## 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

Ranking	7.7344	3.6719	3.2969	3.875	6.7188	3.4219	4.4844	2.7969
Algorithm	Base	ADASYN	SMOTE	Bord	NCL	SMOTE+TL	SMOTE+ENN	CCR

Table 1: Average Rankings of the algorithms

Friedman statistic considering reduction performance (distributed according to chi-square with 7 degrees of freedom: 117.179688.

## 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	$z = (R_0 - R_i)/SE$	d	Shaffer
28	Base vs. CCR	8.062904	0	0.001786
27	Base vs. SMOTE	7.246407	0	0.002381
56	Base vs. SMOTE+TL	7.042283	0	0.002381
22	Base vs. ADASYN	6.634035	0	0.002381
24	NCL vs. CCR	6.404395	0	0.002381
23	Base vs. Bord	6.302333	0	0.002381
22	SMOTE vs. NCL	5.587898	0	0.002381
21	NCL vs. SMOTE+TL	5.383774	0	0.002381
20	Base vs. SMOTE+ENN	5.307228	0	0.003125
19	ADASYN vs. NCL	4.975526	0.000001	0.003125
18	Bord vs. NCL	4.643824	0.000003	0.003125
17	NCL vs. SMOTE+ENN	3.648719	0.000264	0.003125
16	SMOTE+ENN vs. CCR	2.755676	0.005857	0.003125
15	SMOTE vs. SMOTE+ENN	1.939179	0.052479	0.003333
14	Bord vs. CCR	1.760571	0.078311	0.003571
13	SMOTE+TL vs. SMOTE+ENN	1.735055	0.082731	0.003846
12	Base vs. NCL	1.658509	0.097215	0.004167
11	ADASYN vs. CCR	1.428869	0.153042	0.004545
10	ADASYN vs. SMOTE+ENN	1.326807	0.184573	0.005
6	SMOTE+TL vs. CCR	1.020621	0.307434	0.005556
∞	Bord vs. SMOTE+ENN	0.995105	0.319685	0.00625
_	SMOTE vs. Bord	0.944074	0.345132	0.007143
9	SMOTE vs. CCR	0.816497	0.414216	0.008333
20	Bord vs. SMOTE+TL	0.73995	0.45933	0.01
4	ADASYN vs. SMOTE	0.612372	0.540291	0.0125
က	ADASYN vs. SMOTE+TL	0.408248	0.683091	0.016667
2	ADASYN vs. Bord	0.331702	0.740114	0.025
П	SMOTE vs. SMOTE+TL	0.204124	0.838256	0.05

Table 2: P-values Table for  $\alpha = 0.05$ 

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Shaffer	0.00357	0.004762	0.004762	0.004762	0.004762	0.004762	0.004762	0.004762	0.00625	0.00625	0.00625	0.00625	0.00625	7.006667	0.007143	0.007692	0.008333	0.009091	0.01	0.011111	0.0125	0.014286	0.016667	0.02	0.025	0.033333	0.05	0.1
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d	0	0	0	0	0	0	0	0	0	0.000001	0.000003	0.000264	0.005857	0.052479	0.078311	0.082731	0.097215	0.153042	0.184573	0.307434	0.319685	0.345132	0.414216	0.45933	0.540291	0.683091	0.740114	0.838256
[ <del>1</del> ]										0	0	0	0	0	0	0	0	0	0	0	0	0	0	U	0	0	0	0
$R_i)/S_i$	<b>7</b> 4	20	83	35	95	33	86	74	28	56	24	19	92	62	71	55	60	99	20	21	35	74	26	5	72	48	20	24
$= (R_0 - R_i)/SE$	8.062904	7.246407	7.042283	6.634035	6.404395	6.302333	5.587898	5.383774	5.307228	4.975526	4.643824	3.648719	2.755676	1.939179	1.76057	735055	658509	428869	1.326807	1.02062	0.995105	0.944074	0.816497	0.73995	0.612372	0.408248	0.331702	0.204124
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hms	CCR	Base vs. SMOTE	Base vs. SMOTE+T1	Base vs. ADASYN	CCR	Bord	SMOTE vs. NCL	NCL vs. SMOTE+TL	Base vs. SMOTE+ENN	ADASYN vs. NCL	NCL	NCL vs. SMOTE+ENN	SMOTE+ENN vs. CCR	IOTE	Bord vs. CCR	LOWS	NCL	ADASYN vs. CCR	MOTE	SMOTE+TL vs. CCR	Bord vs. SMOTE+ENN	SMOTE vs. Bord	SMOTE vs. CCR	Bord vs. SMOTE+TL	ADASYN vs. SMOTE	MOT	ADASYN vs. Bord	SMOTE vs. SMOTE+TL
algorithms	Base vs. CCR	vs. S	s. SM	vs. A	NCL vs. CCR	Base vs. Bord	TE V	s. SM	SMC	SYN	Bord vs. NCL	SMC	HEN!	s. SN	rd vs.	L vs.	Base vs. NCL	SYN	vs. Sl	E+TL	SMC	TE V	TE vs	s. SM	/N vs.	vs. S	SYN	vs. SI
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			Д					Z	B			ž	S	$_{\rm SMC}$		SMOTE+TL vs. SMOTE+ENN			ADA	S	ğ			М	∢.	$AD_{i}$		$_{\rm SM}$
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Table 3: P-values Table for  $\alpha = 0.10$ 

Shaffer's procedure rejects those hypotheses that have an unadjusted p-value  $\leq 0.003571$ .

	hypothesis	unadjusted $p$	$p_{Shaf}$
П	Base vs .CCR	0	0
2	Base vs.SMOTE	0	0
3	Base vs .SMOTE+TL	0	0
4	Base vs .ADASYN	0	0
2	NCL vs .CCR	0	0
9	Base vs .Bord	0	0
7	SMOTE vs.NCL	0	0
œ	NCL vs .SMOTE+TL	0	0.000002
6	Base vs. SMOTE+ENN	0	0.000002
10	ADASYN vs. NCL	0.000001	0.00001
11	Bord vs .NCL	0.000003	0.000055
12	NCL vs .SMOTE+ENN	0.000264	0.004217
13	SMOTE+ENN vs.CCR	0.005857	0.093714
14	SMOTE vs .SMOTE+ENN	0.052479	0.787192
15	Bord vs .CCR	0.078311	1.018044
16	SMOTE+TL vs .SMOTE+ENN	0.082731	1.075503
17	Base vs .NCL	0.097215	1.166578
18	ADASYN vs. CCR	0.153042	1.683461
19	ADASYN vs .SMOTE+ENN	0.184573	1.845726
20	SMOTE+TL vs .CCR	0.307434	2.766907
21	Bord vs .SMOTE+ENN	0.319685	2.766907
22	SMOTE vs .Bord	0.345132	2.766907
23	SMOTE vs.CCR	0.414216	2.766907
24	Bord vs .SMOTE+TL	0.45933	2.766907
25	ADASYN vs. SMOTE	0.540291	2.766907
26	ADASYN vs.SMOTE+TL	0.683091	2.766907
27	ADASYN vs .Bord	0.740114	2.766907
28	SMOTE vs .SMOTE+TL	0.838256	2.766907

Table 4: Adjusted p-values