

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	1.9219
ADASYN	5.4375
SMOTE	5.5312
Bord	4.75
NCL	3.1094
SMOTE+TL	4.9375
SMOTE+ENN	3.9062
CCR	6.4062

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 78.736979.

P-value computed by Friedman Test: 6.110123518254795E-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	7.322954	0	0.001786
27	Base vs. SMOTE	5.894085	0	0.002381
26	Base vs. ADASYN	5.740992	0	0.002381
25	NCL vs. CCR	5.383774	0	0.002381
24	Base vs. SMOTE+TL	4.924495	0.000001	0.002381
23	Base vs. Bord	4.618309	0.000004	0.002381
22	SMOTE+ENN vs. CCR	4.082483	0.000045	0.002381
21	SMOTE vs. NCL	3.954905	0.000077	0.002381
20	ADASYN vs. NCL	3.801812	0.000144	0.003125
19	Base vs. SMOTE+ENN	3.240471	0.001193	0.003125
18	NCL vs. SMOTE+TL	2.985316	0.002833	0.003125
17	Bord vs. CCR	2.704645	0.006838	0.003125
16	Bord vs. NCL	2.679129	0.007381	0.003125
15	SMOTE vs. SMOTE+ENN	2.653614	0.007963	0.003333
14	ADASYN vs. SMOTE+ENN	2.500521	0.012401	0.003571
13	SMOTE+TL vs. CCR	2.398459	0.016464	0.003846
12	Base vs. NCL	1.939179	0.052479	0.004167
11	SMOTE+TL vs. SMOTE+ENN	1.684024	0.092177	0.004545
10	ADASYN vs. CCR	1.581962	0.113658	0.005
9	SMOTE vs. CCR	1.428869	0.153042	0.005556
8	Bord vs. SMOTE+ENN	1.377838	0.168253	0.00625
7	NCL vs. SMOTE+ENN	1.301291	0.193159	0.007143
6	SMOTE vs. Bord	1.275776	0.202035	0.008333
5	ADASYN vs. Bord	1.122683	0.261572	0.01
4	SMOTE vs. SMOTE+TL	0.96959	0.332251	0.0125
3	ADASYN vs. SMOTE+TL	0.816497	0.414216	0.016667
2	Bord vs. SMOTE+TL	0.306186	0.759463	0.025
1	ADASYN vs. SMOTE	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	Base vs. CCR	7.322954	0	0.003571
27	Base vs. SMOTE	5.894085	0	0.004762
26	Base vs. ADASYN	5.740992	0	0.004762
25	NCL vs. CCR	5.383774	0	0.004762
24	Base vs. SMOTE+TL	4.924495	0.000001	0.004762
23	Base vs. Bord	4.618309	0.000004	0.004762
22	SMOTE+ENN vs. CCR	4.082483	0.000045	0.004762
21	SMOTE vs. NCL	3.954905	0.000077	0.004762
20	ADASYN vs. NCL	3.801812	0.000144	0.00625
19	Base vs. SMOTE+ENN	3.240471	0.001193	0.00625
18	NCL vs. SMOTE+TL	2.985316	0.002833	0.00625
17	Bord vs. CCR	2.704645	0.006838	0.00625
16	Bord vs. NCL	2.679129	0.007381	0.00625
15	SMOTE vs. SMOTE+ENN	2.653614	0.007963	0.006667
14	ADASYN vs. SMOTE+ENN	2.500521	0.012401	0.007143
13	SMOTE+TL vs. CCR	2.398459	0.016464	0.007692
12	Base vs. NCL	1.939179	0.052479	0.008333
11	SMOTE+TL vs. SMOTE+ENN	1.684024	0.092177	0.009091
10	ADASYN vs. CCR	1.581962	0.113658	0.01
9	SMOTE vs. CCR	1.428869	0.153042	0.011111
8	Bord vs. SMOTE+ENN	1.377838	0.168253	0.0125
7	NCL vs. SMOTE+ENN	1.301291	0.193159	0.014286
6	SMOTE vs. Bord	1.275776	0.202035	0.016667
5	ADASYN vs. Bord	1.122683	0.261572	0.02
4	SMOTE vs. SMOTE+TL	0.96959	0.332251	0.025
3	ADASYN vs. SMOTE+TL	0.816497	0.414216	0.033333
2	Bord vs. SMOTE+TL	0.306186	0.759463	0.05
1	ADASYN vs. SMOTE	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	Base vs .CCR	0	0
2	Base vs .SMOTE	0	0
3	Base vs .ADASYN	0	0
4	NCL vs .CCR	0	0.000002
5	Base vs .SMOTE+TL	0.000001	0.000018
6	Base vs .Bord	0.000004	0.000081
7	SMOTE+ENN vs .CCR	0.000045	0.000936
8	SMOTE vs .NCL	0.000077	0.001608
9	ADASYN vs .NCL	0.000144	0.002298
10	Base vs .SMOTE+ENN	0.001193	0.019093
11	NCL vs .SMOTE+TL	0.002833	0.045326
12	Bord vs .CCR	0.006838	0.109404
13	Bord vs .NCL	0.007381	0.118102
14	SMOTE vs .SMOTE+ENN	0.007963	0.119452
15	ADASYN vs .SMOTE+ENN	0.012401	0.161214
16	SMOTE+TL vs .CCR	0.016464	0.214035
17	Base vs .NCL	0.052479	0.629754
18	SMOTE+TL vs .SMOTE+ENN	0.092177	1.013947
19	ADASYN vs .CCR	0.113658	1.136582
20	SMOTE vs .CCR	0.153042	1.377377
21	Bord vs .SMOTE+ENN	0.168253	1.377377
22	NCL vs .SMOTE+ENN	0.193159	1.377377
23	SMOTE vs .Bord	0.202035	1.377377
24	ADASYN vs .Bord	0.261572	1.377377
25	SMOTE vs .SMOTE+TL	0.332251	1.377377
26	ADASYN vs .SMOTE+TL	0.414216	1.377377
27	Bord vs .SMOTE+TL	0.759463	1.518926
28	ADASYN vs .SMOTE	0.878325	1.518926

Table 4: Adjusted p -values