

Fig. 6 The schematic sketch of the effect of SHS: (a) represents the original feature distribution of the subset, (b) describes the identification results of LORDS for the overlapping samples.(c) is the subset after undersampling of overlapping majority samples, and (d) depicts the final balanced subset with low overlap after oversampling of minority samples.

Table 3 Classification performance of different algorithms using SVM on the datasets with low and high IR. The superscript m1-m4 represents the methods of oversampling, undersampling, hybrid sampling and ensemble learning (see section4.1.1)

Dataset	Ionospl	here			glass1				Monk			
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
CMOTEM1	0.700	0.747	0.793	0.802	0.909	0.560	0.486	0.587	0.847	0.577	0.606	0.642
SMOTE <sup>m1</sup>	6	10	9	9	3	3	9	5	1	2	3	2
KNSMOTE <sup>m1</sup>	0.664	0.741	0.784	0.797	0.235	0.281	0.405	0.541	0.528	0.424	0.511	0.514
KNSMU1E	12	12	12	12	11	12	12	12	11	10	10	11
ADPCHFO <sup>m1</sup>	0.657	0.747	0.786	0.801	0.130	0.190	0.323	0.528	0.644	0.486	0.555	0.565
АДРСПГО	13	9	11	10	14	14	14	13	9	9	9	9
ENN <sup>m2</sup>	0.642	0.735	0.777	0.793	0.225	0.298	0.426	0.548	0.024	0.046	0.154	0.512
LININ	14	13	13	13	13	11	11	11	14	14	14	12
CBIS <sup>m2</sup>	0.762	0.754	0.806	0.809	0.950	0.560	0.433	0.578	0.669	0.524	0.600	0.607
CDIS	2	5	3	4	2	4	10	8	7	7	6	6
AdaOBU <sup>m2</sup>	0.740	0.637	0.704	0.707	0.232	0.234	0.363	0.425	0.540	0.415	0.492	0.501
AuaODO	4	14	14	14	12	13	13	14	10	11	11	14
SMTL <sup>m3</sup>	0.717	0.753	0.800	0.807	0.905	0.560	0.487	0.587	0.833	0.566	0.595	0.632
DIVITL	5	7	4	5	4	5	8	6	3	3	7	3
CUSS <sup>m3</sup>	0.695	0.754	0.796	0.807	0.607	0.481	0.503	0.592	0.404	0.260	0.241	0.537
2000	7	6	7	7	10	10	4	3	12	12	13	10
RFMSE <sup>m3</sup>	0.688	0.759	0.799	0.810	0.832	0.540	0.503	0.572	0.656	0.491	0.558	0.571
1011101	10	3	5	3	7	8	5	10	8	8	8	8
SBE <sup>m4</sup>	0.676	0.742	0.786	0.798	0.610	0.483	0.535	0.577	0.201	0.196	0.308	0.506
SEL	11	10	10	11	9	9	3	9	13	13	12	13
DTE-SBD <sup>m4</sup>	0.690	0.753	0.796	0.806	0.892	0.557	0.491	0.585	0.780	0.556	0.603	0.625
212 000	9	8	8	8	5	6	7	7	4	5	5	5
REMDD <sup>m4</sup>	0.691	0.755	0.797	0.807	0.878	0.555	0.502	0.588	0.769	0.555	0.606	0.626
101.11010	8	4	6	6	6	4	6	4	5	6	2	4
EASE <sup>m4</sup>	0.832	0.761	0.813	0.815	0.749	0.654	0.627	0.637	0.674	0.562	0.604	0.605
24 101	1	2	2	2	8	2	2	2	6	4	4	7
DCSHS	0.742	0.810	0.834	0.840	0.957	0.611	0.572	0.649	0.839	0.626	0.684	0.701
	3	1	1	1	1	1	1	1	2	1	1	1
Dataset	haberm	ian			Vehicle	e1			Vehicle	e2		
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
SMOTE <sup>m1</sup>	0.412	0.432	0.574	0.620	0.937	0.847	0.919	0.920	0.786	0.613	0.757	0.758
DIVIOTE	8	3	3	1	7	6	2	2	3	1	1	2
KNSMOTE <sup>m1</sup>	0.494	0.400	0.559	0.578	0.823	0.854	0.890	0.893	0.605	0.549	0.691	0.698
KINDIVIOTE	5	6	6	9	12	4	10	10	13	11	11	11
ADPCHFO <sup>m1</sup>	0.219	0.309	0.443	0.579	0.916	0.857	0.919	0.919	0.679	0.584	0.724	0.727

	12	12	12	8	8	2	4	4	10	6	7	7
ENN <sup>m2</sup>	0.140	0.218	0.354	0.550	0.819	0.855	0.889	0.892	0.416	0.507	0.618	0.66
	13	13	13	12	13	3	11	11	14	13	14	12
CBIS <sup>m2</sup>	0.067	0.119	0.254	0.526	0.911	0.820	0.901	0.901	0.638	0.583	0.717	0.72
0.510	14	14	14	14	9	9	7	7	11	7	9	8
AdaOBU <sup>m2</sup>	0.585	0.394	0.538	0.545	0.835	0.715	0.829	0.829	0.624	0.497	0.656	0.65
1144020	3	8	9	13	11	13	13	13	12	14	13	14
SMTL <sup>m3</sup>	0.435	0.426	0.573	0.611	0.937	0.846	0.919	0.920	0.797	0.603	0.749	0.75
OWIL	7	4	4	3	6	7	3	3	2	3	3	3
CUSS <sup>m3</sup>	0.313	0.394	0.525	0.612	0.861	0.849	0.899	0.901	0.687	0.592	0.729	0.73
COBB	11	9	10	2	10	5	8	8	8	4	5	5
RFMSE <sup>m3</sup>	0.385	0.362	0.512	0.566	0.944	0.772	0.881	0.883	0.682	0.510	0.668	0.66
KI WISL	9	11	11	10	2	12	12	12	9	12	12	13
SBE <sup>m4</sup>	0.507	0.437	0.586	0.611	0.950	0.806	0.901	0.903	0.728	0.571	0.720	0.72
SBL	4	2	2	4	1	10	6	6	6	9	8	9
DTE-SBD <sup>m4</sup>	0.467	0.414	0.570	0.593	0.941	0.826	0.911	0.911	0.738	0.582	0.729	0.73
DTL-SDD	6	5	5	7	4	8	5	5	4	8	6	6
REMDD <sup>m4</sup>	0.375	0.398	0.541	0.602	0.942	0.803	0.898	0.900	0.693	0.554	0.705	0.70
KEMDD	10	7	8	5	3	11	9	9	7	10	10	10
EASE <sup>m4</sup>	0.599	0.388	0.548	0.556	0.761	0.599	0.741	0.742	0.738	0.592	0.737	0.73
EASE	2	10	7	11	14	14	14	14	5	5	4	4
DCSHS	0.602	0.442	0.594	0.601	0.939	0.878	0.935	0.935	0.892	0.607	0.752	0.76
DCSHS	0.602 1	0.442 1	0.594 1	0.601 6	0.939 5	0.878 1	0.935 1	0.935 1	0.892 1	0.607 2	0.752 2	0.76
DCSHS  Dataset		1										
	1	1			5				1			1
Dataset Measure	1 Vehicle	1 e3	1	6	5 ecoli1	1	1	1	yeast2	2	2	1 AU
Dataset	Vehicle Rec	1 e3 F1-M	1 G-M	6 AUC	5 ecoli1 Rec	1 F1-M	1 G-M	1 AUC	yeast2 Rec	2 F1-M	2 G-M	1 AU
Dataset  Measure  SMOTE <sup>m1</sup>	Vehicle Rec 0.791	1 e3 F1-M 0.594	G-M 0.747	AUC 0.749	5 ecoli1 Rec 0.932	F1-M 0.767	G-M 0.889	AUC 0.891	yeast2  Rec  0.706	F1-M 0.550	2 G-M 0.764	1 AU0 0.76 2
Dataset Measure	Vehicle Rec 0.791	1 e3 F1-M 0.594 2	G-M 0.747 2	AUC 0.749	5 ecoli1 Rec 0.932 3	F1-M 0.767 3	G-M 0.889 4	AUC 0.891 4	yeast2 Rec 0.706 7	F1-M 0.550 4	G-M 0.764 2	AU0 0.76 2
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	1 Vehicle Rec 0.791 3 0.613	1 e3 F1-M 0.594 2 0.514	G-M 0.747 2 0.673	AUC 0.749 2 0.678	5 ecoli1 Rec 0.932 3 0.837	F1-M 0.767 3 0.753	G-M 0.889 4 0.858	AUC 0.891 4 0.861	yeast2 Rec 0.706 7 0.678	F1-M 0.550 4 0.525	2 G-M 0.764 2 0.743	AU0 0.76 2 0.75 9
Dataset  Measure  SMOTE <sup>m1</sup>	Vehicle Rec 0.791 3 0.613	1 e3 F1-M 0.594 2 0.514 11	G-M 0.747 2 0.673 11	AUC 0.749 2 0.678 11	5 ecoli1 Rec 0.932 3 0.837 12	F1-M 0.767 3 0.753 8	G-M 0.889 4 0.858 12	AUC 0.891 4 0.861 11	yeast2 Rec 0.706 7 0.678	F1-M 0.550 4 0.525 10	2 G-M 0.764 2 0.743 9	AU0 0.76 2 0.75 9
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	Vehicle Rec 0.791 3 0.613 12 0.621	1 e3 F1-M 0.594 2 0.514 11 0.557	G-M 0.747 2 0.673 11 0.701	AUC 0.749 2 0.678 11 0.710	5 ecoli1 Rec 0.932 3 0.837 12 0.820	F1-M 0.767 3 0.753 8 0.739	G-M 0.889 4 0.858 12 0.848	AUC 0.891 4 0.861 11 0.850	yeast2 Rec 0.706 7 0.678 10 0.622	F1-M 0.550 4 0.525 10 0.578	2 G-M 0.764 2 0.743 9 0.745	AU0 0.76 2 0.75 9 0.75 7
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	Vehicle Rec 0.791 3 0.613 12 0.621 10	1 e3 F1-M 0.594 2 0.514 11 0.557 5	G-M 0.747 2 0.673 11 0.701 6	AUC 0.749 2 0.678 11 0.710 6	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13	F1-M 0.767 3 0.753 8 0.739 11	G-M 0.889 4 0.858 12 0.848 13	AUC 0.891 4 0.861 11 0.850 13	yeast2 Rec 0.706 7 0.678 10 0.622	F1-M 0.550 4 0.525 10 0.578	2 G-M 0.764 2 0.743 9 0.745 8	AU0 0.76 2 0.75 9 0.75 7
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	Per Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151	G-M 0.747 2 0.673 11 0.701 6 0.278	AUC 0.749 2 0.678 11 0.710 6 0.537	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793	F1-M 0.767 3 0.753 8 0.739 11 0.733	G-M 0.889 4 0.858 12 0.848 13 0.837	AUC 0.891 4 0.861 11 0.850 13 0.841	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476	G-M 0.764 2 0.743 9 0.745 8 0.590	AU0 0.76 2 0.75 9 0.75 7 0.66
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151	G-M 0.747 2 0.673 11 0.701 6 0.278 14	AUC 0.749 2 0.678 11 0.710 6 0.537 14	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14	F1-M 0.767 3 0.753 8 0.739 11 0.733 13	G-M 0.889 4 0.858 12 0.848 13 0.837	AUC 0.891 4 0.861 11 0.850 13 0.841 14	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476	G-M 0.764 2 0.743 9 0.745 8 0.590 14	AU0 0.76 2 0.75 9 0.75 7 0.66
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14 0.656	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151 14 0.546	G-M 0.747 2 0.673 11 0.701 6 0.278 14 0.700	AUC 0.749 2 0.678 11 0.710 6 0.537 14 0.704	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14 0.902	F1-M 0.767 3 0.753 8 0.739 11 0.733 13 0.759	G-M 0.889 4 0.858 12 0.848 13 0.837 14 0.878	AUC 0.891 4 0.861 11 0.850 13 0.841 14 0.879	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14 0.492	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476 13 0.549	2 G-M 0.764 2 0.743 9 0.745 8 0.590 14 0.678	AU0 0.76 2 0.75 9 0.75 7 0.66 14 0.71
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14 0.656 9	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151 14 0.546 7	G-M 0.747 2 0.673 11 0.701 6 0.278 14 0.700 7	AUC 0.749 2 0.678 11 0.710 6 0.537 14 0.704 7	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14 0.902 9	F1-M 0.767 3 0.753 8 0.739 11 0.733 13 0.759 6	G-M 0.889 4 0.858 12 0.848 13 0.837 14 0.878 7	AUC  0.891  4  0.861  11  0.850  13  0.841  14  0.879  7	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14 0.492 12	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476 13 0.549 5	2 G-M 0.764 2 0.743 9 0.745 8 0.590 14 0.678 12	AU0 0.76 2 0.75 9 0.75 7 0.66 14 0.71
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14 0.656 9 0.616	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151 14 0.546 7 0.489	G-M 0.747 2 0.673 11 0.701 6 0.278 14 0.700 7 0.654	6 AUC 0.749 2 0.678 11 0.710 6 0.537 14 0.704 7 0.657	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14 0.902 9 0.926	F1-M 0.767 3 0.753 8 0.739 11 0.733 13 0.759 6 0.733	G-M 0.889 4 0.858 12 0.848 13 0.837 14 0.878 7 0.869	AUC 0.891 4 0.861 11 0.850 13 0.841 14 0.879 7 0.872	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14 0.492 12 0.728	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476 13 0.549 5	G-M 0.764 2 0.743 9 0.745 8 0.590 14 0.678 12 0.741	AU0 0.76 2 0.75 9 0.75 7 0.66 14 0.71 11 0.74
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14 0.656 9 0.616 11	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151 14 0.546 7 0.489 13	G-M 0.747 2 0.673 11 0.701 6 0.278 14 0.700 7 0.654 13	6 AUC 0.749 2 0.678 11 0.710 6 0.537 14 0.704 7 0.657 13	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14 0.902 9 0.926 4	1 F1-M 0.767 3 0.753 8 0.739 11 0.733 13 0.759 6 0.733 14	G-M 0.889 4 0.858 12 0.848 13 0.837 14 0.878 7 0.869	AUC 0.891 4 0.861 11 0.850 13 0.841 14 0.879 7 0.872 10	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14 0.492 12 0.728 2	2 F1-M 0.550 4 0.525 10 <b>0.578</b> 1 0.476 13 0.549 5 0.492	G-M 0.764 2 0.743 9 0.745 8 0.590 14 0.678 12 0.741 10	AU0 0.76 2 0.75 9 0.75 7 0.66 14 0.71 11 0.74
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	1 Vehicle Rec 0.791 3 0.613 12 0.621 10 0.092 14 0.656 9 0.616 11 0.800	1 e3 F1-M 0.594 2 0.514 11 0.557 5 0.151 14 0.546 7 0.489 13 0.584	G-M 0.747 2 0.673 11 0.701 6 0.278 14 0.700 7 0.654 13 0.739	AUC 0.749 2 0.678 11 0.710 6 0.537 14 0.704 7 0.657 13 0.742	5 ecoli1 Rec 0.932 3 0.837 12 0.820 13 0.793 14 0.902 9 0.926 4 0.945	1 F1-M 0.767 3 0.753 8 0.739 11 0.733 13 0.759 6 0.733 14 0.763	G-M 0.889 4 0.858 12 0.848 13 0.837 14 0.878 7 0.869 10 0.890	AUC 0.891 4 0.861 11 0.850 13 0.841 14 0.879 7 0.872 10 0.892	yeast2 Rec 0.706 7 0.678 10 0.622 11 0.362 14 0.492 12 0.728 2 0.710	2 F1-M 0.550 4 0.525 10 0.578 1 0.476 13 0.549 5 0.492 11 0.546	G-M 0.764 2 0.743 9 0.745 8 0.590 14 0.678 12 0.741 10 0.764	AU0 0.76 2 0.75 9 0.75 7 0.66 14 0.71 11 0.74 10

RFMSE <sup>m3</sup>	0.669	0.501	0.666	0.668	0.913	0.738	0.870	0.872	0.785	0.492	0.752	0.754
RFMSE	8	12	12	12	8	12	9	9	1	12	7	8
ar =m4	0.716	0.533	0.694	0.697	0.917	0.755	0.880	0.881	0.709	0.539	0.760	0.763
SBE <sup>m4</sup>	7	10	9	9	7	7	5	5	6	9	5	5
m1	0.760	0.556	0.715	0.718	0.944	0.766	0.891	0.893	0.702	0.548	0.762	0.766
DTE-SBD <sup>m4</sup>	4	6	5	5	2	4	1	2	8	6	4	4
m4	0.723	0.535	0.696	0.699	0.919	0.752	0.879	0.881	0.680	0.551	0.757	0.762
REMDD <sup>m4</sup>	6	8	8	8	6	9	6	6	9	3	6	6
	0.739	0.574	0.726	0.727	0.902	0.768	0.863	0.866	0.712	0.454	0.716	0.717
EASE <sup>m4</sup>	5	4	4	4	10	2	11	12	4	14	11	12
	0.890	0.602	0.754	0.766	0.923	0.777	0.890	0.894	0.722	0.577	0.780	0.784
DCSHS	1	1	1	1	5	1	2	1	3	2	1	1
Dataset	ecoli2				yeast3				ecoli3			
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
a	0.916	0.720	0.897	0.899	0.875	0.675	0.892	0.893	0.894	0.577	0.873	0.876
SMOTE <sup>m1</sup>	6	6	5	5	8	6	7	7	7	5	4	5
	0.766	0.624	0.781	0.803	0.815	0.620	0.850	0.857	0.761	0.522	0.787	0.822
KNSMOTE <sup>m1</sup>	12	13	13	13	10	13	10	10	11	8	11	11
m1	0.867	0.732	0.884	0.887	0.801	0.746	0.875	0.879	0.843	0.679	0.879	0.883
ADPCHFO <sup>m1</sup>	10	2	7	6	11	2	9	9	9	2	2	2
m <sup>2</sup>	0.612	0.680	0.765	0.790	0.564	0.674	0.744	0.776	0.371	0.461	0.585	0.675
ENN <sup>m2</sup>	14	12	14	14	14	7	14	14	14	13	14	13
anzam?	0.800	0.727	0.859	0.862	0.729	0.738	0.839	0.849	0.826	0.680	0.872	0.877
CBIS <sup>m2</sup>	11	5	9	9	13	4	13	13	10	1	5	4
	0.909	0.527	0.803	0.811	0.820	0.591	0.849	0.850	0.971	0.496	0.863	0.870
AdaOBU <sup>m2</sup>	7	14	11	12	9	14	11	12	1	11	8	8
as eme m3	0.920	0.719	0.899	0.900	0.880	0.669	0.893	0.893	0.911	0.572	0.877	0.880
SMTL <sup>m3</sup>	3	7	4	4	7	9	6	6	6	6	3	3
arraam3	0.695	0.691	0.803	0.820	0.735	0.744	0.842	0.853	0.656	0.589	0.760	0.800
CUSS <sup>m3</sup>	13	9	12	11	12	3	12	11	13	4	12	12
m3	0.917	0.681	0.884	0.886	0.913	0.625	0.893	0.894	0.949	0.490	0.853	0.860
RFMSE <sup>m3</sup>	5	11	6	7	5	12	5	5	3	12	9	9
an =m4	0.923	0.732	0.904	0.905	0.916	0.662	0.905	0.905	0.949	0.513	0.866	0.871
SBE <sup>m4</sup>	1	4	2	2	3	10	2	2	4	10	7	7
DEE	0.882	0.696	0.863	0.866	0.907	0.669	0.903	0.903	0.689	0.377	0.605	0.627
DTE-SBD <sup>m4</sup>	9	8	8	8	6	8	3	3	12	14	13	14
n = = = m4	0.920	0.732	0.903	0.905	0.914	0.651	0.901	0.901	0.957	0.516	0.869	0.874
REMDD <sup>m4</sup>	2	3	3	3	4	11	4	4	2	9	6	6
EASE <sup>m4</sup>	0.897	0.686	0.849	0.856	0.920	0.676	0.879	0.881	0.881	0.554	0.818	0.828
E A CEM4												

Decile	0.920	0.741	0.906	0.907	0.918	0.744	0.925	0.925	0.911	0.592	0.882	0.885
DCSHS	4	1	1	1	2	1	1	1	5	3	1	1
Dataset	yeast2v	rs4			ecoli06	57vs35			ecoli02	234vs5		
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
GMOTEM1	0.833	0.692	0.880	0.884	0.764	0.627	0.831	0.845	0.850	0.753	0.894	0.901
SMOTE <sup>m1</sup>	7	6	3	3	9	5	7	5	9	8	6	6
VNG ACTEM1	0.809	0.707	0.873	0.878	0.695	0.569	0.779	0.807	0.850	0.785	0.900	0.907
KNSMOTE <sup>m1</sup>	9	4	7	7	11	7	12	12	8	5	4	3
A DROLLEOM1	0.741	0.747	0.845	0.857	0.742	0.766	0.844	0.861	0.845	0.840	0.905	0.914
ADPCHFO <sup>m1</sup>	10	2	10	10	10	1	2	2	10	1	2	2
ENDIM2	0.493	0.641	0.695	0.745	0.366	0.513	0.591	0.682	0.704	0.777	0.822	0.848
ENN <sup>m2</sup>	14	13	14	14	14	12	14	14	14	6	14	14
cp.cm2	0.627	0.725	0.783	0.809	0.686	0.734	0.813	0.834	0.784	0.803	0.869	0.884
CBIS <sup>m2</sup>	13	3	12	12	12	3	11	9	12	2	11	11
+ 1 opum?	0.825	0.650	0.868	0.873	0.851	0.475	0.820	0.825	0.850	0.542	0.847	0.852
AdaOBU <sup>m2</sup>	8	12	9	9	3	13	9	10	7	14	13	13
m²	0.837	0.684	0.881	0.884	0.764	0.637	0.833	0.846	0.855	0.752	0.897	0.903
SMTL <sup>m3</sup>	5	7	2	2	8	4	4	4	2	9	5	5
orra am3	0.641	0.707	0.785	0.813	0.491	0.579	0.676	0.738	0.754	0.792	0.850	0.871
CUSS <sup>m3</sup>	12	5	11	11	13	6	13	13	13	3	12	12
n = 1 ca = m3	0.843	0.662	0.878	0.882	0.859	0.464	0.816	0.822	0.850	0.681	0.881	0.887
RFMSE <sup>m3</sup>	4	10	4	4	2	14	10	11	6	12	10	10
an =m4	0.844	0.655	0.878	0.881	0.828	0.559	0.842	0.848	0.855	0.710	0.889	0.895
SBE <sup>m4</sup>	3	11	5	5	5	9	3	3	4	11	7	8
m1	0.725	0.579	0.743	0.753	0.802	0.561	0.831	0.839	0.860	0.765	0.901	0.906
DTE-SBD <sup>m4</sup>	11	14	13	13	7	8	6	6	3	7	3	4
m4	0.835	0.674	0.878	0.881	0.825	0.537	0.833	0.839	0.840	0.743	0.889	0.895
REMDD <sup>m4</sup>	6	9	6	6	6	10	5	7	11	10	8	7
··· 4	0.934	0.680	0.870	0.878	0.863	0.531	0.830	0.837	0.863	0.603	0.889	0.894
EASE <sup>m4</sup>	1	8	8	8	1	11	8	8	2	13	9	9
T. CCTTC	0.867	0.765	0.911	0.912	0.833	0.714	0.890	0.892	0.895	0.791	0.921	0.926
DCSHS	2	1	1	1	4	2	1	1	1	4	1	1
Dataset	yeast03	359vs78			yeast02	2579vs36	58		ecoli01	vs235		
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
	0.714	0.369	0.733	0.739	0.871	0.722	0.904	0.906	0.833	0.719	0.884	0.890
SMOTE <sup>m1</sup>	3	3	2	2	7	8	5	5	6	7	2	2
-	0.554	0.292	0.618	0.654	0.826	0.756	0.889	0.893	0.764	0.741	0.851	0.865
KNSMOTE <sup>m1</sup>	9	12	8	7	11	6	9	9	10	6	8	7
												0.000
ADPCHFO <sup>m1</sup>	0.305	0.347	0.522	0.630	0.853	0.797	0.908	0.911	0.798	0.806	0.880	0.889

ENN <sup>m2</sup>	0.227											
LIVIV	0.227	0.344	0.462	0.610	0.777	0.832	0.876	0.884	0.642	0.767	0.792	0.821
	14	9	13	12	14	1	12	12	14	5	13	13
CBIS <sup>m2</sup>	0.227	0.344	0.462	0.610	0.788	0.808	0.879	0.885	0.678	0.788	0.814	0.838
CDIS	13	8	12	11	13	2	11	11	12	3	12	11
AdaOBU <sup>m2</sup>	0.239	0.322	0.460	0.600	0.894	0.602	0.886	0.887	0.829	0.554	0.845	0.850
AdaOBO	11	11	14	13	3	14	10	10	7	12	9	9
SMTL <sup>m3</sup>	0.704	0.364	0.727	0.734	0.870	0.734	0.906	0.907	0.833	0.708	0.882	0.888
SMIL	5	4	3	3	8	7	4	3	5	9	3	4
CUSS <sup>m3</sup>	0.227	0.344	0.462	0.610	0.813	0.806	0.890	0.895	0.703	0.768	0.824	0.846
CUSS	12	7	11	10	12	3	8	7	11	4	10	10
RFMSE <sup>m3</sup>	0.802	0.262	0.618	0.649	0.886	0.642	0.893	0.894	0.874	0.548	0.856	0.862
KFMSE	1	13	7	8	5	12	7	8	2	13	7	8
CDEm4	0.696	0.335	0.700	0.710	0.893	0.684	0.906	0.907	0.837	0.669	0.875	0.881
SBE <sup>m4</sup>	6	10	5	5	4	10	3	4	4	10	5	5
DEE GDD m4	0.704	0.354	0.721	0.727	0.841	0.680	0.867	0.869	0.666	0.506	0.657	0.683
DTE-SBD <sup>m4</sup>	4	5	4	4	10	11	13	13	13	14	14	14
n=1 cn=m4	0.560	0.370	0.669	0.697	0.876	0.690	0.900	0.901	0.811	0.718	0.872	0.880
REMDD <sup>m4</sup>	8	2	6	6	6	9	6	6	8	8	6	6
~_m1	0.592	0.220	0.576	0.593	0.903	0.614	0.862	0.865	0.919	0.610	0.822	0.832
EASE <sup>m4</sup>	7	14	9	14	2	13	14	14	1	11	11	12
D.CCIIIC	0.714	0.377	0.751	0.752	0.938	0.760	0.937	0.937	0.857	0.800	0.912	0.913
DCSHS	0.714 2	0.377 1	0.751 1	0.752 1	0.938 1	0.760 5	0.937 1	0.937 1	0.857	0.800 2	0.912 1	0.913 1
<b>DCSHS</b> Dataset		1				5				2		
	glass06	1	1		ecoli01	5			3 glass01	2		
Dataset Measure	glass06	1 Svs5	1	1	ecoli01	5 vs5	1	1	3 glass01	2 46vs2	1	1
Dataset	glass06 Rec	1 5vs5 F1-M	1 G-M	1 AUC	ecoli01 Rec	5 vs5 F1-M	1 G-M	1 AUC	3 glass01 Rec	2 46vs2 F1-M	1 G-M	1 AUC
Dataset Measure SMOTE <sup>m1</sup>	2 glass06 Rec 1.000	1 6vs5 F1-M 0.647	G-M 0.938	AUC 0.941	ecoli01 Rec 0.850	5 vs5 F1-M 0.748	G-M 0.898	AUC 0.905	3  glass01  Rec  0.932	2 46vs2 F1-M 0.198	G-M 0.537	AUC 0.624
Dataset Measure	2 glass06 Rec 1.000 2	1 5vs5 F1-M 0.647 3	G-M 0.938	AUC 0.941	ecoli01 Rec 0.850 7	5 vs5 F1-M 0.748 9	G-M 0.898 3	AUC 0.905	3 glass01 Rec 0.932 5	2 46vs2 F1-M 0.198 10	G-M 0.537 3	AUC 0.624 4
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	2 glass06 Rec 1.000 2 0.663	1 5vs5 F1-M 0.647 3 0.551	G-M 0.938 1 0.761	AUC 0.941 1 0.796	1 ecoli01 Rec 0.850 7 0.770	5 vs5 F1-M 0.748 9 0.788	G-M 0.898 3 0.862	AUC 0.905 4 0.877	3 glass01 Rec 0.932 5 0.844	2 46vs2 F1-M 0.198 10 0.200	G-M 0.537 3 0.535	AUC 0.624 4 0.612
Dataset Measure SMOTE <sup>m1</sup>	2 glass06 Rec 1.000 2 0.663	1 6vs5 F1-M 0.647 3 0.551 7	G-M 0.938 1 0.761 8	AUC 0.941 1 0.796 8	1 ecoli01 Rec 0.850 7 0.770 11	5 vs5 F1-M 0.748 9 0.788 5	G-M 0.898 3 0.862 9	AUC 0.905 4 0.877 9	3 glass01 Rec 0.932 5 0.844 7	2 46vs2 F1-M 0.198 10 0.200 8	G-M 0.537 3 0.535 5	AUC 0.624 4 0.612 13
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707	1 6vs5 F1-M 0.647 3 0.551 7 0.601	G-M 0.938 1 0.761 8 0.791	AUC 0.941 1 0.796 8 0.824	1 ecoli01 Rec 0.850 7 0.770 11 0.830	5 vs5 F1-M 0.748 9 0.788 5 0.813	G-M 0.898 3 0.862 9 0.897	AUC 0.905 4 0.877 9 0.905	3 glass01 Rec 0.932 5 0.844 7 0.230	2 46vs2 F1-M 0.198 10 0.200 8 0.373	G-M 0.537 3 0.535 5 0.479	AUC 0.624 4 0.612 13 0.615
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707 8	1 6vs5 F1-M 0.647 3 0.551 7 0.601 5	G-M 0.938 1 0.761 8 0.791	AUC 0.941 1 0.796 8 0.824 6	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9	5 vs5 F1-M 0.748 9 0.788 5 0.813 2	G-M 0.898 3 0.862 9 0.897 5	AUC 0.905 4 0.877 9 0.905 3	3 glass01 Rec 0.932 5 0.844 7 0.230 14	2 F1-M 0.198 10 0.200 8 0.373 5	G-M 0.537 3 0.535 5 0.479 14	AUC 0.624 4 0.612 13 0.615 11
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	glass06 Rec 1.000 2 0.663 11 0.707 8 0.377	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540	G-M 0.938 1 0.761 8 0.791 7 0.609	AUC 0.941 1 0.796 8 0.824 6 0.688	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790	G-M 0.898 3 0.862 9 0.897 5 0.817	AUC 0.905 4 0.877 9 0.905 3 0.842	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230	2 46vs2 F1-M 0.198 10 0.200 8 0.373 5 0.373	G-M 0.537 3 0.535 5 0.479 14 0.479	AUC 0.624 4 0.612 13 0.615 11 0.615
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9	G-M 0.938 1 0.761 8 0.791 7 0.609 14	AUC 0.941 1 0.796 8 0.824 6 0.688 14	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4	G-M 0.898 3 0.862 9 0.897 5 0.817 14	AUC 0.905 4 0.877 9 0.905 3 0.842 14	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 13	2 46vs2 F1-M 0.198 10 0.200 8 0.373 5 0.373 4	G-M 0.537 3 0.535 5 0.479 14 0.479 13	AUC 0.624 4 0.612 13 0.615 11 0.615
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14 0.607	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9 0.487	G-M 0.938 1 0.761 8 0.791 7 0.609 14 0.716	AUC  0.941  1  0.796  8  0.824  6  0.688  14  0.753	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14 0.720	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4 <b>0.815</b>	G-M 0.898 3 0.862 9 0.897 5 0.817 14 0.839	AUC 0.905 4 0.877 9 0.905 3 0.842 14 0.859	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 13 0.230	2 46vs2 F1-M 0.198 10 0.200 8 0.373 5 0.373 4 0.373	G-M 0.537 3 0.535 5 0.479 14 0.479 13 0.479	AUC 0.624 4 0.612 13 0.615 11 0.615 10 0.615
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14 0.607 12	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9 0.487 10	G-M 0.938 1 0.761 8 0.791 7 0.609 14 0.716 9	AUC  0.941  1  0.796  8  0.824  6  0.688  14  0.753  9	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14 0.720 12	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4 0.815 1	G-M 0.898 3 0.862 9 0.897 5 0.817 14 0.839 12	AUC 0.905 4 0.877 9 0.905 3 0.842 14 0.859 11	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 13 0.230 12	2 46vs2 F1-M 0.198 10 0.200 8 0.373 5 0.373 4 0.373 3	G-M 0.537 3 0.535 5 0.479 14 0.479 13 0.479 12	AUC 0.624 4 0.612 13 0.615 11 0.615 10 0.615 9
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14 0.607 12 0.673	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9 0.487 10 0.327	G-M 0.938 1 0.761 8 0.791 7 0.609 14 0.716 9 0.699	AUC  0.941  1  0.796  8  0.824  6  0.688  14  0.753  9  0.719	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14 0.720 12 0.810	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4 <b>0.815</b> 1 0.645	G-M 0.898 3 0.862 9 0.897 5 0.817 14 0.839 12 0.861	AUC 0.905 4 0.877 9 0.905 3 0.842 14 0.859 11 0.870	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 13 0.230 12 0.230	2 F1-M 0.198 10 0.200 8 0.373 5 0.373 4 0.373 3 0.373	G-M 0.537 3 0.535 5 0.479 14 0.479 13 0.479 12 0.479	AUC 0.624 4 0.612 13 0.615 11 0.615 10 0.615 9 0.615
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup>	glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14 0.607 12 0.673 9	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9 0.487 10 0.327 14	G-M 0.938 1 0.761 8 0.791 7 0.609 14 0.716 9 0.699 12	AUC  0.941  1  0.796  8  0.824  6  0.688  14  0.753  9  0.719  12	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14 0.720 12 0.810 10	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4 0.815 1 0.645 12	G-M 0.898 3 0.862 9 0.897 5 0.817 14 0.839 12 0.861 10	AUC 0.905 4 0.877 9 0.905 3 0.842 14 0.859 11 0.870 10	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 13 0.230 12 0.230 11	2 F1-M 0.198 10 0.200 8 0.373 5 0.373 4 0.373 3 0.373 2	G-M 0.537 3 0.535 5 0.479 14 0.479 13 0.479 12 0.479 11	AUC 0.624 4 0.612 13 0.615 11 0.615 9 0.615 8
Dataset Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	2 glass06 Rec 1.000 2 0.663 11 0.707 8 0.377 14 0.607 12 0.673 9 1.000	1 5vs5 F1-M 0.647 3 0.551 7 0.601 5 0.540 9 0.487 10 0.327 14 0.646	G-M 0.938 1 0.761 8 0.791 7 0.609 14 0.716 9 0.699 12 0.937	AUC 0.941 1 0.796 8 0.824 6 0.688 14 0.753 9 0.719 12 0.940	1 ecoli01 Rec 0.850 7 0.770 11 0.830 9 0.685 14 0.720 12 0.810 10 0.850	5 vs5 F1-M 0.748 9 0.788 5 0.813 2 0.790 4 <b>0.815</b> 1 0.645 12 0.740	G-M 0.898 3 0.862 9 0.897 5 0.817 14 0.839 12 0.861 10 0.897	AUC 0.905 4 0.877 9 0.905 3 0.842 14 0.859 11 0.870 10 0.903	3 glass01 Rec 0.932 5 0.844 7 0.230 14 0.230 12 0.230 11 0.937	2   46vs2   F1-M   0.198   10   0.200   8   0.373   5   0.373   4   0.373   3   0.373   2   0.199	G-M 0.537 3 0.535 5 0.479 14 0.479 13 0.479 12 0.479 11 0.536	AUC 0.624 4 0.612 13 0.615 11 0.615 9 0.615 8 0.625

2	0.833	0.423	0.796	0.811	0.850	0.613	0.872	0.878	0.937	0.187	0.490	0.600
RFMSE <sup>m3</sup>	6	11	6	7	5	13	8	8	3	14	9	14
an =m4	0.670	0.371	0.715	0.739	0.850	0.727	0.895	0.901	0.907	0.190	0.496	0.613
SBE <sup>m4</sup>	10	13	10	11	4	11	7	7	6	13	7	12
n ann m4	0.943	0.588	0.895	0.904	0.850	0.767	0.901	0.907	0.963	0.196	0.514	0.622
DTE-SBD <sup>m4</sup>	4	6	4	4	3	7	2	2	2	11	6	5
DEL CDDM4	0.717	0.391	0.714	0.748	0.845	0.764	0.898	0.904	0.987	0.194	0.494	0.620
REMDD <sup>m4</sup>	7	12	11	10	8	8	4	5	1	12	8	6
EAGEM4	0.952	0.717	0.885	0.891	0.879	0.554	0.841	0.859	0.643	0.227	0.598	0.626
EASE <sup>m4</sup>	3	2	5	5	1	14	11	12	9	7	2	2
DCSHS	0.917	0.803	0.931	0.939	0.855	0.798	0.907	0.914	0.714	0.294	0.655	0.657
DCSHS	5	1	3	3	2	3	1	1	8	6	1	1
Dataset	glass2				ecoli01	46vs5			yeast1v	rs7		
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
GMOTEM1	0.850	0.186	0.547	0.612	0.840	0.658	0.884	0.893	0.750	0.306	0.758	0.764
SMOTE <sup>m1</sup>	6	11	2	11	7	10	6	5	2	8	2	4
IANGMOTEM1	0.842	0.189	0.541	0.614	0.780	0.720	0.860	0.874	0.727	0.329	0.756	0.767
KNSMOTE <sup>m1</sup>	7	10	3	9	11	6	9	9	6	2	3	2
ADDCHEOM1	0.230	0.373	0.479	0.615	0.800	0.771	0.878	0.889	0.294	0.314	0.517	0.626
ADPCHFO <sup>m1</sup>	14	5	14	8	10	1	7	7	11	6	11	11
ENN <sup>m2</sup>	0.230	0.373	0.479	0.615	0.619	0.733	0.775	0.808	0.143	0.250	0.378	0.571
EININ	13	4	13	7	14	5	14	14	13	13	14	14
CBIS <sup>m2</sup>	0.230	0.373	0.479	0.615	0.664	0.767	0.803	0.831	0.143	0.250	0.378	0.571
CDIS	12	3	12	6	13	2	12	12	14	12	13	13
AdaOBU <sup>m2</sup>	0.230	0.373	0.479	0.615	0.815	0.511	0.845	0.851	0.345	0.332	0.547	0.650
AdaOBO	11	2	11	5	9	13	10	10	10	1	10	10
SMTL <sup>m3</sup>	0.850	0.184	0.540	0.608	0.845	0.674	0.890	0.896	0.763	0.309	0.763	0.769
SWIIL	5	13	4	14	6	7	2	2	1	7	1	1
CUSS <sup>m3</sup>	0.230	0.373	0.479	0.615	0.679	0.750	0.810	0.835	0.143	0.250	0.378	0.571
CUSS	10	1	10	4	12	4	11	11	12	11	12	12
RFMSE <sup>m3</sup>	0.937	0.183	0.506	0.610	0.850	0.564	0.870	0.875	0.740	0.272	0.729	0.737
KITMSE	3	14	9	13	3	12	8	8	4	10	8	8
SBE <sup>m4</sup>	0.995	0.191	0.512	0.632	0.850	0.626	0.885	0.890	0.710	0.325	0.749	0.759
טטט	2	9	8	3	2	11	5	6	9	3	5	5
DTE-SBD <sup>m4</sup>	0.908	0.185	0.523	0.613	0.845	0.672	0.889	0.895	0.740	0.300	0.741	0.753
חומ-חות	4	12	6	10	5	8	3	3	3	9	7	7
REMDD <sup>m4</sup>	1.000	0.192	0.515	0.635	0.845	0.664	0.889	0.894	0.710	0.320	0.747	0.756
KL/MIDD	1	8	7	2	4	9	4	4	8	5	6	6
EASE <sup>m4</sup>	0.682	0.252	0.649	0.664	0.822	0.425	0.789	0.809	0.733	0.240	0.681	0.695
LASE	8	7	1	1	8	14	13	13	5	14	9	9

DCSHS	0.350	0.264	0.532	0.611	0.850	0.752	0.902	0.908	0.727	0.323	0.756	0.765
	9	6	5	12	1	3	1	1	7	4	4	3
Dataset	glass4				ecoli4				zoo3			
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
SMOTE <sup>m1</sup>	0.877	0.547	0.885	0.896	0.875	0.751	0.917	0.923	0.800	0.787	0.876	0.892
SWICTE	5	3	1	1	8	4	5	6	8	4	2	2
KNSMOTE <sup>m1</sup>	0.837	0.545	0.864	0.879	0.704	0.724	0.819	0.846	0.790	0.780	0.870	0.887
KINSIVIOTE	7	4	4	3	12	7	12	12	9	7	5	5
ADPCHFO <sup>m1</sup>	0.742	0.558	0.822	0.842	0.865	0.802	0.917	0.923	0.740	0.790	0.845	0.867
ADPCHFU	11	2	8	8	9	3	6	5	13	3	8	8
ENN <sup>m2</sup>	0.338	0.488	0.574	0.668	0.450	0.601	0.658	0.725	0.730	0.759	0.836	0.858
ENN	13	8	13	13	14	12	14	14	14	9	10	10
CBIS <sup>m2</sup>	0.317	0.469	0.559	0.657	0.830	0.851	0.903	0.912	0.770	0.783	0.860	0.879
CRI2	14	10	14	14	10	2	9	9	10	6	6	6
A 1 OPTIM?	0.747	0.321	0.766	0.779	0.800	0.680	0.871	0.882	1.000	0.158	0.649	0.714
AdaOBU <sup>m2</sup>	10	14	11	11	11	8	11	11	1	14	13	13
	0.877	0.541	0.884	0.895	0.875	0.747	0.916	0.922	0.800	0.765	0.873	0.889
SMTL <sup>m3</sup>	4	5	2	2	7	6	7	7	7	8	4	4
	0.393	0.484	0.606	0.691	0.470	0.603	0.666	0.735	0.740	0.793	0.845	0.867
CUSS <sup>m3</sup>	12	9	12	12	13	11	13	13	12	2	7	7
m3	0.917	0.380	0.856	0.863	0.950	0.539	0.913	0.918	0.800	0.757	0.873	0.890
RFMSE <sup>m3</sup>	1	12	6	6	4	14	8	8	6	10	3	3
A	0.903	0.383	0.851	0.859	1.000	0.565	0.946	0.948	0.800	0.289	0.747	0.763
SBE <sup>m4</sup>	2	11	7	7	2	13	4	4	5	12	12	12
4	0.857	0.502	0.864	0.874	0.945	0.749	0.950	0.952	0.800	0.800	0.876	0.893
DTE-SBD <sup>m4</sup>	6	6	3	5	6	5	3	3	4	1	1	1
	0.810	0.355	0.770	0.786	0.990	0.618	0.951	0.952	0.820	0.384	0.775	0.796
REMDD <sup>m4</sup>	9	13	10	10	3	10	2	2	2	11	11	11
	0.898	0.493	0.787	0.826	0.948	0.642	0.891	0.899	0.803	0.227	0.535	0.702
EASE <sup>m4</sup>	3	7	9	9	5	9	10	10	3	13	14	14
	0.820	0.569	0.862	0.875	1.000	0.875	0.989	0.989	0.740	0.787	0.844	0.866
DCSHS	8	1	5	4	1	1	1	1	11	5	9	9
Dataset	lympho	graphy-1	normal-fi	brosis	winequ	ality-red	4		poker9	vs7		
Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
4	0.807	0.796	0.882	0.898	0.649	0.134	0.680	0.687	0.587	0.238	0.682	0.715
SMOTE <sup>m1</sup>	8	4	7	7	7	7	2	2	8	8	7	6
_	0.750	0.778	0.848	0.871	0.212	0.054	0.389	0.495	0.583	0.247	0.685	0.718
KNSMOTE <sup>m1</sup>	11	8	10	11	9	14	9	14	10	7	6	5
	0.750	0.770	0.848	0.872	0.101	0.157	0.312	0.548	0.587	0.635	0.743	0.784
ADPCHFO <sup>m1</sup>												

ENN <sup>m2</sup>	0.737	0.780	0.841	0.866	0.086	0.159	0.294	0.543	0.407	0.573	0.634	0.703
ENN	14	7	14	14	14	4	14	13	14	5	13	12
CBIS <sup>m2</sup>	0.740	0.783	0.843	0.868	0.086	0.159	0.294	0.543	0.407	0.573	0.634	0.703
CBIS	13	6	13	13	13	3	13	12	13	4	12	11
AdaOBU <sup>m2</sup>	0.817	0.648	0.872	0.888	0.086	0.159	0.294	0.543	0.747	0.164	0.707	0.727
AdaOBU	6	12	9	9	12	2	12	11	1	11	3	4
CNATTA M3	0.873	0.850	0.921	0.933	0.650	0.133	0.679	0.686	0.583	0.231	0.678	0.71
SMTL <sup>m3</sup>	4	1	3	2	6	8	3	3	9	9	9	8
CUSS <sup>m3</sup>	0.740	0.783	0.843	0.868	0.086	0.159	0.294	0.543	0.407	0.573	0.634	0.70
CUSS	12	5	12	12	11	1	11	10	12	3	11	10
DEL (GEM3	0.797	0.768	0.872	0.891	0.715	0.104	0.645	0.651	0.733	0.138	0.673	0.69
RFMSE <sup>m3</sup>	9	10	8	8	1	12	7	7	4	13	10	13
CDEm4	0.977	0.585	0.950	0.954	0.696	0.118	0.672	0.676	0.737	0.145	0.680	0.70
SBE <sup>m4</sup>	2	14	1	1	3	11	5	5	3	12	8	9
DTE CDE m4	0.857	0.819	0.910	0.923	0.655	0.132	0.679	0.685	0.580	0.324	0.699	0.73
DTE-SBD <sup>m4</sup>	5	2	4	5	5	9	4	4	11	6	4	3
DEL (DD m4	0.917	0.605	0.922	0.930	0.692	0.119	0.671	0.674	0.713	0.203	0.686	0.71
REMDD <sup>m4</sup>	3	13	2	3	4	10	6	6	5	10	5	7
	0.979	0.747	0.887	0.929	0.713	0.103	0.589	0.613	0.628	0.071	0.505	0.60
EASE <sup>m4</sup>	1	11	5	4	2	13	8	8	6	14	14	14
	0.040											
рсене	0.810	0.810	0.883	0.901	0.637	0.141	0.683	0.692	0.743	0.717	0.841	0.86
DCSHS	0.810 7	0.810	0.883 6	0.901 6	0.637 8	0.141 6	0.683	0.692 1	0.743 2	0.717 1	0.841 1	0.86 1
<b>DCSHS</b> Dataset		3			8		1					0.86
	7 abalone	3			8 winequ	6	1 ee9vs4		2			
Dataset Measure	7 abalone	3 e3vs11	6	6	8 winequ	6 alitywhit	1 ee9vs4	1	2 yeast6	1	1	1
Dataset Measure	7 abalone Rec	3 e3vs11 F1-M	6 G-M	6 AUC	8 wineque	6 alitywhit F1-M	1 ce9vs4 G-M	1 AUC	yeast6 Rec	1 F1-M	1 G-M	1 AUC
Dataset  Measure  SMOTE <sup>m1</sup>	7 abalone Rec 1.000	3 e3vs11 F1-M <b>0.971</b>	6 G-M <b>0.999</b>	AUC 0.999	8 wineque Rec 0.900	6 alitywhit F1-M 0.635	1 ee9vs4 G-M 0.922	AUC 0.930	2 yeast6 Rec 0.854	F1-M 0.305	G-M 0.879	1 AUC 0.88 4
Dataset  Measure  SMOTE <sup>m1</sup>	7 abalone Rec 1.000 10	3 e3vs11 F1-M 0.971 5	6 G-M 0.999 6	6 AUC 0.999 6	8 wineque Rec 0.900 6	6 alitywhit F1-M 0.635 7	1 ee9vs4 G-M 0.922 3	AUC 0.930 3	yeast6 Rec 0.854	F1-M 0.305 5	G-M 0.879 4	AUC 0.88
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	7 abalone Rec 1.000 10 1.000	3 e3vs11 F1-M 0.971 5 0.971	6 G-M 0.999 6 0.999	AUC 0.999 6 0.999	8 wineque Rec 0.900 6 0.550	6 alitywhit F1-M 0.635 7 0.519	1 G-M 0.922 3 0.722	AUC 0.930 3 0.755	yeast6 Rec 0.854 7 0.846	F1-M 0.305 5 0.329	G-M 0.879 4 0.879	AUC 0.88 4 0.88 3
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup>	7 abalone Rec 1.000 10 1.000 9	3 e3vs11 F1-M 0.971 5 0.971 4	6 G-M 0.999 6 0.999 5	AUC 0.999 6 0.999 5	8 wineque Rec 0.900 6 0.550 10	6 alitywhit F1-M 0.635 7 0.519	1 G-M 0.922 3 0.722 10	AUC 0.930 3 0.755 10	yeast6 Rec 0.854 7 0.846 9	F1-M 0.305 5 0.329 3	G-M 0.879 4 0.879 3	AUC 0.88 4 0.88 3
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	7 abalone Rec 1.000 10 1.000 9 1.000	3 e3vs11 F1-M 0.971 5 0.971 4 0.971	6 G-M 0.999 6 0.999 5 0.999	AUC 0.999 6 0.999 5 0.999	8 wineque Rec 0.900 6 0.550 10 0.900	6 alitywhit F1-M 0.635 7 0.519 9 0.709	1 ce9vs4 G-M 0.922 3 0.722 10 <b>0.928</b>	AUC 0.930 3 0.755 10 0.936	yeast6 Rec 0.854 7 0.846 9 0.729	F1-M 0.305 5 0.329 3 0.422	G-M 0.879 4 0.879 3 0.829	0.88 4 0.88 3 0.84 9
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup>	7 Rec 1.000 10 1.000 9 1.000 8	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3	6 G-M 0.999 6 0.999 5 0.999 4	AUC 0.999 6 0.999 5 0.999 4	8 wineque Rec 0.900 6 0.550 10 0.900 5	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2	1 ce9vs4 G-M 0.922 3 0.722 10 <b>0.928</b> 2	AUC 0.930 3 0.755 10 0.936 1	yeast6 Rec 0.854 7 0.846 9 0.729 10	F1-M 0.305 5 0.329 3 0.422 1	G-M 0.879 4 0.879 3 0.829 9	0.88 4 0.88 3 0.84 9
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954	6 G-M 0.999 6 0.999 5 0.999 4 0.960	6 AUC 0.999 6 0.999 5 0.999 4 0.967	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667	1 de9vs4 G-M 0.922 3 0.722 10 <b>0.928</b> 2 0.707	AUC 0.930 3 0.755 10 0.936 1 0.750	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125	1 F1-M 0.305 5 0.329 3 0.422 1 0.222	G-M 0.879 4 0.879 3 0.829 9 0.354	1 0.88 4 0.88 3 0.84 9 0.56
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14	AUC 0.999 6 0.999 5 0.999 4 0.967 14	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6	1 de9vs4 G-M 0.922 3 0.722 10 <b>0.928</b> 2 0.707 14	AUC 0.930 3 0.755 10 0.936 1 0.750 14	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14	1 F1-M 0.305 5 0.329 3 0.422 1 0.222	G-M 0.879 4 0.879 3 0.829 9 0.354 14	1 0.88 4 0.88 3 0.84 9 0.56
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14 0.933	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10 0.954	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14 0.960	AUC 0.999 6 0.999 5 0.999 4 0.967 14 0.967	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14 0.500	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6 0.667	1 de9vs4 G-M 0.922 3 0.722 10 0.928 2 0.707 14 0.707	AUC 0.930 3 0.755 10 0.936 1 0.750 14 0.750	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14 0.125	1 F1-M 0.305 5 0.329 3 0.422 1 0.222 13 0.222	G-M 0.879 4 0.879 3 0.829 9 0.354 14 0.354	1 0.88 4 0.88 3 0.84 9 0.56 14 0.56
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14 0.933 13	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10 0.954 9	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14 0.960 13	6 AUC 0.999 6 0.999 5 0.999 4 0.967 14 0.967 13	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14 0.500 13	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6 0.667 5	1 de9vs4 G-M 0.922 3 0.722 10 0.928 2 0.707 14 0.707 13	AUC 0.930 3 0.755 10 0.936 1 0.750 14 0.750 13	2 yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14 0.125 13	1 F1-M 0.305 5 0.329 3 0.422 1 0.222 13 0.222	G-M 0.879 4 0.879 3 0.829 9 0.354 14 0.354 13	1 0.88 4 0.88 3 0.84 9 0.56 14 0.56
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14 0.933 13 1.000	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10 0.954 9 0.666	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14 0.960 13 0.983	6 AUC 0.999 6 0.999 5 0.999 4 0.967 14 0.967 13 0.983	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14 0.500 13 0.500	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6 0.667 5 0.667	1 de9vs4 G-M 0.922 3 0.722 10 0.928 2 0.707 14 0.707 13 0.707	AUC 0.930 3 0.755 10 0.936 1 0.750 14 0.750 13 0.750	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14 0.125 13 0.886	1 F1-M 0.305 5 0.329 3 0.422 1 0.222 13 0.222 12 0.270	G-M 0.879 4 0.879 3 0.829 9 0.354 14 0.354 13 0.885	1 AUC 0.88 4 0.88 3 0.84 9 0.56 14 0.56 13 0.88 2
Dataset	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14 0.933 13 1.000 7	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10 0.954 9 0.666 14	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14 0.960 13 0.983 11	6 AUC 0.999 6 0.999 5 0.999 4 0.967 14 0.967 13 0.983 11	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14 0.500 13 0.500 12	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6 0.667 5 0.667 4	1 ee9vs4 G-M 0.922 3 0.722 10 0.928 2 0.707 14 0.707 13 0.707 12	1 AUC 0.930 3 0.755 10 0.936 1 0.750 14 0.750 13 0.750 12	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14 0.125 13 0.886 2	1 F1-M 0.305 5 0.329 3 0.422 1 0.222 13 0.222 12 0.270 6	G-M 0.879 4 0.879 3 0.829 9 0.354 14 0.354 13 0.885 2	1 AUC 0.88 4 0.88 3 0.84 9 0.56 14 0.56 13 0.88 2
Dataset  Measure  SMOTE <sup>m1</sup> KNSMOTE <sup>m1</sup> ADPCHFO <sup>m1</sup> ENN <sup>m2</sup> CBIS <sup>m2</sup> AdaOBU <sup>m2</sup>	7 abalone Rec 1.000 10 1.000 9 1.000 8 0.933 14 0.933 13 1.000 7 1.000	3 e3vs11 F1-M 0.971 5 0.971 4 0.971 3 0.954 10 0.954 9 0.666 14 0.969	6 G-M 0.999 6 0.999 5 0.999 4 0.960 14 0.960 13 0.983 11 0.999	6 AUC 0.999 6 0.999 5 0.999 4 0.967 14 0.967 13 0.983 11 0.999	8 wineque Rec 0.900 6 0.550 10 0.900 5 0.500 14 0.500 13 0.500 12 0.890	6 alitywhit F1-M 0.635 7 0.519 9 0.709 2 0.667 6 0.667 5 0.667 4 0.610	1 re9vs4 G-M 0.922 3 0.722 10 0.928 2 0.707 14 0.707 13 0.707 12 0.914	1 AUC 0.930 3 0.755 10 0.936 1 0.750 14 0.750 13 0.750 12 0.923	yeast6 Rec 0.854 7 0.846 9 0.729 10 0.125 14 0.125 13 0.886 2 0.851	1 F1-M 0.305 5 0.329 3 0.422 1 0.222 13 0.222 12 0.270 6 0.308	G-M 0.879 4 0.879 3 0.829 9 0.354 14 0.354 13 0.885 2 0.878	1 AUC 0.88 4 0.88 3 0.84 9 0.56 14 0.56 13 0.88 2 0.88

No. Processes   Part   Part	DEMOEM3	1.000	0.959	0.998	0.998	0.900	0.480	0.904	0.912	0.877	0.224	0.864	0.865
Simple   Parish	RFMSE <sup>m3</sup>	5	7	7	7	4	11	5	5	5	11	8	8
Height	GDEm4	1.000	0.768	0.990	0.990	0.900	0.230	0.832	0.841	0.880	0.252	0.877	0.878
Description         3         1         8         8         8         7         1         6         6         1         <	SBE	4	13	10	10	3	14	8	8	4	8	7	7
Heat Properties   Heat Prop	DTE CDDM4	1.000	0.947	0.998	0.998	0.890	0.515	0.901	0.909	0.708	0.215	0.694	0.709
REMDOM***         2         12         9         9         2         13         7         3         7         6         6         7         1         2         2         1         2         1         2         0         0.785         0.721         0.724         0.793         0.806         0.242         0.000         0.785         0.201         0.724         0.000         0.785         0.201         0.724         0.000         0.000         0.740         0.724         0.000         0.0	D1E-SBD	3	11	8	8	7	10	6	6	11	14	11	11
Heater Page 1	DEMOD m4	1.000	0.773	0.990	0.990	0.900	0.265	0.842	0.852	0.883	0.253	0.878	0.879
EASEM         1         2         2         2         9         1         9         1         9         10         10         10         1,00         0,90         0,90         0,90         0,71         0,20 <td>REMDD</td> <td>2</td> <td>12</td> <td>9</td> <td>9</td> <td>2</td> <td>13</td> <td>7</td> <td>7</td> <td>3</td> <td>7</td> <td>6</td> <td>6</td>	REMDD	2	12	9	9	2	13	7	7	3	7	6	6
DCHSIS         1.000         0.971         0.999         0.999         0.990         0.974         0.928         0.935         0.935         0.640         0.14         0.28         0.935         0.867         0.413         0.892         0.893           Dataset         1900         1900         1900         1900         1900         1900         1900         1900         1900         1900         1900         1900         1900         0.903         0.903         0.903         0.904         0.020         0.401         0.004         0.004         0.003         0.004	EAGE <b>m</b> 4	0.998	0.971	0.999	0.999	0.785	0.271	0.724	0.793	0.886	0.242	0.809	0.817
Description         Incremental Distance         Incremental Dist	EASE	11	2	2	2	9	12	9	9	1	9	10	10
Dataset   Massure   Mas	DCCHC	1.000	0.971	0.999	0.999	0.900	0.714	0.928	0.935	0.867	0.413	0.892	0.893
Messure   Rec   F1-M   G-M   AUC   Rec   F1-M   G-M   AUC   Rec   F1-M   G-M   AUC   Rec   Rec   F1-M   G-M   AUC   Rec   Rec   R1-M   G-M   AUC   Rec   R1-M   G-M   G-M   AUC   Rec   R1-M   G-M   AUC   Rec   R1-M   G-M   AUC   R1-M   G-M   AUC   Rec   R1-M   G-M   G-M   AUC   Rec   R1-M   G-M   G-M   AUC   Rec   R1-M   G-M	DCSHS	1	1	1	1	1	1	1	2	6	2	1	1
SMOTE <sup>m1</sup>   1	Dataset	winequ	alitywhit	te39vs5		shuttle	2vs5			poker8	vs6		
SMOTE <sup>III</sup> 1         9         1         1         7         6         6         6         6         1 <th< td=""><td>Measure</td><td>Rec</td><td>F1-M</td><td>G-M</td><td>AUC</td><td>Rec</td><td>F1-M</td><td>G-M</td><td>AUC</td><td>Rec</td><td>F1-M</td><td>G-M</td><td>AUC</td></th<>	Measure	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC	Rec	F1-M	G-M	AUC
Name	смотем1	0.568	0.086	0.663	0.685	1.000	1.000	1.000	1.000	0.401	0.023	0.441	0.481
Namotre	SMOTE	1	9	1	1	7	6	6	6	6	12	11	12
Harmonian   Har	ZNIGNOTEM1	0.316	0.056	0.492	0.568	0.986	0.992	0.993	0.993	0.346	0.027	0.474	0.518
ADPCHFO <sup>MI</sup> 1         4         11         9         6         5         5         5         10         6         3         2           ENN <sup>m2</sup> 0.167         0.286         0.408         0.583         0.740         0.839         0.857         0.870         0.230         0.373         0.479         0.615           ENN <sup>m2</sup> 114         3         14         12         11         11         11         14         4         6         5           CBIS <sup>m2</sup> 0.167         0.286         0.408         0.583         0.738         0.838         0.856         0.869         0.230         0.373         0.479         0.615           CBIS <sup>m2</sup> 0.167         0.286         0.693         0.544         0.607         0.734         0.824         0.853         0.867         0.230         0.323         0.474         0.605           AdaOBU <sup>m2</sup> 9         11         9         8         13         13         13         12         5         8         6           SMIL <sup>m3</sup> 0.580         0.681         0.681         1.000         1.000         1.000         1.000         1.000         0.875         0.87	KNSMO1E	10	13	10	13	8	8	8	8	8	7	9	10
Harmonia   Harmonia	A DROLLEOM1	0.190	0.267	0.431	0.592	1.000	1.000	1.000	1.000	0.265	0.274	0.506	0.624
ENN <sup>m2</sup> 14         3         14         12         11         11         11         11         14         4         4         6         5           CBIS <sup>m2</sup> 0.167         0.286         0.408         0.583         0.738         0.838         0.856         0.869         0.230         0.373         0.479         0.615           CBIS <sup>m2</sup> 13         11         12         12         12         13         3         5         4           AdaOBU <sup>m2</sup> 0.365         0.083         0.544         0.607         0.734         0.824         0.853         0.867         0.230         0.323         0.474         0.605           SMTL <sup>m3</sup> 9         11         9         8         13         13         13         13         12         5         8         6           SMTL <sup>m3</sup> 0.560         0.885         0.681         1.000         1.000         1.000         0.412         0.023         0.446         0.484           CMSS <sup>m3</sup> 0.167         0.286         0.681         1.000         1.000         1.000         1.000         0.230         0.373         0.479         0.535           REMSE	ADPCHFO	11	4	11	9	6	5	5	5	10	6	3	2
CBISM2         14         3         14         12         11         11         11         11         14         4         6         5           CBISM2         0.167         0.286         0.408         0.583         0.738         0.838         0.856         0.869         0.230         0.373         0.479         0.615           AdaOBU <sup>m2</sup> 13         2         13         11         12         12         12         12         13         3         5         4           AdaOBU <sup>m2</sup> 9         11         9         8         13         13         13         13         12         5         8         6           SMTL <sup>m3</sup> 0.560         0.085         0.681         1.000         1.000         1.000         1.000         0.401         1.000         0.412         0.230         0.446         0.484           SMTL <sup>m3</sup> 2         10         2         2         5         4         4         4         5         13         10         11           CUSS <sup>m3</sup> 12         1         12         10         10         10         10         10         10         10         10	ENIMP	0.167	0.286	0.408	0.583	0.740	0.839	0.857	0.870	0.230	0.373	0.479	0.615
CBIS <sup>m2</sup> 13         2         13         11         12         12         12         12         12         12         12         12         12         12         12         12         12         12         12         12         12         12         12         13         3         5         4           AdaOBU <sup>m2</sup> 9         11         9         8         13         13         13         12         5         8         6           SMTL <sup>m3</sup> 0.560         0.085         0.658         0.681         1.000         1.000         1.000         1.000         0.412         0.23         0.446         0.484           SMTL <sup>m3</sup> 1         1         2         2         5         4         4         4         5         13         10         11           CUSS <sup>m3</sup> 12         1         12         10         10         10         10         11         2         4         3           RemSem³         0.530         0.073         0.619         0.643         1.000         1.000         1.000         1.000         0.691         0.621         0.475         0.535         0.845 <td< td=""><td>ENN</td><td>14</td><td>3</td><td>14</td><td>12</td><td>11</td><td>11</td><td>11</td><td>11</td><td>14</td><td>4</td><td>6</td><td>5</td></td<>	ENN	14	3	14	12	11	11	11	11	14	4	6	5
AdaOBU <sup>m2</sup>	CDICM2	0.167	0.286	0.408	0.583	0.738	0.838	0.856	0.869	0.230	0.373	0.479	0.615
AdaOBU**2         9         11         9         8         13         13         13         13         13         12         5         8         6           BMIL***         0.560         0.085         0.681         1.000         1.000         1.000         1.000         0.412         0.023         0.446         0.484           BMIL****         10         2         5         4         4         5         13         10         11           CUSS****         12         1         12         10         10         10         10         11         2         4         3           ALS****         1.00         1.00         1.00         1.00         1.00         1.00         1.00         0.230         0.373         0.479         0.615           ALS******         1.00         1.00         1.00         1.00         1.00         1.00         1.00         0.230         0.373         0.479         0.535           ALS************************************	CDIS	13	2	13	11	12	12	12	12	13	3	5	4
SMTL <sup>m3</sup>	A do ODI IM2	0.365	0.083	0.544	0.607	0.734	0.824	0.853	0.867	0.230	0.323	0.474	0.605
SMTL <sup>m3</sup> 2 10 2 2 5 4 4 4 4 5 13 10 11  CUSS <sup>m3</sup> 2 10 0.286 0.408 0.583 0.740 0.839 0.857 0.870 0.230 0.373 0.479 0.615  CUSS <sup>m3</sup> 12 1 12 10 10 10 10 10 10 10 11 2 4 3  RFMSE <sup>m3</sup> 5 12 6 7 4 7 7 7 2 10 7 7  SBE <sup>m4</sup> 0.539 0.088 0.631 0.660 1.000 1.000 1.000 0.887 0.687 0.021 0.355 0.481  DTE-SBD <sup>m4</sup> 4 8 5 6 6 3 3 4 9 9 9 9 9 9 0.38 14 14 13  REMDD <sup>m4</sup> 6 0.515 0.091 0.635 0.669 0.639 0.695 0.712 0.729 0.733 0.026 0.406 0.528  EASE <sup>m4</sup> 0.555 0.042 0.553 0.566 1.000 1.000 1.000 1.000 0.462 0.025 0.514 0.533	AdaOBU	9	11	9	8	13	13	13	13	12	5	8	6
CUSS <sup>m3</sup>	CMTI m3	0.560	0.085	0.658	0.681	1.000	1.000	1.000	1.000	0.412	0.023	0.446	0.484
CUSS <sup>m3</sup> 12	SMIL	2	10	2	2	5	4	4	4	5	13	10	11
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	CUSCm3	0.167	0.286	0.408	0.583	0.740	0.839	0.857	0.870	0.230	0.373	0.479	0.615
RFMSE <sup>m3</sup> 5 12 6 7 4 7 7 7 2 10 7 7  BBE <sup>m4</sup> 6 6 3 4 9 9 9 9 9 0.539 0.088 0.631 0.660 1.000 1.000 1.000 1.000 0.385 0.023 0.439 0.471  BTE-SBD <sup>m4</sup> 7 7 4 5 14 14 14 14 14 14 14 14 18 13 9  EASE <sup>m4</sup> 0.555 0.042 0.553 0.566 1.000 1.000 1.000 1.000 0.462 0.025 0.514 0.533	COSS	12	1	12	10	10	10	10	10	11	2	4	3
SBE <sup>m4</sup> SBE <sup>m4</sup> 0.519 0.092 0.642 0.676 0.756 0.845 0.867 0.878 0.687 0.021 0.355 0.481  DTE-SBD <sup>m4</sup> 0.539 0.088 0.631 0.660 1.000 1.000 1.000 1.000 0.385 0.023 0.439 0.471  A REMDD <sup>m4</sup> REMDD <sup>m4</sup> 0.515 0.091 0.635 0.669 0.639 0.695 0.712 0.729 0.733 0.026 0.406 0.528  EASE <sup>m4</sup> 0.555 0.042 0.553 0.566 1.000 1.000 1.000 1.000 0.462 0.025 0.514 0.533	pemsem3	0.530	0.073	0.619	0.643	1.000	0.996	1.000	1.000	0.691	0.024	0.475	0.535
SBE <sup>m4</sup> 6 6 6 3 4 9 9 9 9 9 3 14 14 13  DTE-SBD <sup>m4</sup> 0.539 0.088 0.631 0.660 1.000 1.000 1.000 1.000 0.385 0.023 0.439 0.471  A 8 5 6 3 3 3 3 7 11 12 14  REMDD <sup>m4</sup> 7 7 4 5 14 14 14 14 14 14 1 8 13 9  EASE <sup>m4</sup> 0.555 0.042 0.553 0.566 1.000 1.000 1.000 1.000 0.385 0.023 0.439 0.471  B 9 9 9 9 9 9 9 3 14 14 14 14 14 14 14 14 14 14 14 14 14	KIWISE	5	12	6	7	4	7	7	7	2	10	7	7
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SDEm4	0.519	0.092	0.642	0.676	0.756	0.845	0.867	0.878	0.687	0.021	0.355	0.481
DTE-SBD <sup>m4</sup> $4$ 8 5 6 3 3 3 3 7 11 12 14 $\frac{14}{14}$ REMDD <sup>m4</sup> $\frac{1}{7}$ 7 4 5 14 14 14 14 14 1 18 13 9 $\frac{1}{14}$ EASE <sup>m4</sup>	SDL	6	6	3	4	9	9	9	9	3	14	14	13
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	DTE CRDM4	0.539	0.088	0.631	0.660	1.000	1.000	1.000	1.000	0.385	0.023	0.439	0.471
REMDD <sup>m4</sup> 7 7 4 5 14 14 14 14 1 1 8 13 9  0.555 0.042 0.553 0.566 <b>1.000 1.000 1.000 1.000</b> 0.462 0.025 0.514 0.533  EASE <sup>m4</sup>	DIE-SDD	4	8	5	6	3	3	3	3	7	11	12	14
	DEMDDm4	0.515	0.091	0.635	0.669	0.639	0.695	0.712	0.729	0.733	0.026	0.406	0.528
EASE <sup>m4</sup>	KEMIDD	7	7	4	5	14	14	14	14	1	8	13	9
LASE	EASEM4	0.555	0.042	0.553	0.566	1.000	1.000	1.000	1.000	0.462	0.025	0.514	0.533
3 14 8 14 <b>2 2 2 2</b> 4 9 2 8	EASE	3	14	8	14	2	2	2	2	4	9	2	8

DCSHS	0.439	0.152	0.616	0.680	1.000	1.000	1.000	1.000	0.316	0.446	0.550	0.658
DCSHS	8	5	7	3	1	1	1	1	9	1	1	1

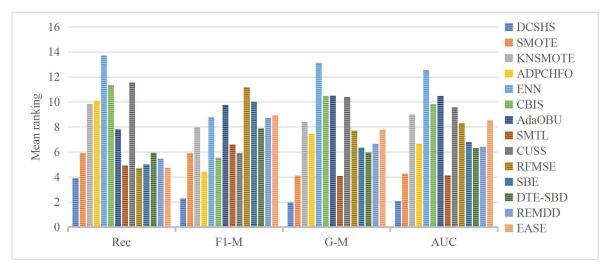


Fig. 7 Mean ranking of four evaluation criteria by the algorithms on all datasets

Table 4 The *p*-value of Holm test with DCSHS as control method.

Algorithms	Rec	F1-M	G-M	AUC
SMOTE	1.42E-03	3.97E-06	1.30E-03	2.21E-03
KNSMOTE	9.78E-20	1.16E-12	2.53E-20	1.85E-20
ADPCHFO	2.49E-21	6.32E-02	1.47E-15	3.11E-10
ENN	1.91E-45	7.89E-16	6.35E-50	1.04E-40
CBIS	4.83E-29	3.13E-05	2.92E-32	8.69E-25
AdaOBU	9.47E-10	3.59E-20	1.96E-32	2.65E-28
SMTL	9.98E-02	4.53E-08	1.50E-03	4.12E-03
CUSS	2.59E-30	3.97E-06	6.48E-32	1.86E-23
RFMSE	2.13E-01	7.42E-27	1.98E-14	4.22E-17
SBE	5.42E-01	2.54E-21	1.13E-10	9.41E-11
DTE-SBD	1.22E-03	2.36E-12	3.59E-09	4.86E-09
REMDD	1.29E-02	1.03E-15	6.21E-12	2.48E-09
EASE	1.97E-01	1.59E-16	4.83E-17	3.78E-18

Table 5 Classification performance of different algorithms using SVM on the datasets with higher IR

Dataset	Measure	SBE	DTE-SBD	REMDD	EASE	DCSHS
	Rec	0.833	0.778	0.6	1	0.900
lad doe ethith e ela	F1-M	0.833	0.875	0.750	0.911	0.947
kddrootkitback	G-M	0.912	0.882	0.775	0.920	0.949
	AUC	0.916	0.889	0.800	0.930	0.950
	Rec	0.615	0.857	0.875	0.690	0.909
Abalana 10	F1-M	0.026	0.037	0.020	0.038	0.058
Abalone19	G-M	0.565	0.802	0.634	0.657	0.819
	AUC	0.567	0.804	0.667	0.690	0.824
	Rec	1	1	1	0.995	1
	F1-M	0.057	0.467	0.099	0.341	0.500
cod	G-M	0.980	0.999	0.983	0.955	0.999
	AUC	0.981	0.999	0.983	0.958	0.999

Table 6 Diversity analysis of base classifier

Dataset	Indicators	DCSHS	SBE	DTE-SBD	REMDD	EASE
Ecoli3	dis	0.290	0.015	0.017	0.231	0.203
	ς	0.157	0.962	0.923	0.459	0.377
	Q-statistic	0.177	0.999	0.999	0.636	0.712
	κ	0.152	0.963	0.922	0.456	0.351
Yeast2vs4	dis	0.203	0.029	0.01	0.285	0.117
	ς	0.177	0.850	0.925	0.233	0.501
	Q-statistic	0.359	0.998	0.999	0.453	0.866
	κ	0.159	0.840	0.923	0.220	0.461

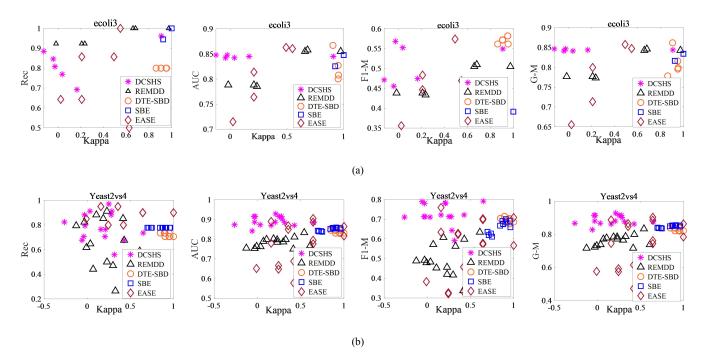


Fig. 8 Diversity and performance analysis of base classifiers :(a) diversity and performance analysis for Ecoli3, (b) diversity and performance analysis for Yeast2vs4