

Output tables for the test of Multiple comparisons.

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1 Average rankings of Friedman test

Average ranks obtained by applying the Friedman procedure

Algorithm	Ranking
Base	4.7812
ADASYN	6
SMOTE	4.3438
Bord	4.5625
NCL	4.5938
SMOTE+TL	4.7188
SMOTE+ENN	3.9688
CCR	3.0312

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 25.885417.

P-value computed by Friedman Test: 5.279698625180185E-4.

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	4.847948	0.000001	0.001786
27	ADASYN vs. SMOTE+ENN	3.317017	0.00091	0.002381
26	Base vs. CCR	2.857738	0.004267	0.002381
25	SMOTE+TL vs. CCR	2.755676	0.005857	0.002381
24	ADASYN vs. SMOTE	2.704645	0.006838	0.002381
23	NCL vs. CCR	2.551552	0.010724	0.002381
22	Bord vs. CCR	2.500521	0.012401	0.002381
21	ADASYN vs. Bord	2.347428	0.018904	0.002381
20	ADASYN vs. NCL	2.296397	0.021653	0.0025
19	SMOTE vs. CCR	2.143304	0.032089	0.002632
18	ADASYN vs. SMOTE+TL	2.092272	0.036414	0.002778
17	Base vs. ADASYN	1.99021	0.046568	0.002941
16	SMOTE+ENN vs. CCR	1.530931	0.125786	0.003125
15	Base vs. SMOTE+ENN	1.326807	0.184573	0.003333
14	SMOTE+TL vs. SMOTE+ENN	1.224745	0.220671	0.003571
13	NCL vs. SMOTE+ENN	1.020621	0.307434	0.003846
12	Bord vs. SMOTE+ENN	0.96959	0.332251	0.004167
11	Base vs. SMOTE	0.714435	0.474959	0.004545
10	SMOTE vs. SMOTE+TL	0.612372	0.540291	0.005
9	SMOTE vs. SMOTE+ENN	0.612372	0.540291	0.005556
8	SMOTE vs. NCL	0.408248	0.683091	0.00625
7	Base vs. Bord	0.357217	0.720929	0.007143
6	SMOTE vs. Bord	0.357217	0.720929	0.008333
5	Base vs. NCL	0.306186	0.759463	0.01
4	Bord vs. SMOTE+TL	0.255155	0.798603	0.0125
3	NCL vs. SMOTE+TL	0.204124	0.838256	0.016667
2	Base vs. SMOTE+TL	0.102062	0.918707	0.025
1	Bord vs. NCL	0.051031	0.959301	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	4.847948	0.000001	0.003571
27	ADASYN vs. SMOTE+ENN	3.317017	0.00091	0.004762
26	Base vs. CCR	2.857738	0.004267	0.004762
25	SMOTE+TL vs. CCR	2.755676	0.005857	0.004762
24	ADASYN vs. SMOTE	2.704645	0.006838	0.004762
23	NCL vs. CCR	2.551552	0.010724	0.004762
22	Bord vs. CCR	2.500521	0.012401	0.004762
21	ADASYN vs. Bord	2.347428	0.018904	0.004762
20	ADASYN vs. NCL	2.296397	0.021653	0.005
19	SMOTE vs. CCR	2.143304	0.032089	0.005263
18	ADASYN vs. SMOTE+TL	2.092272	0.036414	0.005556
17	Base vs. ADASYN	1.99021	0.046568	0.005882
16	SMOTE+ENN vs. CCR	1.530931	0.125786	0.00625
15	Base vs. SMOTE+ENN	1.326807	0.184573	0.006667
14	SMOTE+TL vs. SMOTE+ENN	1.224745	0.220671	0.007143
13	NCL vs. SMOTE+ENN	1.020621	0.307434	0.007692
12	Bord vs. SMOTE+ENN	0.96959	0.332251	0.008333
11	Base vs. SMOTE	0.714435	0.474959	0.009091
10	SMOTE vs. SMOTE+TL	0.612372	0.540291	0.01
9	SMOTE vs. SMOTE+ENN	0.612372	0.540291	0.011111
8	SMOTE vs. NCL	0.408248	0.683091	0.0125
7	Base vs. Bord	0.357217	0.720929	0.014286
6	SMOTE vs. Bord	0.357217	0.720929	0.016667
5	Base vs. NCL	0.306186	0.759463	0.02
4	Bord vs. SMOTE+TL	0.255155	0.798603	0.025
3	NCL vs. SMOTE+TL	0.204124	0.838256	0.033333
2	Base vs. SMOTE+TL	0.102062	0.918707	0.05
1	Bord vs. NCL	0.051031	0.959301	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	0.000001	0.000035
2	ADASYN vs .SMOTE+ENN	0.00091	0.019107
3	Base vs .CCR	0.004267	0.089601
4	SMOTE+TL vs .CCR	0.005857	0.122999
5	ADASYN vs .SMOTE	0.006838	0.143593
6	NCL vs .CCR	0.010724	0.225213
7	Bord vs .CCR	0.012401	0.260423
8	ADASYN vs .Bord	0.018904	0.396974
9	ADASYN vs .NCL	0.021653	0.396974
10	SMOTE vs .CCR	0.032089	0.51342
11	ADASYN vs .SMOTE+TL	0.036414	0.582626
12	Base vs .ADASYN	0.046568	0.745084
13	SMOTE+ENN vs .CCR	0.125786	2.012583
14	Base vs .SMOTE+ENN	0.184573	2.768588
15	SMOTE+TL vs .SMOTE+ENN	0.220671	2.868728
16	NCL vs .SMOTE+ENN	0.307434	3.996644
17	Bord vs .SMOTE+ENN	0.332251	3.996644
18	Base vs .SMOTE	0.474959	5.224544
19	SMOTE vs .SMOTE+TL	0.540291	5.402914
20	SMOTE vs .SMOTE+ENN	0.540291	5.402914
21	SMOTE vs .NCL	0.683091	5.464731
22	Base vs .Bord	0.720929	5.464731
23	SMOTE vs .Bord	0.720929	5.464731
24	Base vs .NCL	0.759463	5.464731
25	Bord vs .SMOTE+TL	0.798603	5.464731
26	NCL vs .SMOTE+TL	0.838256	5.464731
27	Base vs .SMOTE+TL	0.918707	5.464731
28	Bord vs .NCL	0.959301	5.464731

Table 4: Adjusted p -values