vs. SMOTE+TL	0.535826	0.592079	0.016667
2	NCL vs. SMOTE+TL	0.22964	0.818372	0.025
1	Bord vs. SMOTE+ENN	0.127578	0.898483	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	6.302333	0	0.003571
27	SMOTE+ENN vs. CCR	5.434805	0	0.004762
26	Bord vs. CCR	5.307228	0	0.004762
25	NCL vs. CCR	4.082483	0.000045	0.004762
24	SMOTE+TL vs. CCR	3.852843	0.000117	0.004762
23	Base vs. ADASYN	3.572173	0.000354	0.004762
22	SMOTE vs. CCR	3.317017	0.00091	0.004762
21	Base vs. SMOTE	2.985316	0.002833	0.004762
20	ADASYN vs. CCR	2.73016	0.00633	0.00625
19	ADASYN vs. SMOTE+ENN	2.704645	0.006838	0.00625
18	ADASYN vs. Bord	2.577067	0.009964	0.00625
17	Base vs. SMOTE+TL	2.44949	0.014306	0.00625
16	Base vs. NCL	2.21985	0.026429	0.00625
15	SMOTE vs. SMOTE+ENN	2.117788	0.034193	0.006667
14	SMOTE vs. Bord	1.99021	0.046568	0.007143
13	SMOTE+TL vs. SMOTE+ENN	1.581962	0.113658	0.007692
12	Bord vs. SMOTE+TL	1.454385	0.14584	0.008333
11	ADASYN vs. NCL	1.352322	0.176272	0.009091
10	NCL vs. SMOTE+ENN	1.352322	0.176272	0.01
9	Bord vs. NCL	1.224745	0.220671	0.01111
8	ADASYN vs. SMOTE+TL	1.122683	0.261572	0.0125
7	Base vs. Bord	0.995105	0.319685	0.014286
6	Base vs. SMOTE+ENN	0.867528	0.385653	0.016667
5	SMOTE vs. NCL	0.765466	0.443994	0.02
4	ADASYN vs. SMOTE	0.586857	0.5573	0.025
3	SMOTE vs. SMOTE+TL	0.535826	0.592079	0.033333
2	NCL vs. SMOTE+TL	0.22964	0.818372	0.05
1	Bord vs. SMOTE+ENN	0.127578	0.898483	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_{Shelf}
1	Base vs .CCR	0	0
2	SMOTE+ENN vs .CCR	0	0.000001
3	Bord vs .CCR	0	0.000002
4	NCL vs .CCR	0.000045	0.000936
5	SMOTE+TL vs .CCR	0.000117	0.002452
6	Base vs .ADASYN	0.000354	0.007435
7	SMOTE vs .CCR	0.00091	0.019107
8	Base vs .SMOTE	0.002833	0.05949
9	ADASYN vs .CCR	0.00633	0.101286
10	ADASYN vs .SMOTE+ENN	0.006838	0.109404
11	ADASYN vs .Bord	0.009964	0.159428
12	Base vs .SMOTE+TL	0.014306	0.228894
13	Base vs .NCL	0.026429	0.422863
14	SMOTE vs .SMOTE+ENN	0.034193	0.512895
15	SMOTE vs .Bord	0.046568	0.605381
16	SMOTE+TL vs .SMOTE+ENN	0.113658	1.477557
17	Bord vs .SMOTE+TL	0.14584	1.750077
18	ADASYN vs .NCL	0.176272	1.938994
19	NCL vs .SMOTE+ENN	0.176272	1.938994
20	Bord vs .NCL	0.220671	1.986042
21	ADASYN vs .SMOTE+TL	0.261572	2.092578
22	Base vs .Bord	0.319685	2.237796
23	Base vs .SMOTE+ENN	0.385653	2.313918
24	SMOTE vs .NCL	0.443994	2.313918
25	ADASYN vs .SMOTE	0.5573	2.313918
26	SMOTE vs .SMOTE+TL	0.592079	2.313918
27	NCL vs .SMOTE+TL	0.818372	2.313918
28	Bord vs .SMOTE+ENN	0.898483	2.313918

Table 4: Adjusted p -values