Geometric SMOTENC
A geometrically enhanced drop-in replacement for SMOTENC

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This is an abstract.

1. Introduction

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2. Related Work

3. Proposed Method

4. Methodology

5. Results and Discussion

5.1. Results

Table 1: Description of the datasets collected after data preprocessing. The sampling strategy is similar across datasets. Legend: (IR) Imbalance Ratio

Dataset	Metric	Non-Metric	Obs.	Min. Obs.	Maj. Obs.	IR	Classes
Abalone	1	7	4139	15	689	45.93	18
Adult	8	6	5000	1268	3732	2.94	2
Adult (10)	8	6	5000	451	4549	10.09	2
Annealing	4	6	790	34	608	17.88	4
Census	24	7	5000	337	4663	13.84	2
Contraceptive	4	5	1473	333	629	1.89	3
Contraceptive (10)	4	5	1036	62	629	10.15	3
Contraceptive (20)	4	5	990	31	629	20.29	3
Contraceptive (31)	4	5	973	20	629	31.45	3
Contraceptive (41)	4	5	966	15	629	41.93	3
Covertype	2	10	5000	20	2449	122.45	7
Credit Approval	9	6	653	296	357	1.21	2
German Credit	13	7	1000	300	700	2.33	2
German Credit (10)	13	7	770	70	700	10.00	2
German Credit (20)	13	7	735	35	700	20.00	2
German Credit (30)	13	7	723	23	700	30.43	2
German Credit (41)	13	7	717	17	700	41.18	2
Heart Disease	5	5	740	22	357	16.23	5
Heart Disease (21)	5	5	735	17	357	21.00	5

Table 2: Mean rankings over the different datasets, folds and runs used in the experiment.

Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
DT	OA	1.66 ± 0.13	**1.55 ± 0.21**	3.16 ± 0.15	4.00 ± 0.07	4.63 ± 0.19
DT	F-Score	**1.11 ± 0.07**	3.21 ± 0.29	2.58 ± 0.17	3.53 ± 0.16	4.58 ± 0.19
DT	G-Mean	**1.53 ± 0.20**	4.89 ± 0.07	2.53 ± 0.17	2.47 ± 0.23	3.58 ± 0.23
KNN	OA	2.39 ± 0.12	**1.32 ± 0.22**	3.58 ± 0.15	2.97 ± 0.25	4.74 ± 0.16
KNN	F-Score	**1.37 ± 0.15**	3.37 ± 0.27	2.68 ± 0.20	2.95 ± 0.26	4.63 ± 0.17
KNN	G-Mean	**1.74 ± 0.16**	4.84 ± 0.11	2.63 ± 0.17	3.26 ± 0.25	2.53 ± 0.34
LR	OA	2.47 ± 0.14	**1.32 ± 0.22**	2.76 ± 0.17	3.66 ± 0.20	4.79 ± 0.16
LR	F-Score	**1.89 ± 0.21**	3.84 ± 0.27	2.05 ± 0.23	2.79 ± 0.24	4.42 ± 0.20
LR	G-Mean	1.97 ± 0.22	5.00 ± 0.00	3.29 ± 0.16	**1.89 ± 0.16**	2.84 ± 0.29
RF	OA	1.76 ± 0.09	**1.24 ± 0.09**	3.37 ± 0.11	3.66 ± 0.12	4.97 ± 0.03
RF	F-Score	**1.26 ± 0.13**	4.21 ± 0.24	2.68 ± 0.17	2.42 ± 0.21	4.42 ± 0.11
RF	G-Mean	**1.68 ± 0.21**	4.84 ± 0.15	2.89 ± 0.21	2.26 ± 0.22	3.32 ± 0.25

Table 3: Mean scores over the different datasets, folds and runs used in the experiment

Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
DT	OA	0.74 ± 0.04	**0.75 ± 0.04**	0.68 ± 0.04	0.66 ± 0.04	0.58 ± 0.04
DT	F-Score	**0.56 ± 0.04**	0.52 ± 0.04	0.54 ± 0.04	0.52 ± 0.04	0.48 ± 0.04
DT	G-Mean	**0.69 ± 0.02**	0.60 ± 0.02	0.68 ± 0.03	0.67 ± 0.03	0.65 ± 0.03
KNN	OA	0.69 ± 0.04	**0.73 ± 0.05**	0.67 ± 0.04	0.69 ± 0.05	0.57 ± 0.04
KNN	F-Score	**0.53 ± 0.04**	0.50 ± 0.04	0.52 ± 0.04	0.52 ± 0.04	0.46 ± 0.04
KNN	G-Mean	**0.66 ± 0.03**	0.58 ± 0.02	0.64 ± 0.03	0.62 ± 0.03	0.65 ± 0.03
LR	OA	0.68 ± 0.04	**0.75 ± 0.04**	0.68 ± 0.05	0.66 ± 0.04	0.58 ± 0.04
LR	F-Score	**0.54 ± 0.04**	0.52 ± 0.04	**0.54 ± 0.04**	0.53 ± 0.04	0.48 ± 0.04
LR	G-Mean	**0.69 ± 0.02**	0.60 ± 0.02	0.68 ± 0.02	**0.69 ± 0.02**	0.67 ± 0.03
RF	OA	0.74 ± 0.04	**0.76 ± 0.04**	0.69 ± 0.04	0.69 ± 0.04	0.59 ± 0.04
RF	F-Score	**0.57 ± 0.04**	0.48 ± 0.04	0.55 ± 0.04	0.55 ± 0.04	0.49 ± 0.04
RF	G-Mean	**0.70 ± 0.02**	0.57 ± 0.02	0.68 ± 0.03	0.69 ± 0.03	0.68 ± 0.03

5.2. Statistical Analysis

5.3. Discussion

6. Conclusion

References

[1] N. V. Chawla, K. W. Bowyer, L. O. Hall, and W. P. Kegelmeyer, "SMOTE: Synthetic Minority Over-sampling Technique," *Journal of Artificial Intelligence Research*, vol. 16, pp. 321–357, jun 2002.

A. Appendix

Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
Abalone	DT	OA	0.221	**0.256**	0.190	0.203	0.207

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Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
Abalone	DT	F-Score	0.168	**0.170**	0.156	0.154	0.132
Abalone	DT	G-Mean	**0.460**	0.413	0.445	0.457	0.421
Abalone	KNN	OA	0.215	**0.237**	0.186	0.197	0.188
Abalone	KNN	F-Score	**0.167**	0.157	0.150	0.151	0.140
Abalone	KNN	G-Mean	**0.429**	0.391	0.409	0.397	0.421
Abalone	LR	OA	0.235	**0.272**	0.228	0.229	0.195
Abalone	LR	F-Score	**0.189**	0.180	0.186	0.179	0.166
Abalone	LR	G-Mean	**0.473**	0.415	0.466	0.456	0.441
Abalone	RF	OA	0.237	**0.276**	0.221	0.224	0.197
Abalone	RF	F-Score	**0.194**	0.174	0.180	0.184	0.162
Abalone	RF	G-Mean	**0.486**	0.416	0.461	0.465	0.448
Adult	DT	OA	0.830	**0.835**	0.785	0.800	0.785
Adult	DT	F-Score	**0.767**	0.763	0.754	0.755	0.744
Adult	DT	G-Mean	**0.809**	0.747	0.808	0.806	0.801
Adult	KNN	OA	0.786	**0.805**	0.781	0.763	0.761
Adult	KNN	F-Score	**0.738**	0.732	0.735	0.718	0.728
Adult	KNN	G-Mean	0.766	0.724	0.762	0.757	**0.780**
Adult	LR	OA	0.803	**0.839**	0.803	0.804	0.801
Adult	LR	F-Score	0.768	**0.773**	0.767	0.771	0.769
Adult	LR	G-Mean	0.813	0.758	0.805	**0.815**	**0.815**
Adult	RF	OA	0.820	**0.832**	0.757	0.755	0.753
Adult	RF	F-Score	**0.769**	0.739	0.727	0.729	0.728
Adult	RF	G-Mean	0.796	0.711	0.787	**0.797**	**0.797**
Adult (10)	DT	OA	**0.930**	0.928	0.822	0.789	0.775
Adult (10)	DT	F-Score	**0.711**	0.708	0.656	0.641	0.630
Adult (10)	DT	G-Mean	0.812	0.663	0.807	**0.815**	0.808
Adult (10)	KNN	OA	0.864	**0.909**	0.854	0.851	0.745
Adult (10)	KNN	F-Score	**0.667**	0.652	0.658	0.648	0.602
Adult (10)	KNN	G-Mean	0.745	0.629	0.747	0.722	**0.783**
Adult (10)	LR	OA	0.836	**0.925**	0.837	0.815	0.791
Adult (10)	LR	F-Score	0.666	**0.705**	0.667	0.663	0.647
Adult (10)	LR	G-Mean	0.804	0.663	0.787	0.811	**0.814**
Adult (10)	RF	OA	0.899	**0.924**	0.773	0.763	0.743
Adult (10)	RF	F-Score	**0.718**	0.615	0.620	0.624	0.610
Adult (10)	RF	G-Mean	**0.809**	0.579	0.786	0.806	0.806
Annealing	DT	OA	0.824	**0.843**	0.742	0.733	0.694
Annealing	DT	F-Score	**0.736**	0.643	0.732	0.724	0.683
Annealing	DT	G-Mean	**0.914**	0.738	0.909	0.906	0.880
Annealing	KNN	OA	0.849	0.847	0.829	**0.854**	0.508
Annealing	KNN	F-Score	0.780	0.724	0.747	**0.783**	0.476
Annealing	KNN	G-Mean	0.901	0.781	0.867	**0.909**	0.814
Annealing	LR	OA	0.572	**0.814**	0.573	0.566	0.510
Annealing	LR	F-Score	**0.620**	0.540	0.617	0.615	0.496
Annealing	LR	G-Mean	**0.851**	0.663	0.843	0.848	0.811
Annealing	RF	OA	**0.868**	**0.868**	0.729	0.733	0.637
Annealing	RF	F-Score	**0.800**	0.644	0.730	0.736	0.641
Annealing	RF	G-Mean	**0.917**	0.727	0.904	0.910	0.873
Census	DT	OA	0.942	**0.943**	0.894	0.844	0.795

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Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
Census	DT	F-Score	**0.733**	0.731	0.693	0.652	0.617
Census	DT	G-Mean	0.813	0.698	0.800	0.814	**0.817**
Census	KNN	OA	0.874	**0.933**	0.867	0.878	0.731
Census	KNN	F-Score	0.652	0.648	**0.655**	0.640	0.567
Census	KNN	G-Mean	0.767	0.620	0.768	0.733	**0.794**
Census	LR	OA	0.940	**0.949**	0.938	0.940	0.815
Census	LR	F-Score	0.760	0.743	0.760	**0.762**	0.639
Census	LR	G-Mean	0.807	0.707	0.782	0.801	**0.837**
Census	RF	OA	0.876	**0.933**	0.819	0.740	0.714
Census	RF	F-Score	**0.679**	0.483	0.636	0.580	0.562
Census	RF	G-Mean	**0.827**	0.500	0.818	0.822	0.814
Contraceptive	DT	OA	**0.563**	0.538	0.537	0.512	0.525
Contraceptive	DT	F-Score	**0.549**	0.518	0.529	0.507	0.520
Contraceptive	DT	G-Mean	**0.661**	0.630	0.646	0.630	0.641
Contraceptive	KNN	OA	0.465	**0.478**	0.455	0.435	0.468
Contraceptive	KNN	F-Score	0.460	**0.462**	0.450	0.432	0.461
Contraceptive	KNN	G-Mean	0.588	0.580	0.579	0.566	**0.590**
Contraceptive	LR	OA	**0.515**	0.514	0.514	0.510	0.510
Contraceptive	LR	F-Score	**0.512**	0.492	0.509	0.505	0.506
Contraceptive	LR	G-Mean	**0.635**	0.604	0.631	0.628	0.627
Contraceptive	RF	OA	0.553	**0.557**	0.540	0.534	0.526
Contraceptive	RF	F-Score	**0.545**	0.524	0.535	0.529	0.522
Contraceptive	RF	G-Mean	**0.659**	0.634	0.653	0.649	0.643
Contraceptive (10)	DT	OA	**0.645**	**0.645**	0.568	0.528	0.487
Contraceptive (10)	DT	F-Score	**0.479**	0.452	0.478	0.454	0.414
Contraceptive (10)	DT	G-Mean	0.644	0.584	**0.648**	0.637	0.610
Contraceptive (10)	KNN	OA	0.524	**0.570**	0.508	0.495	0.451
Contraceptive (10)	KNN	F-Score	**0.419**	0.404	0.410	0.404	0.368
Contraceptive (10)	KNN	G-Mean	**0.576**	0.529	0.561	0.569	0.561
Contraceptive (10)	LR	OA	0.516	**0.622**	0.506	0.489	0.476
Contraceptive (10)	LR	F-Score	**0.431**	0.375	0.426	0.425	0.411
Contraceptive (10)	LR	G-Mean	0.619	0.526	0.609	**0.624**	0.618
Contraceptive (10)	RF	OA	0.648	**0.651**	0.569	0.550	0.494
Contraceptive (10)	RF	F-Score	**0.500**	0.387	0.473	0.471	0.425
Contraceptive (10)	RF	G-Mean	**0.656**	0.542	0.639	0.650	0.625
Contraceptive (20)	DT	OA	**0.671**	0.659	0.612	0.556	0.456
Contraceptive (20)	DT	F-Score	**0.475**	0.430	0.459	0.428	0.371
Contraceptive (20)	DT	G-Mean	**0.643**	0.570	0.626	0.632	0.605
Contraceptive (20)	KNN	OA	0.556	**0.600**	0.529	0.541	0.442
Contraceptive (20)	KNN	F-Score	**0.399**	0.375	0.384	0.389	0.345
Contraceptive (20)	KNN	G-Mean	**0.565**	0.519	0.544	0.537	0.549
Contraceptive (20)	LR	OA	0.506	**0.641**	0.508	0.486	0.440
Contraceptive (20)	LR	F-Score	**0.397**	0.375	**0.397**	0.389	0.358
Contraceptive (20)	LR	G-Mean	0.608	0.523	0.604	**0.613**	0.585
Contraceptive (20)	RF	OA	0.668	**0.674**	0.588	0.562	0.475
Contraceptive (20)	RF	F-Score	**0.473**	0.384	0.450	0.436	0.389
Contraceptive (20)	RF	G-Mean	0.659	0.535	0.641	**0.670**	0.633
Contraceptive (31)	DT	OA	0.667	**0.670**	0.608	0.604	0.440

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Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
Contraceptive (31)	DT	F-Score	**0.454**	0.441	0.438	0.453	0.346
Contraceptive (31)	DT	G-Mean	0.642	0.577	0.605	**0.655**	0.592
Contraceptive (31)	KNN	OA	0.563	**0.633**	0.545	0.550	0.405
Contraceptive (31)	KNN	F-Score	**0.403**	0.385	0.384	0.378	0.298
Contraceptive (31)	KNN	G-Mean	**0.574**	0.527	0.544	0.531	0.511
Contraceptive (31)	LR	OA	0.500	**0.656**	0.508	0.483	0.423
Contraceptive (31)	LR	F-Score	**0.379**	0.376	**0.379**	0.374	0.336
Contraceptive (31)	LR	G-Mean	**0.597**	0.523	0.579	0.585	0.580
Contraceptive (31)	RF	OA	0.681	**0.683**	0.608	0.583	0.442
Contraceptive (31)	RF	F-Score	**0.450**	0.378	0.434	0.435	0.349
Contraceptive (31)	RF	G-Mean	**0.647**	0.531	0.630	0.640	0.600
Contraceptive (41)	DT	OA	0.651	**0.666**	0.588	0.566	0.433
Contraceptive (41)	DT	F-Score	**0.459**	0.426	0.408	0.409	0.336
Contraceptive (41)	DT	G-Mean	**0.622**	0.573	0.579	0.589	0.555
Contraceptive (41)	KNN	OA	0.563	**0.611**	0.546	0.538	0.395
Contraceptive (41)	KNN	F-Score	**0.393**	0.373	0.381	0.370	0.289
Contraceptive (41)	KNN	G-Mean	0.542	0.515	**0.550**	0.526	0.515
Contraceptive (41)	LR	OA	0.525	**0.658**	0.524	0.504	0.435
Contraceptive (41)	LR	F-Score	0.389	0.375	**0.393**	0.387	0.336
Contraceptive (41)	LR	G-Mean	0.606	0.520	0.604	**0.627**	0.569
Contraceptive (41)	RF	OA	0.665	**0.681**	0.598	0.588	0.415
Contraceptive (41)	RF	F-Score	**0.444**	0.378	0.418	0.429	0.323
Contraceptive (41)	RF	G-Mean	0.612	0.528	**0.616**	**0.616**	0.566
Covertype	DT	OA	0.580	**0.705**	0.587	0.567	0.450
Covertype	DT	F-Score	0.484	**0.490**	0.481	0.475	0.361
Covertype	DT	G-Mean	**0.769**	0.671	0.758	0.758	0.700
Covertype	KNN	OA	0.690	**0.700**	0.683	0.699	0.454
Covertype	KNN	F-Score	0.532	0.457	0.535	**0.561**	0.367
Covertype	KNN	G-Mean	0.745	0.642	0.753	**0.763**	0.691
Covertype	LR	OA	0.637	**0.721**	0.640	0.611	0.472
Covertype	LR	F-Score	0.516	0.507	**0.526**	0.492	0.353
Covertype	LR	G-Mean	**0.792**	0.678	0.786	0.790	0.697
Covertype	RF	OA	0.598	**0.704**	0.583	0.587	0.485
Covertype	RF	F-Score	0.517	0.360	0.507	**0.519**	0.394
Covertype	RF	G-Mean	0.800	0.572	0.799	**0.804**	0.737
Credit Approval	DT	OA	**0.867**	0.847	0.862	0.861	0.865
Credit Approval	DT	F-Score	**0.867**	0.845	0.862	0.861	0.865
Credit Approval	DT	G-Mean	**0.874**	0.848	0.869	0.867	0.872
Credit Approval	KNN	OA	**0.870**	0.865	0.868	**0.870**	0.865
Credit Approval	KNN	F-Score	**0.869**	0.864	0.867	**0.869**	0.864
Credit Approval	KNN	G-Mean	**0.871**	0.865	0.868	**0.871**	0.866
Credit Approval	LR	OA	0.873	0.868	0.871	**0.874**	0.873
Credit Approval	LR	F-Score	0.873	0.868	0.871	**0.874**	0.873
Credit Approval	LR	G-Mean	0.877	0.873	0.877	**0.879**	0.878
Credit Approval	RF	OA	0.876	**0.877**	0.871	0.868	0.868
Credit Approval	RF	F-Score	0.876	**0.877**	0.871	0.868	0.868
Credit Approval	RF	G-Mean	**0.879**	**0.879**	0.876	0.872	0.873
German Credit	DT	OA	0.704	**0.713**	0.702	0.660	0.644

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Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
German Credit	DT	F-Score	**0.662**	0.608	0.654	0.633	0.623
German Credit	DT	G-Mean	**0.681**	0.608	0.667	0.663	0.660
German Credit	KNN	OA	0.681	**0.718**	0.682	0.670	0.641
German Credit	KNN	F-Score	**0.653**	0.628	0.650	0.636	0.616
German Credit	KNN	G-Mean	**0.675**	0.621	0.668	0.656	0.642
German Credit	LR	OA	0.727	**0.751**	0.729	0.724	0.712
German Credit	LR	F-Score	0.695	0.681	**0.697**	**0.697**	0.686
German Credit	LR	G-Mean	**0.722**	0.672	0.713	0.720	0.713
German Credit	RF	OA	**0.760**	0.741	0.739	0.737	0.700
German Credit	RF	F-Score	0.701	0.580	0.702	**0.709**	0.680
German Credit	RF	G-Mean	0.715	0.588	0.716	**0.730**	0.719
German Credit (10)	DT	OA	**0.909**	0.906	0.804	0.713	0.696
German Credit (10)	DT	F-Score	**0.575**	0.539	0.572	0.526	0.511
German Credit (10)	DT	G-Mean	0.628	0.535	0.629	**0.644**	0.631
German Credit (10)	KNN	OA	0.787	**0.913**	0.757	0.835	0.684
German Credit (10)	KNN	F-Score	0.578	**0.581**	0.558	0.573	0.528
German Credit (10)	KNN	G-Mean	0.662	0.559	0.643	0.588	**0.667**
German Credit (10)	LR	OA	0.839	**0.904**	0.831	0.799	0.682
German Credit (10)	LR	F-Score	0.619	0.596	0.610	**0.620**	0.550
German Credit (10)	LR	G-Mean	0.683	0.578	0.675	0.716	**0.722**
German Credit (10)	RF	OA	**0.910**	0.909	0.865	0.877	0.696
German Credit (10)	RF	F-Score	0.624	0.476	0.614	**0.661**	0.557
German Credit (10)	RF	G-Mean	0.653	0.500	0.646	0.709	**0.729**
German Credit (20)	DT	OA	**0.952**	**0.952**	0.875	0.795	0.668
German Credit (20)	DT	F-Score	**0.573**	0.525	0.559	0.522	0.457
German Credit (20)	DT	G-Mean	0.666	0.529	0.679	**0.690**	0.629
German Credit (20)	KNN	OA	0.856	**0.952**	0.826	0.905	0.679
German Credit (20)	KNN	F-Score	**0.561**	0.535	0.528	0.556	0.491
German Credit (20)	KNN	G-Mean	0.692	0.527	0.635	0.570	**0.709**
German Credit (20)	LR	OA	0.913	**0.952**	0.910	0.838	0.680
German Credit (20)	LR	F-Score	**0.596**	0.534	0.593	0.553	0.473
German Credit (20)	LR	G-Mean	0.651	0.531	0.627	0.661	**0.682**
German Credit (20)	RF	OA	**0.954**	0.952	0.920	0.931	0.709
German Credit (20)	RF	F-Score	**0.597**	0.488	0.574	0.572	0.493
German Credit (20)	RF	G-Mean	0.681	0.500	0.625	0.674	**0.691**
German Credit (30)	DT	OA	**0.968**	0.963	0.885	0.856	0.628
German Credit (30)	DT	F-Score	**0.558**	0.509	0.526	0.506	0.413
German Credit (30)	DT	G-Mean	**0.686**	0.509	0.631	0.602	0.565
German Credit (30)	KNN	OA	0.902	**0.968**	0.849	0.935	0.697
German Credit (30)	KNN	F-Score	**0.530**	0.492	0.512	0.519	0.473
German Credit (30)	KNN	G-Mean	0.681	0.500	0.588	0.536	**0.705**
German Credit (30)	LR	OA	0.921	**0.967**	0.918	0.877	0.611
German Credit (30)	LR	F-Score	**0.578**	0.516	0.577	0.537	0.421
German Credit (30)	LR	G-Mean	0.649	0.510	0.650	**0.661**	0.660
German Credit (30)	RF	OA	**0.968**	**0.968**	0.942	0.954	0.705
German Credit (30)	RF	F-Score	**0.592**	0.492	0.563	0.589	0.474
German Credit (30)	RF	G-Mean	**0.689**	0.500	0.601	0.606	0.679
German Credit (41)	DT	OA	**0.976**	0.971	0.916	0.905	0.635

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Table 4: Wide optimal results

Dataset	Classifier	Metric	G-SMOTE	NONE	SMOTENC	ROS	RUS
German Credit (41)	DT	F-Score	**0.563**	0.493	0.544	0.502	0.408
German Credit (41)	DT	G-Mean	**0.636**	0.497	0.615	0.520	0.524
German Credit (41)	KNN	OA	0.929	**0.976**	0.876	0.944	0.674
German Credit (41)	KNN	F-Score	**0.524**	0.494	0.500	0.502	0.440
German Credit (41)	KNN	G-Mean	0.593	0.500	0.558	0.516	**0.630**
German Credit (41)	LR	OA	0.940	**0.976**	0.943	0.927	0.641
German Credit (41)	LR	F-Score	0.546	0.494	**0.552**	0.515	0.420
German Credit (41)	LR	G-Mean	**0.602**	0.500	0.592	0.598	0.597
German Credit (41)	RF	OA	**0.976**	**0.976**	0.961	0.969	0.636
German Credit (41)	RF	F-Score	**0.598**	0.494	0.566	0.591	0.413
German Credit (41)	RF	G-Mean	0.621	0.500	**0.622**	0.614	0.572
Heart Disease	DT	OA	0.532	**0.566**	0.509	0.473	0.430
Heart Disease	DT	F-Score	**0.371**	0.322	0.342	0.331	0.295
Heart Disease	DT	G-Mean	**0.588**	0.534	0.563	0.545	0.515
Heart Disease	KNN	OA	0.538	**0.564**	0.535	0.534	0.504
Heart Disease	KNN	F-Score	**0.363**	0.287	0.360	0.352	0.341
Heart Disease	KNN	G-Mean	**0.571**	0.509	**0.571**	0.560	0.557
Heart Disease	LR	OA	0.558	**0.584**	0.557	0.536	0.480
Heart Disease	LR	F-Score	**0.397**	0.329	0.395	0.374	0.333
Heart Disease	LR	G-Mean	0.601	0.539	0.601	**0.603**	0.567
Heart Disease	RF	OA	0.553	**0.601**	0.546	0.539	0.480
Heart Disease	RF	F-Score	**0.385**	0.314	0.366	0.360	0.326
Heart Disease	RF	G-Mean	**0.600**	0.531	0.580	0.569	0.566
Heart Disease (21)	DT	OA	0.532	**0.566**	0.512	0.486	0.431
Heart Disease (21)	DT	F-Score	**0.376**	0.296	0.341	0.336	0.311
Heart Disease (21)	DT	G-Mean	**0.598**	0.509	0.558	0.562	0.538
Heart Disease (21)	KNN	OA	0.561	**0.569**	0.543	0.541	0.491
Heart Disease (21)	KNN	F-Score	**0.385**	0.312	0.365	0.363	0.334
Heart Disease (21)	KNN	G-Mean	**0.589**	0.520	0.570	0.566	0.546
Heart Disease (21)	LR	OA	0.573	**0.592**	0.565	0.547	0.525
Heart Disease (21)	LR	F-Score	**0.408**	0.331	0.405	0.387	0.343
Heart Disease (21)	LR	G-Mean	**0.638**	0.540	0.610	0.602	0.583
Heart Disease (21)	RF	OA	0.577	**0.608**	0.565	0.561	0.517
Heart Disease (21)	RF	F-Score	**0.417**	0.323	0.390	0.383	0.337
Heart Disease (21)	RF	G-Mean	**0.621**	0.536	0.596	0.593	0.567