

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	7.3438
ADASYN	4.25
SMOTE	3.5938
Bord	3.7344
NCL	6.6875
SMOTE+TL	3.4531
SMOTE+ENN	3.6719
CCR	3.2656

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 94.119792.

P-value computed by Friedman Test: 8.832590214780112E-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	6.65955	0	0.001786
27	Base vs. SMOTE+TL	6.35364	0	0.002381
26	Base vs. SMOTE	6.12374	0	0.002381
25	Base vs. SMOTE+ENN	5.996147	0	0.002381
24	Base vs. Bord	5.894085	0	0.002381
23	NCL vs. CCR	5.587898	0	0.002381
22	NCL vs. SMOTE+TL	5.281712	0	0.002381
21	Base vs. ADASYN	5.052073	0	0.002381
20	SMOTE vs. NCL	5.052073	0	0.003125
19	NCL vs. SMOTE+ENN	4.924495	0.000001	0.003125
18	Bord vs. NCL	4.822433	0.000001	0.003125
17	ADASYN vs. NCL	3.980421	0.000069	0.003125
16	ADASYN vs. CCR	1.607478	0.10795	0.003125
15	ADASYN vs. SMOTE+TL	1.301291	0.193159	0.003333
14	Base vs. NCL	1.071652	0.283876	0.003571
13	ADASYN vs. SMOTE	1.071652	0.283876	0.003846
12	ADASYN vs. SMOTE+ENN	0.944074	0.345132	0.004167
11	ADASYN vs. Bord	0.842012	0.399781	0.004545
10	Bord vs. CCR	0.765466	0.443994	0.005
9	SMOTE+ENN vs. CCR	0.663403	0.507072	0.005556
8	SMOTE vs. CCR	0.535826	0.592079	0.00625
7	Bord vs. SMOTE+TL	0.459279	0.646034	0.007143
6	SMOTE+TL vs. SMOTE+ENN	0.357217	0.720929	0.008333
5	SMOTE+TL vs. CCR	0.306186	0.759463	0.01
4	SMOTE vs. Bord	0.22964	0.818372	0.0125
3	SMOTE vs. SMOTE+TL	0.22964	0.818372	0.016667
2	SMOTE vs. SMOTE+ENN	0.127578	0.898483	0.025
1	Bord vs. SMOTE+ENN	0.102062	0.918707	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	6.65955	0	0.003571
27	Base vs. SMOTE+TL	6.35364	0	0.004762
26	Base vs. SMOTE	6.123724	0	0.004762
25	Base vs. SMOTE+ENN	5.996147	0	0.004762
24	Base vs. Bord	5.894085	0	0.004762
23	NCL vs. CCR	5.587898	0	0.004762
22	NCL vs. SMOTE+TL	5.281712	0	0.004762
21	Base vs. ADASYN	5.052073	0	0.004762
20	SMOTE vs. NCL	5.052073	0	0.00625
19	NCL vs. SMOTE+ENN	4.924495	0.000001	0.00625
18	Bord vs. NCL	4.822433	0.000001	0.00625
17	ADASYN vs. NCL	3.980421	0.000069	0.00625
16	ADASYN vs. CCR	1.607478	0.10795	0.00625
15	ADASYN vs. SMOTE+TL	1.301291	0.193159	0.006667
14	Base vs. NCL	1.071652	0.283876	0.007143
13	ADASYN vs. SMOTE	1.071652	0.283876	0.007692
12	ADASYN vs. SMOTE+ENN	0.944074	0.345132	0.008333
11	ADASYN vs. Bord	0.842012	0.399781	0.009091
10	Bord vs. CCR	0.765466	0.443994	0.01
9	SMOTE+ENN vs. CCR	0.663403	0.507072	0.01111
8	SMOTE vs. CCR	0.535826	0.592079	0.0125
7	Bord vs. SMOTE+TL	0.459279	0.646034	0.014286
6	SMOTE+TL vs. SMOTE+ENN	0.357217	0.720929	0.016667
5	SMOTE+TL vs. CCR	0.306186	0.759463	0.02
4	SMOTE vs. Bord	0.22964	0.818372	0.025
3	SMOTE vs. SMOTE+TL	0.22964	0.818372	0.033333
2	SMOTE vs. SMOTE+ENN	0.127578	0.898483	0.05
1	Bord vs. SMOTE+ENN	0.102062	0.918707	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	Base vs .SMOTE+TL	0	0
3	Base vs .SMOTE	0	0
4	Base vs .SMOTE+ENN	0	0
5	Base vs .Bord	0	0
6	NCL vs .CCR	0	0
7	NCL vs .SMOTE+TL	0	0.000003
8	Base vs .ADASYN	0	0.000009
9	SMOTE vs .NCL	0	0.000009
10	NCL vs .SMOTE+ENN	0.000001	0.000014
11	Bord vs .NCL	0.000001	0.000023
12	ADASYN vs .NCL	0.000069	0.001101
13	ADASYN vs .CCR	0.10795	1.727194
14	ADASYN vs .SMOTE+TL	0.193159	2.897381
15	Base vs .NCL	0.283876	3.690394
16	ADASYN vs .SMOTE	0.283876	3.690394
17	ADASYN vs .SMOTE+ENN	0.345132	4.141581
18	ADASYN vs .Bord	0.399781	4.397593
19	Bord vs .CCR	0.443994	4.439944
20	SMOTE+ENN vs .CCR	0.507072	4.56365
21	SMOTE vs .CCR	0.592079	4.736631
22	Bord vs .SMOTE+TL	0.646034	4.736631
23	SMOTE+TL vs .SMOTE+ENN	0.720929	4.736631
24	SMOTE+TL vs .CCR	0.759463	4.736631
25	SMOTE vs .Bord	0.818372	4.736631
26	SMOTE vs .SMOTE+TL	0.818372	4.736631
27	SMOTE vs .SMOTE+ENN	0.898483	4.736631
28	Bord vs .SMOTE+ENN	0.918707	4.736631

Table 4: Adjusted p -values