

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	3.0938
ADASYN	5.5625
SMOTE	4.5312
Bord	3.75
NCL	5
SMOTE+TL	4.4375
SMOTE+ENN	2.9375
CCR	6.6875

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 59.46875.

P-value computed by Friedman Test: 2.548554700609884E-10.

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	SMOTE+ENN vs. CCR	6.123724	0	0.001786
27	Base vs. CCR	5.868569	0	0.002381
26	Bord vs. CCR	4.796917	0.000002	0.002381
25	ADASYN vs. SMOTE+ENN	4.286607	0.000018	0.002381
24	Base vs. ADASYN	4.031452	0.000055	0.002381
23	SMOTE+TL vs. CCR	3.674235	0.000239	0.002381
22	SMOTE vs. CCR	3.521142	0.00043	0.002381
21	NCL vs. SMOTE+ENN	3.368048	0.000757	0.002381
20	Base vs. NCL	3.112893	0.001853	0.003125
19	ADASYN vs. Bord	2.9598	0.003078	0.003125
18	NCL vs. CCR	2.755676	0.005857	0.003125
17	SMOTE vs. SMOTE+ENN	2.602583	0.009252	0.003125
16	SMOTE+TL vs. SMOTE+ENN	2.44949	0.014306	0.003125
15	Base vs. SMOTE	2.347428	0.018904	0.003333
14	Base vs. SMOTE+TL	2.194335	0.028211	0.003571
13	Bord vs. NCL	2.041241	0.041227	0.003846
12	ADASYN vs. SMOTE+TL	1.837117	0.066193	0.004167
11	ADASYN vs. CCR	1.837117	0.066193	0.004545
10	ADASYN vs. SMOTE	1.684024	0.092177	0.005
9	Bord vs. SMOTE+ENN	1.326807	0.184573	0.005556
8	SMOTE vs. Bord	1.275776	0.202035	0.00625
7	Bord vs. SMOTE+TL	1.122683	0.261572	0.007143
6	Base vs. Bord	1.071652	0.283876	0.008333
5	ADASYN vs. NCL	0.918559	0.358326	0.01
4	NCL vs. SMOTE+TL	0.918559	0.358326	0.0125
3	SMOTE vs. NCL	0.765466	0.443994	0.016667
2	Base vs. SMOTE+ENN	0.255155	0.798603	0.025
1	SMOTE vs. SMOTE+TL	0.153093	0.878325	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	SMOTE+ENN vs. CCR	6.123724	0	0.003571
27	Base vs. CCR	5.868569	0	0.004762
26	Bord vs. CCR	4.796917	0.000002	0.004762
25	ADASYN vs. SMOTE+ENN	4.286607	0.000018	0.004762
24	Base vs. ADASYN	4.031452	0.000055	0.004762
23	SMOTE+TL vs. CCR	3.674235	0.000239	0.004762
22	SMOTE vs. CCR	3.521142	0.00043	0.004762
21	NCL vs. SMOTE+ENN	3.368048	0.000757	0.004762
20	Base vs. NCL	3.112893	0.001853	0.00625
19	ADASYN vs. Bord	2.9598	0.003078	0.00625
18	NCL vs. CCR	2.755676	0.005857	0.00625
17	SMOTE vs. SMOTE+ENN	2.602583	0.009252	0.00625
16	SMOTE+TL vs. SMOTE+ENN	2.44949	0.014306	0.00625
15	Base vs. SMOTE	2.347428	0.018904	0.006667
14	Base vs. SMOTE+TL	2.194335	0.028211	0.007143
13	Bord vs. NCL	2.041241	0.041227	0.007692
12	ADASYN vs. SMOTE+TL	1.837117	0.066193	0.008333
11	ADASYN vs. CCR	1.837117	0.066193	0.009091
10	ADASYN vs. SMOTE	1.684024	0.092177	0.01
9	Bord vs. SMOTE+ENN	1.326807	0.184573	0.01111
8	SMOTE vs. Bord	1.275776	0.202035	0.0125
7	Bord vs. SMOTE+TL	1.122683	0.261572	0.014286
6	Base vs. Bord	1.071652	0.283876	0.016667
5	ADASYN vs. NCL	0.918559	0.358326	0.02
4	NCL vs. SMOTE+TL	0.918559	0.358326	0.025
3	SMOTE vs. NCL	0.765466	0.443994	0.033333
2	Base vs. SMOTE+ENN	0.255155	0.798603	0.05
1	SMOTE vs. SMOTE+TL	0.153093	0.878325	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	SMOTE+ENN vs .CCR	0	0
2	Base vs .CCR	0	0
3	Bord vs .CCR	0.000002	0.000034
4	ADASYN vs .SMOTE+ENN	0.000018	0.000381
5	Base vs .ADASYN	0.000055	0.001164
6	SMOTE+TL vs .CCR	0.000239	0.00501
7	SMOTE vs .CCR	0.00043	0.009024
8	NCL vs .SMOTE+ENN	0.000757	0.015897
9	Base vs .NCL	0.001853	0.029642
10	ADASYN vs .Bord	0.003078	0.049254
11	NCL vs .CCR	0.005857	0.093714
12	SMOTE vs .SMOTE+ENN	0.009252	0.148039
13	SMOTE+TL vs .SMOTE+ENN	0.014306	0.228894
14	Base vs .SMOTE	0.018904	0.283553
15	Base vs .SMOTE+TL	0.028211	0.366748
16	Bord vs .NCL	0.041227	0.535949
17	ADASYN vs .SMOTE+TL	0.066193	0.794311
18	ADASYN vs .CCR	0.066193	0.794311
19	ADASYN vs .SMOTE	0.092177	0.92177
20	Bord vs .SMOTE+ENN	0.184573	1.661153
21	SMOTE vs .Bord	0.202035	1.661153
22	Bord vs .SMOTE+TL	0.261572	1.831006
23	Base vs .Bord	0.283876	1.831006
24	ADASYN vs .NCL	0.358326	1.831006
25	NCL vs .SMOTE+TL	0.358326	1.831006
26	SMOTE vs .NCL	0.443994	1.831006
27	Base vs .SMOTE+ENN	0.798603	1.831006
28	SMOTE vs .SMOTE+TL	0.878325	1.831006

Table 4: Adjusted p -values