Supplementary Materials: Searchlight-scanned Over-sampling for Class Imbalance Problem

I. SCOS ALGORITHM

Algorithm S1 SCOS

Input: Training set S_{maj} and S_{min} with size N_1 and N_2.
Output: Synthetic samples S_{new}
/* Step 1: compute the relationship between pairs of minority samples */
for i=1 to N_2 **do**
    for j=i+1 to N_2 **do**
        for k=1 to N_1 **do**
            Compute $D(\boldsymbol{x}_i, \boldsymbol{x}_j, \boldsymbol{z}_k)$;
        end for
        Compute $M(\boldsymbol{x}_i, \boldsymbol{x}_j)$;
        $I(\boldsymbol{x}_i, \boldsymbol{x}_j) = 0$;
        if $M(\boldsymbol{x}_i, \boldsymbol{x}_j) \geq \delta$ **then**
            $I(\boldsymbol{x}_i, \boldsymbol{x}_j) = 1$;
        end if
    end for
end for
/* Step 2: Compute the searchlight structure for each minority sample */
for $x \in S_{min}$ **do**
    Compute k nearest majority neighbours from S_{maj};
    Compute the center $\bar{\boldsymbol{z}}$ of k nearest majority neighbours;
    Obtain the vertical vector $\boldsymbol{a} = \boldsymbol{x} - \bar{\boldsymbol{z}}$;
    Obtain direct interlinked minority samples ($I(x, x_t) = 1$) of $\boldsymbol{x}$;
    Compute corresponding projections on $\boldsymbol{a}$;
    Compute the mean of positive projections;
    Compute the vertex v;
    Find scanned majority samples;
    Find the nearest one from scanned majority samples;
    Compute the radius r;
    if no one direct interlinked minority $|| \boldsymbol{a} == \boldsymbol{0} || r \leq 0 ||$ no scanned majority sample existed **then**
        Considering $\boldsymbol{x}$ as the noise one or the improper one for data generation;
    else
        Recording the searchlight structure with $\boldsymbol{v}$, r and ρ;
    end if
end for
/* Step 3: generate synthetic samples */
for i=1 to $N_1 - N_2$ **do**
    Randomly select one recorded searchlight structure with $\boldsymbol{v}$, r and θ;
    Randomly generate a scalar number ξ in [0,1];
    Randomly generate an unit vector $\overrightarrow{d}$ that falling in the searchlight structure;
    Generate one new synthetic samples $new = v + (\xi \times r) \times \overrightarrow{d}$;
    Add the new synthetic samples to S_{new};
end for
return S_{new}
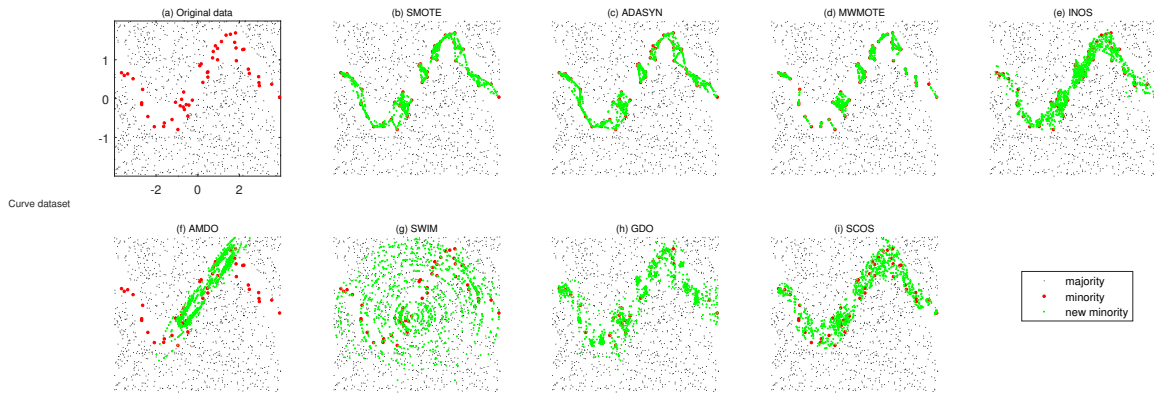

II. VISUAL COMPARISON WITH ANOTHER TWO DATASETS IN $\mathbb{R}^2$

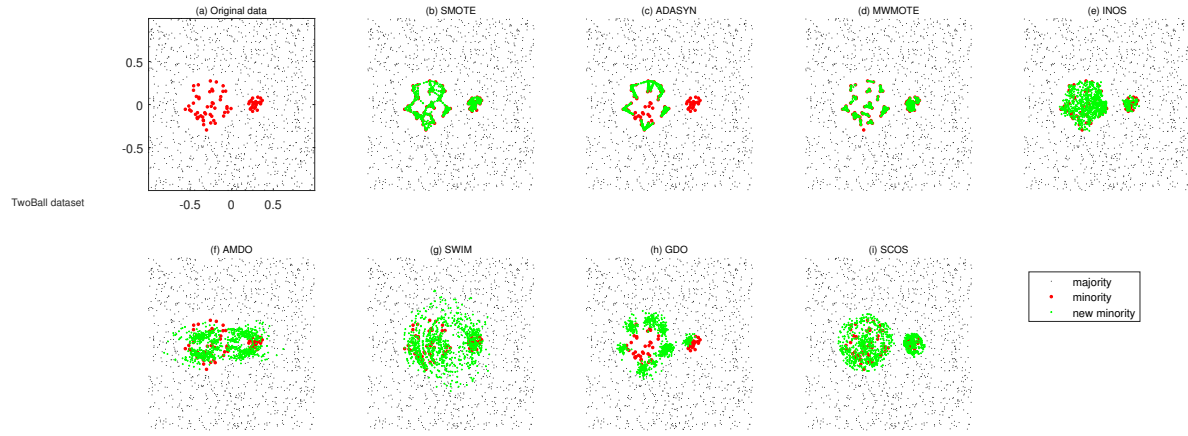Fig. S1: Synthetic data on Curve dataset..

Fig. S2: Synthetic data on TwoBall dataset..

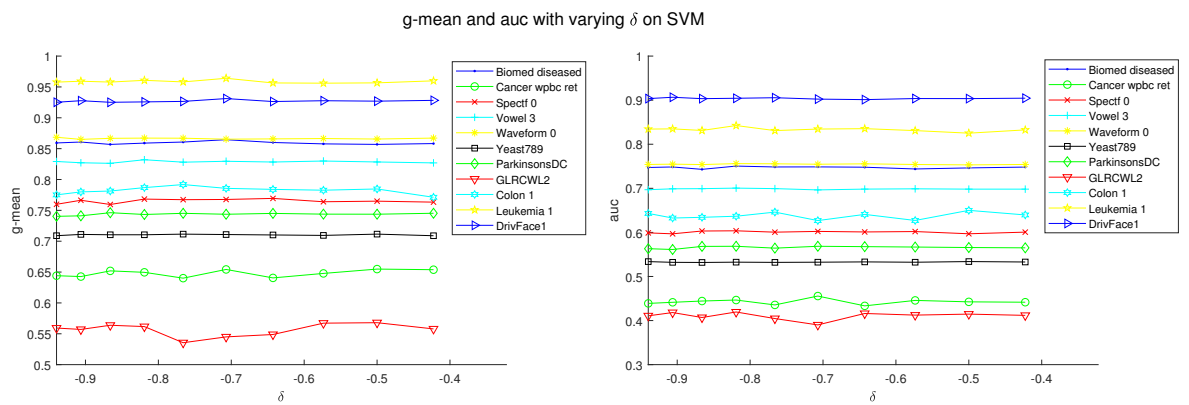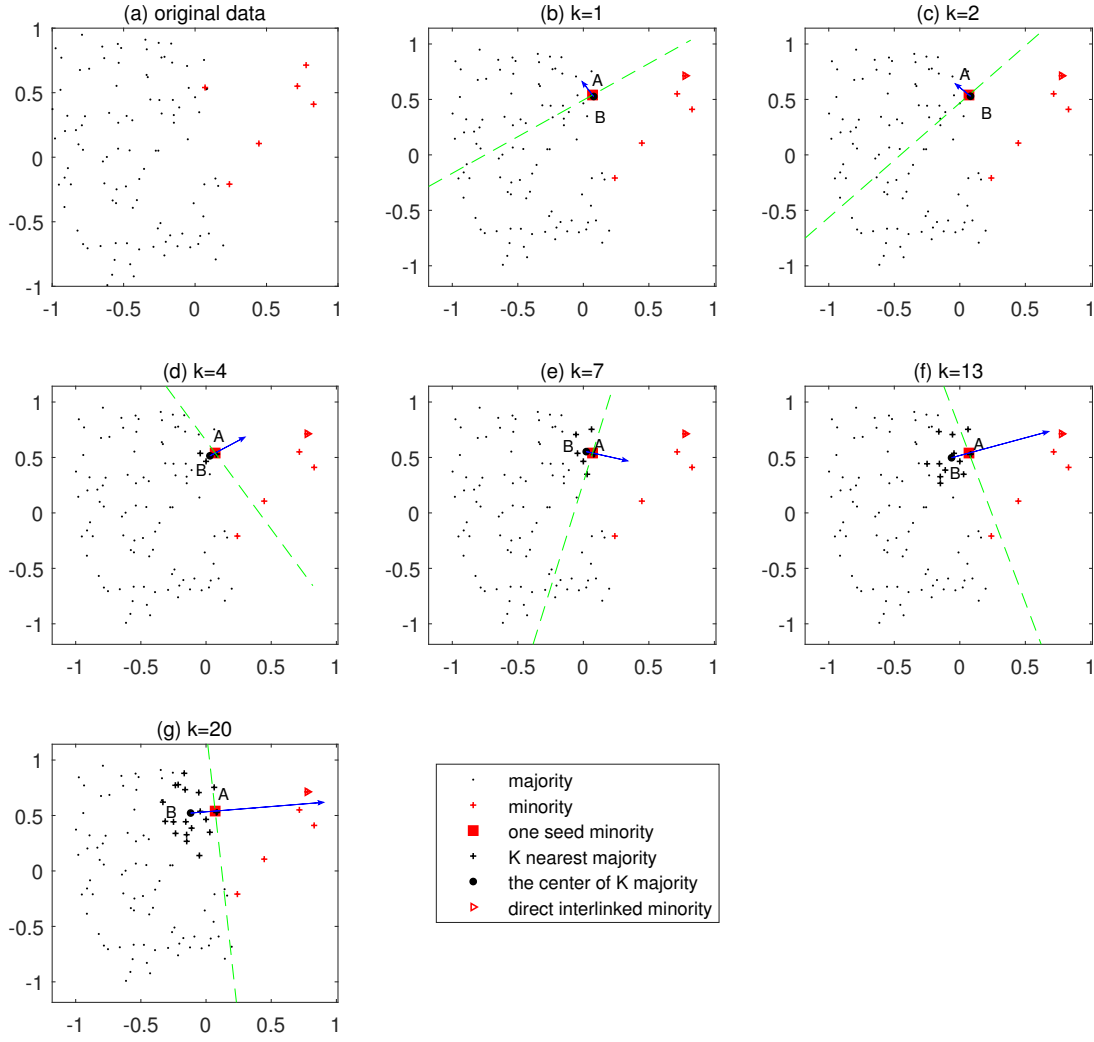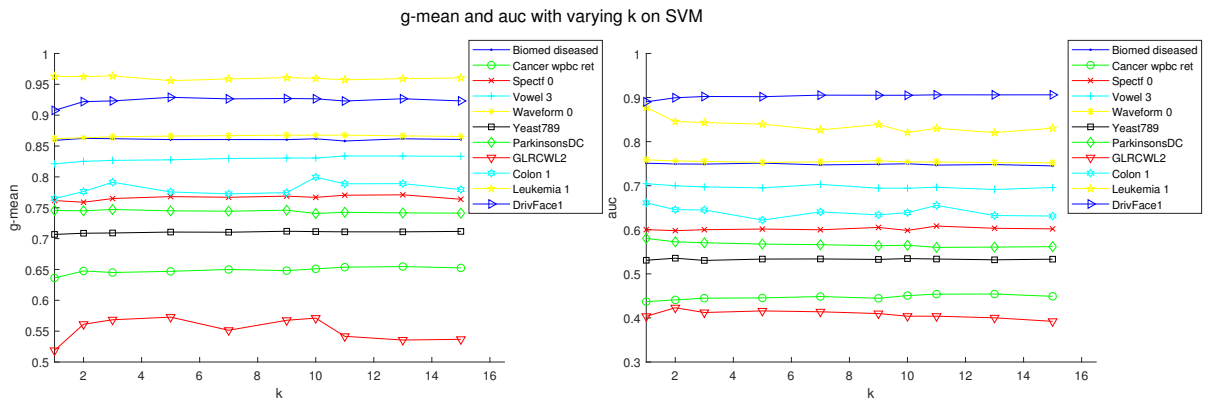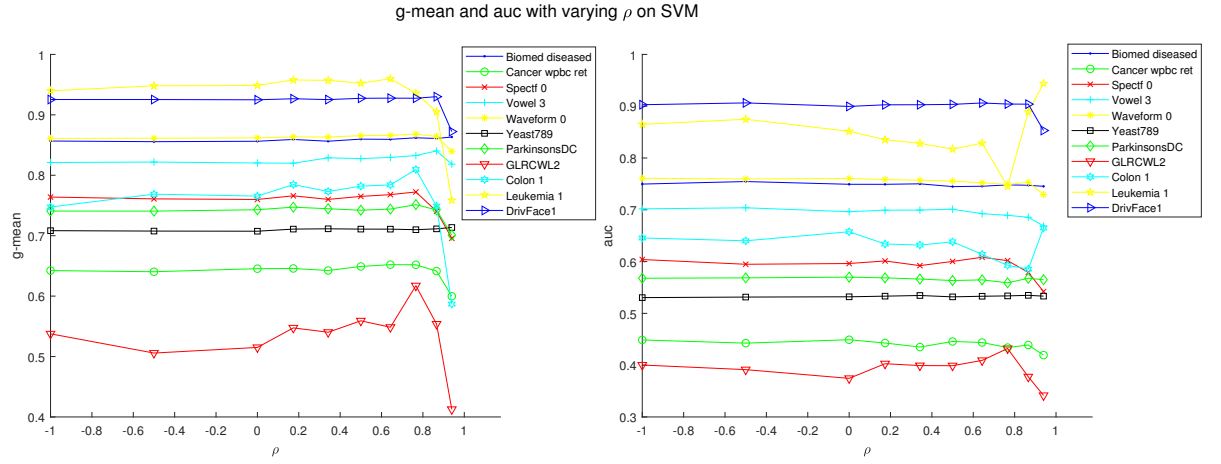## III. PARAMETER SETTING OF δ, k AND ρ
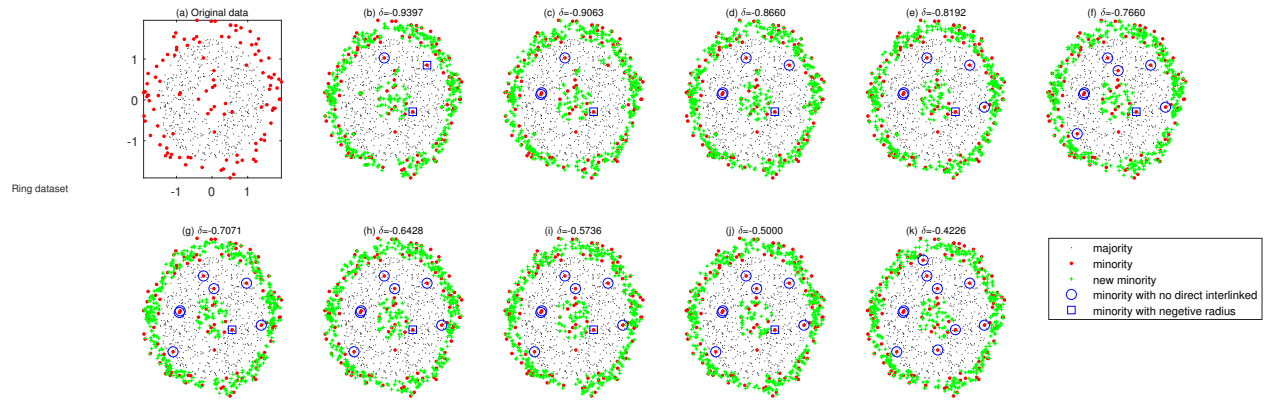
Fig. S3: SCOS: synthetic data on varying δ.

Fig. S4: g-mean and auc with varying δ.

Fig. S5: Different referred vectors on varying k.

Fig. S6: g-mean and auc with varying k.

g-mean and auc with varying ρ on SVM

Fig. S7: g-mean and auc with varying ρ.

IV. BASIC PROPERTIES OF REAL-WORLD DATASETS

TABLE S1: Basic properties of real-world datasets

dataset	dimension	minority, majority class	number	ratio
Survival ¡5yr	3	-	81:225	2.8
Biomed diseased	5	-	67:127	1.9
Cancer wpbc ret	33	-	47:151	3.2
Diabetes absent	8	-	268:500	1.9
Hepatitis normal	19	-	32:123	3.8
Housing MEDV¿35	13	-	48:458	9.5
Spectf 0	44	-	95:254	2.7
Iris setosa	4	-	50:100	2.0
Vowel 3	10	-	48:480	10.0
Vowel 8	10	-	48:480	10.0
Waveform 0	21	-	300:600	2.0
BreastTissue24	8	2,4;rest	31:75	2.4
BreastTissue3	8	3;rest	18:88	4.9
Ecoli2	7	im;rest	77:259	3.4
Ecoli3	7	pp;rest	52:284	5.5
Glass5	9	5;rest	13:201	15.5
Glass7	9	7;rest	29:185	6.4
ImageSegmentation7	19	7;rest	330:1980	6.0
ImageSegmentation5	19	5;rest	330:1980	6.0
LibrasMovement11	90	11;rest	24:336	14.0
LibrasMovement15	90	15;rest	24:336	14.0
Pageblocks35	10	3,5;rest	143:5330	37.3
StatlogVehicleSilhouettes3	18	3;rest	218:628	2.9
StatlogVehicleSilhouettes2	18	2;rest	217:629	2.9
WallFollowingRobotNavigation4	24	4;rest	328:5128	15.6
Yeast789	8	7,8,9;rest	85:1399	16.5
Yeast56	8	5,6;rest	95:1389	14.6
DMEAntiVirus	531	-	72:302	4.1944
ParkinsonsDC	754	-	192:564	2.9375
GLRCWL1	698	hyperplasic;rest	21:55	2.619
GLRCWL2	698	serrated;rest	15:61	4.0667
GLRCNBI1	698	hyperplasic;rest	21:55	2.619
GLRCNBI2	698	serrated;rest	15:61	4.0667
Colon 1	1908	-	22:40	1.8
Leukemia 1	3571	-	25:47	1.9
Metas 1	4919	-	46:99	2.2
DrivFace1	6399	1;rest	27:579	21.4444
DrivFace3	6399	3;rest	33:573	17.3636
ARBT6	8265	BookOfEcclesiastes;rest	12:578	48.1667
ARBT5	8265	BookOfProverb;rest	31:559	18.0323

V. CLASSIFICATION PERFORMANCE OF SUPPORT VECTOR MACHINE (SVM)

TABLE S2: SVM: average precision

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.1677±0.2374(9)	0.5301±0.0905(5)	0.5199±0.0955(7)	0.4968±0.1010(8)	0.5461±0.0819(4)	0.5471±0.0782(3)	**0.5493±0.0874(1)**	0.5266±0.0935(6)	0.5472±0.0793(2)
Biomed diseased	**0.9781±0.0361(1)**	0.9328±0.0610(3)	0.8797±0.0592(8)	0.9166±0.0687(7)	0.9200±0.0656(5)	0.9391±0.0577(2)	0.9238±0.0579(4)	0.8793±0.0656(9)	0.9175±0.0557(6)
Cancer wpbc ret	**0.5698±0.1169(1)**	0.4770±0.0864(4)	0.4697±0.0808(6)	0.4780±0.0753(3)	0.4741±0.0734(5)	0.5542±0.1055(2)	0.4440±0.0635(8)	0.4565±0.0921(7)	0.4426±0.0743(9)
Diabetes absent	**0.7860±0.0411(1)**	0.7059±0.0401(4)	0.6952±0.0439(8)	0.6922±0.0412(9)	0.7108±0.0484(3)	0.7238±0.0460(2)	0.7038±0.0462(5)	0.6966±0.0463(7)	0.7010±0.0408(6)
Hepatitis normal	0.5874±0.1371(1.5)	0.5471±0.1293(4)	0.5235±0.1121(8)	0.5438±0.1087(5)	0.5494±0.1034(3)	0.5874±0.1371(1.5)	0.5278±0.0809(7)	0.5371±0.0890(6)	0.5128±0.0745(9)
Housing MEDV¿35	**0.8742±0.1099(1)**	0.5948±0.0676(5)	0.5794±0.0708(6)	0.6464±0.0994(3)	0.6254±0.0803(4)	0.8426±0.1146(2)	0.4810±0.0542(9)	0.5298±0.0654(7)	0.5225±0.0597(8)
Spectf 0	**0.6686±0.0699(1)**	0.6361±0.0651(3)	0.6338±0.0571(4)	0.6365±0.0654(2)	0.6241±0.0550(6)	0.6302±0.0556(5)	0.5284±0.0499(9)	0.6140±0.0651(7)	0.5965±0.0523(8)
Iris setosa	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	0.9995±0.0046(9)	1.0000±0.0000(4.5)
Vowel 3	**0.9112±0.0929(1)**	0.5543±0.1337(3)	0.4152±0.0785(8)	0.4861±0.1622(5)	0.5392±0.1083(4)	0.8301±0.1143(2)	0.4183±0.0867(7)	0.3928±0.0900(9)	0.4299±0.0836(6)
Vowel 8	0.0000±0.0000(9)	**0.3315±0.0515(1)**	0.3271±0.0464(2)	0.3196±0.0523(4)	0.3161±0.0442(5)	0.2477±0.1747(8)	0.2891±0.0362(7)	0.3159±0.0471(6)	0.3217±0.0424(3)
Waveform 0	**0.8005±0.0286(1)**	0.7763±0.0225(4)	0.7689±0.0269(6)	0.7798±0.0263(3)	0.7754±0.0253(5)	0.7810±0.0273(2)	0.7280±0.0229(9)	0.7568±0.0250(7)	0.7475±0.0242(8)
BreastTissue24	**0.7285±0.0961(1)**	0.6933±0.0867(2)	0.6876±0.0903(7)	0.6922±0.0909(3)	0.6902±0.0911(4)	0.6883±0.0886(5)	0.6282±0.0822(9)	0.6839±0.0819(8)	0.6878±0.0874(6)
BreastTissue3	0.0000±0.0000(9)	0.2577±0.0628(6)	0.2646±0.0531(3)	0.2581±0.0609(5)	0.2412±0.0777(7)	0.0023±0.0189(8)	**0.2776±0.0504(1)**	0.2610±0.0525(4)	0.2651±0.0496(2)
Ecoli2	**0.8727±0.0484(1)**	0.7185±0.0629(4)	0.6805±0.0464(7)	0.7106±0.0647(5)	0.7192±0.0654(3)	0.7731±0.0639(2)	0.6606±0.0394(9)	0.6649±0.0402(8)	0.6913±0.0542(6)
Ecoli3	**0.8154±0.0791(1)**	0.6573±0.0491(3)	0.6042±0.0554(9)	0.6550±0.0493(6)	0.6553±0.0542(5)	0.6792±0.0621(2)	0.6284±0.0499(7)	0.6087±0.0552(8)	0.6561±0.0509(4)
Glass5	0.5095±0.2994(1.5)	0.4985±0.1399(3)	0.4940±0.1402(5)	0.4957±0.1421(4)	0.4743±0.1260(6)	0.5095±0.2994(1.5)	0.3362±0.0741(9)	0.4655±0.1004(7)	0.4401±0.1083(8)
Glass7	**0.8630±0.0713(1)**	0.8419±0.0681(4)	0.8238±0.0608(6)	0.8554±0.0707(2)	0.8262±0.0733(5)	0.8550±0.0725(3)	0.7749±0.0860(9)	0.7771±0.0944(8)	0.7882±0.0832(7)
ImageSegmentation7	1.0000±0.0000(2)	1.0000±0.0000(2)	0.9977±0.0068(8)	1.0000±0.0000(2)	0.9992±0.0029(5)	0.9998±0.0014(4)	0.9987±0.0031(6)	0.9323±0.0486(9)	0.9978±0.0041(7)
ImageSegmentation5	**0.8770±0.0298(1)**	0.4996±0.0248(5)	0.4803±0.0108(7)	0.5270±0.0263(3)	0.5028±0.0281(4)	0.5835±0.2065(2)	0.4602±0.0162(9)	0.4788±0.0115(8)	0.4990±0.0213(6)
LibrasMovement11	**0.4137±0.2948(1)**	0.3477±0.0949(4)	0.3461±0.0959(5)	0.3509±0.0944(3)	0.3396±0.0963(6)	0.3927±0.2886(2)	0.2804±0.0536(9)	0.3336±0.0844(8)	0.3390±0.0796(7)
LibrasMovement15	**0.8567±0.1725(1)**	0.3895±0.1111(6)	0.3805±0.1126(8)	0.3888±0.1158(7)	0.4640±0.1559(3)	0.8413±0.1655(2)	0.2979±0.0747(9)	0.4206±0.1242(4)	0.4028±0.0963(5)
Pageblocks35	**0.8022±0.0850(1)**	0.4168±0.0485(6)	0.3475±0.0451(9)	0.4343±0.0547(5)	0.4609±0.0525(4)	0.5849±0.0734(2)	0.4055±0.0632(7)	0.3508±0.0423(8)	0.4803±0.0545(3)
StatlogVehicleSilhouettes3	**0.9531±0.0190(1)**	0.9358±0.0209(2)	0.9312±0.0239(5)	0.9348±0.0206(3)	0.9284±0.0240(6)	0.9319±0.0225(4)	0.8906±0.0334(8)	0.8923±0.0367(7)	0.8883±0.0305(9)
StatlogVehicleSilhouettes2	**0.7870±0.0761(1)**	0.5820±0.0280(4)	0.5762±0.0274(6)	0.5810±0.0253(5)	0.5834±0.0309(3)	0.5998±0.0394(2)	0.5715±0.0246(8)	0.5750±0.0310(7)	0.5714±0.0262(9)
WallFollowingRobotNavigation4	**0.7465±0.0555(1)**	0.3961±0.0145(4)	0.3619±0.0231(7)	0.4125±0.0143(3)	0.3895±0.0166(5)	0.4174±0.0127(2)	0.3137±0.0121(9)	0.3524±0.0248(8)	0.3801±0.0131(6)
Yeast789	**0.7661±0.2208(1)**	0.2562±0.0389(7)	0.1737±0.0358(9)	0.2701±0.0451(5)	0.2984±0.0471(3)	0.4287±0.0904(2)	0.2623±0.0787(6)	0.2251±0.0412(8)	0.2749±0.0315(4)
Yeast56	**0.8424±0.0886(1)**	0.5591±0.0410(5)	0.4885±0.0534(7)	0.5970±0.0375(3)	0.5766±0.0373(4)	0.6813±0.0564(2)	0.4394±0.0340(9)	0.4731±0.0459(8)	0.5286±0.0392(6)
DMEAntiVirus	0.9711±0.0171(6.5)	0.9711±0.0171(6.5)	0.9711±0.0171(6.5)	0.9711±0.0171(6.5)	0.9711±0.0171(6.5)	0.9025±0.2526(9)	0.9712±0.0171(3)	0.9712±0.0170(2)	**0.9726±0.0165(1)**
ParkinsonsDC	0.7274±0.0539(3.5)	0.7274±0.0539(3.5)	0.7274±0.0539(3.5)	0.7274±0.0539(3.5)	0.7163±0.0517(7)	**0.7278±0.0541(1)**	0.4383±0.0407(9)	0.7260±0.0546(6)	0.5863±0.0387(8)
GLRCWL1	0.7064±0.1348(5)	0.7064±0.1348(5)	0.7064±0.1348(5)	0.7064±0.1348(5)	**0.7164±0.1341(1)**	0.7064±0.1348(5)	0.6373±0.1490(8)	0.7074±0.1351(2)	0.6144±0.0973(9)
GLRCWL2	0.3447±0.3135(6)	0.3447±0.3135(6)	0.3447±0.3135(6)	0.3447±0.3135(6)	0.3594±0.3209(2)	0.3447±0.3135(6)	0.3269±0.1726(9)	0.3457±0.3094(3)	**0.3640±0.1079(1)**
GLRCNBI1	0.7903±0.1618(4)	0.7903±0.1618(4)	0.7903±0.1618(4)	0.7903±0.1618(4)	0.7899±0.1866(7)	0.7903±0.1618(4)	0.6630±0.1636(9)	**0.7916±0.1671(1)**	0.6862±0.1430(8)
GLRCNBI2	0.3212±0.2468(4)	0.3212±0.2468(4)	0.3212±0.2468(4)	0.3212±0.2468(4)	0.3198±0.2468(7)	0.3212±0.2468(4)	0.3148±0.1200(8)	0.3117±0.2232(9)	**0.3224±0.1080(1)**
Colon 1	0.7979±0.2159(5)	0.7979±0.2159(5)	0.7979±0.2159(5)	0.7979±0.2159(5)	0.8007±0.2114(2)	0.7979±0.2159(5)	**0.8017±0.1501(1)**	0.7976±0.2158(8)	0.7532±0.1167(9)
Leukemia 1	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	0.8280±0.1640(9)	1.0000±0.0000(4)	0.9216±0.0654(8)
Metas 1	0.5078±0.2908(4)	0.5078±0.2908(4)	0.5078±0.2908(4)	0.5078±0.2908(4)	0.5063±0.2921(8)	0.5078±0.2908(4)	0.5065±0.2097(7)	**0.5100±0.2902(1)**	0.5000±0.1212(9)
DrivFace1	0.9828±0.0446(3.5)	0.9828±0.0446(3.5)	0.9828±0.0446(3.5)	0.9828±0.0446(3.5)	0.9732±0.0562(7)	0.9828±0.0446(3.5)	0.8402±0.0885(8)	0.9828±0.0446(3.5)	0.8157±0.0904(9)
DrivFace3	0.9618±0.0656(4)	0.9618±0.0656(4)	0.9618±0.0656(4)	0.9618±0.0656(4)	0.9615±0.0609(7)	0.9618±0.0656(4)	0.7836±0.0940(8)	**0.9619±0.0655(1)**	0.7513±0.0902(9)
ARBT6	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	**0.0843±0.1955(1)**	0.0000±0.0000(6)	0.0714±0.2594(2)
ARBT5	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	**1.0000±0.0000(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S3: SVM: average recall

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.0386±0.0595(9)	0.3000±0.0741(4)	0.2961±0.0757(5)	**0.3371±0.0886(1)**	0.3064±0.0754(3)	0.2814±0.0839(8)	0.2946±0.0759(6)	0.2875±0.0782(7)	0.3093±0.0673(2)
Biomed diseased	0.6965±0.0635(9)	0.7619±0.0637(6)	**0.7939±0.0631(1)**	0.7771±0.0696(3)	0.7632±0.0639(5)	0.7195±0.0747(8)	0.7550±0.0621(7)	0.7913±0.0666(2)	0.7714±0.0666(4)
Cancer wpbc ret	0.3000±0.1098(9)	0.4851±0.1084(5)	0.4994±0.0990(3)	0.4857±0.0850(4)	0.3137±0.1023(8)	0.5460±0.0970(2)	0.4416±0.1090(7)	**0.5491±0.0835(1)**
Diabetes absent	0.4194±0.0525(9)	0.5639±0.0497(6)	0.5814±0.0487(2)	**0.5835±0.0493(1)**	0.5497±0.0550(7)	0.5333±0.0452(8)	0.5692±0.0470(5)	0.5729±0.0483(4)	0.5751±0.0489(3)
Hepatitis normal	0.4366±0.1551(9)	0.5259±0.1352(6)	0.5330±0.1336(5)	0.5214±0.1276(7)	0.5464±0.1284(4)	0.4375±0.1549(8)	**0.6545±0.1271(1)**	0.5964±0.1289(3)	0.6509±0.1197(2)
Housing MEDV¿35	0.4798±0.0969(9)	0.7321±0.1027(6)	0.7530±0.1021(4)	0.6917±0.1095(7)	0.7458±0.0973(5)	0.5274±0.0891(8)	**0.8375±0.0627(1)**	0.7935±0.0899(3)	0.8101±0.0811(2)
Spectf 0	0.5395±0.0800(9)	0.6584±0.0908(5)	0.6739±0.0787(3)	0.6626±0.0840(4)	0.6556±0.0832(6)	0.6061±0.0811(8)	0.7249±0.0761(2)	0.6489±0.0815(7)	**0.7316±0.0709(1)**
Iris setosa	0.9823±0.0200(6.5)	0.9823±0.0200(6.5)	0.9823±0.0200(6.5)	0.9823±0.0200(6.5)	0.9829±0.0199(4)	0.9869±0.0189(2)	0.9851±0.0195(3)	0.9811±0.0201(9)	**1.0000±0.0000(1)**
Vowel 3	0.4470±0.1038(9)	0.7179±0.1067(6)	0.7685±0.1139(3)	0.7369±0.1234(5)	0.7077±0.0974(7)	0.6250±0.1198(8)	0.7655±0.0976(4)	**0.7839±0.1158(1)**	0.7714±0.1030(2)
Vowel 8	0.0000±0.0000(9)	0.7292±0.1098(5)	0.7637±0.1037(3)	0.6952±0.1330(7)	0.7226±0.1078(6)	0.1601±0.1450(8)	0.7530±0.1039(4)	0.7667±0.1000(2)	**0.7893±0.0962(1)**
Waveform 0	0.6778±0.0534(9)	0.7953±0.0488(7)	0.8197±0.0502(4)	0.7989±0.0463(6)	0.7974±0.0479(6)	0.7814±0.0472(8)	**0.9011±0.0333(1)**	0.8413±0.0463(3)	0.8869±0.0308(2)
BreastTissue24	0.6371±0.1671(9)	0.8238±0.1334(8)	0.8495±0.1189(3)	0.8267±0.1296(7)	0.8333±0.1211(5)	0.8333±0.1298(4)	**0.9219±0.0886(1)**	0.8324±0.1242(6)	0.8686±0.1174(2)
BreastTissue3	0.0000±0.0000(9)	0.6476±0.2123(4)	0.6746±0.2005(2)	0.6175±0.2162(6)	0.5905±0.2492(7)	0.0048±0.0398(8)	**0.7683±0.1792(1)**	0.6413±0.1912(5)	0.6667±0.1853(3)
Ecoli2	0.6504±0.0755(9)	0.7865±0.0901(7)	0.8387±0.0894(3)	0.7898±0.0979(5)	0.7872±0.0859(6)	0.7380±0.0878(8)	**0.8955±0.0700(1)**	0.8695±0.0786(2)	0.8199±0.0897(4)
Ecoli3	0.5324±0.1022(9)	0.8033±0.0927(7)	**0.8632±0.0804(1)**	0.8038±0.0847(6)	0.8093±0.0852(5)	0.7665±0.0994(8)	0.8610±0.0797(2)	0.8544±0.0833(3)	0.8231±0.0875(4)
Glass5	0.2476±0.1673(8.5)	0.6310±0.2338(5)	0.6262±0.2364(6)	0.6238±0.2334(7)	0.7143±0.2182(4)	0.2476±0.1673(8.5)	**0.8929±0.1238(1)**	0.7833±0.1847(3)	0.8429±0.1652(2)
Glass7	0.7847±0.1272(9)	0.8204±0.1165(6)	0.8316±0.1160(5)	0.8020±0.1199(7)	0.8327±0.1080(4)	0.7959±0.1181(8)	**0.8806±0.0757(1)**	0.8408±0.1142(3)	0.8745±0.0846(2)
ImageSegmentation7	0.9894±0.0041(7.5)	0.9910±0.0047(6)	0.9919±0.0052(4)	0.9894±0.0041(7.5)	0.9932±0.0046(2)	0.9910±0.0046(5)	0.9926±0.0050(3)	0.9716±0.0257(9)	**0.9942±0.0051(1)**
ImageSegmentation5	0.4548±0.0304(9)	0.8931±0.0304(5)	0.9597±0.0222(2)	0.8463±0.0386(7)	0.8825±0.0469(6)	0.7162±0.1751(8)	0.9324±0.0337(3)	**0.9726±0.0169(1)**	0.9195±0.0396(4)
LibrasMovement11	0.1560±0.1116(9)	0.4952±0.1743(5)	0.4940±0.1751(6)	0.4857±0.1726(7)	0.5107±0.1950(4)	0.1643±0.1237(8)	**0.8405±0.1641(1)**	0.5357±0.2054(3)	0.6345±0.2003(2)
LibrasMovement15	0.4190±0.1212(9)	0.6762±0.1496(5)	**0.7167±0.1504(1)**	0.6857±0.1744(5)	0.5524±0.1523(7)	0.4464±0.1221(8)	0.6905±0.1691(4)	0.6964±0.1642(2)	0.6905±0.1631(3)
Pageblocks35	0.2310±0.0694(9)	0.8334±0.0570(3)	0.8646±0.0472(2)	0.8227±0.0555(4)	0.7863±0.0502(6)	0.6984±0.0755(7)	0.6046±0.1124(8)	**0.8887±0.0347(1)**	0.8000±0.0516(5)
StatlogVehicleSilhouettes3	0.8362±0.0296(9)	0.8990±0.0246(5)	0.8953±0.0339(8)	0.8966±0.0233(7)	0.9026±0.0217(3)	0.8980±0.0205(6)	**0.9498±0.0207(1)**	0.9025±0.0322(4)	0.9283±0.0233(2)
StatlogVehicleSilhouettes2	0.2870±0.0637(9)	0.7019±0.0560(4)	**0.7245±0.0512(1)**	0.6948±0.0577(5)	0.6765±0.0490(6)	0.5585±0.0569(8)	0.7193±0.0466(2)	0.6680±0.0515(7)	0.7067±0.0498(3)
WallFollowingRobotNavigation4	0.2259±0.0488(9)	0.8660±0.0217(3)	0.8226±0.0503(7)	0.8581±0.0305(5)	0.8727±0.0260(3)	0.8571±0.0276(6)	**0.9512±0.0155(1)**	0.7839±0.0342(8)	0.9063±0.0226(2)
Yeast789	0.1020±0.0422(9)	0.5588±0.0647(3)	**0.5949±0.0715(1)**	0.5446±0.0637(6)	0.5214±0.0670(7)	0.3895±0.0953(8)	0.5466±0.1545(5)	0.5741±0.0668(2)	0.5585±0.0608(4)
Yeast56	0.3781±0.0813(9)	0.8201±0.0498(5)	0.8301±0.0465(4)	0.8058±0.0565(7)	0.8182±0.0507(6)	0.7122±0.0585(8)	**0.8857±0.0328(1)**	0.8450±0.0393(2)	0.8334±0.0425(3)
DMEAntiVirus	0.9159±0.0541(6)	0.9159±0.0541(6)	0.9159±0.0541(6)	0.9159±0.0541(6)	0.9159±0.0533(6)	0.8476±0.2425(9)	0.9214±0.0547(2)	0.9198±0.0528(3)	**0.9790±0.0153(1)**
ParkinsonsDC	0.5019±0.0631(6.5)	0.5019±0.0631(6.5)	0.5019±0.0631(6.5)	0.5019±0.0631(6.5)	0.5001±0.0602(9)	0.5021±0.0626(4)	**0.7219±0.0595(1)**	0.5140±0.0630(3)	0.6548±0.0542(2)
GLRCWL1	0.4414±0.1646(5.5)	0.4414±0.1646(5.5)	0.4414±0.1646(5.5)	0.4414±0.1646(5.5)	0.4371±0.1626(9)	0.4414±0.1646(5.5)	0.5200±0.1854(2)	0.4414±0.1628(5.5)	**0.6686±0.1638(1)**
GLRCWL2	0.1612±0.1478(6.5)	0.1612±0.1478(6.5)	0.1612±0.1478(6.5)	0.1612±0.1478(6.5)	0.1633±0.1465(3)	0.1612±0.1478(6.5)	0.3245±0.2091(2)	0.1612±0.1478(6.5)	**0.4449±0.1877(1)**
GLRCNBI1	0.4557±0.1901(7)	0.4557±0.1901(7)	0.4557±0.1901(7)	0.4557±0.1901(7)	0.4571±0.1982(4)	0.4557±0.1901(7)	0.5914±0.2097(2)	0.4629±0.1957(3)	**0.6671±0.1808(1)**
GLRCNBI2	0.1755±0.1503(7)	0.1755±0.1503(7)	0.1755±0.1503(7)	0.1755±0.1503(7)	0.1796±0.1570(3.5)	0.1755±0.1503(7)	0.3429±0.1777(2)	0.1796±0.1493(3.5)	**0.4469±0.1786(1)**
Colon 1	0.4117±0.2268(6)	0.4117±0.2268(6)	0.4117±0.2268(6)	0.4117±0.2268(6)	0.4143±0.2268(3)	0.4117±0.2268(6)	0.5013±0.2209(2)	0.4091±0.2258(9)	**0.7169±0.1815(1)**
Leukemia 1	0.5833±0.1323(6)	0.5833±0.1323(6)	0.5833±0.1323(6)	0.5833±0.1323(6)	0.5798±0.1334(9)	0.5833±0.1323(6)	0.9381±0.0916(2)	0.5857±0.1346(3)	**0.9536±0.0579(1)**
Metas 1	0.0988±0.0747(7)	0.0988±0.0747(7)	0.0988±0.0747(7)	0.0988±0.0747(7)	0.0994±0.0748(3.5)	0.0988±0.0747(7)	0.1540±0.0935(2)	0.0994±0.0748(3.5)	**0.3025±0.1011(1)**
DrivFace1	0.5681±0.1305(6)	0.5681±0.1305(6)	0.5681±0.1305(6)	0.5681±0.1305(6)	0.5330±0.1406(9)	0.5681±0.1305(6)	0.8121±0.0986(2)	0.5736±0.1294(3)	**0.8681±0.0964(1)**
DrivFace3	0.5277±0.1174(6)	0.5277±0.1174(6)	0.5277±0.1174(6)	0.5277±0.1174(6)	0.5062±0.1157(9)	0.5277±0.1174(6)	0.8107±0.1121(2)	0.5313±0.1188(3)	**0.8571±0.0988(1)**
ARBT6	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	**0.2214±0.3708(1)**	0.0000±0.0000(6)	0.0119±0.0432(2)
ARBT5	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	**0.1943±0.0816(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S4: SVM: average f-measure

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.0608±0.0918(9)	0.3761±0.0699(5)	0.3680±0.0687(6)	0.3906±0.0774(2)	0.3886±0.0750(3)	0.3669±0.0834(7)	0.3776±0.0753(4)	0.3630±0.0740(8)	**0.3913±0.0667(1)**
Biomed diseased	0.8116±0.0440(8)	0.8354±0.0351(2)	0.8314±0.0331(4)	**0.8369±0.0393(1)**	0.8308±0.0386(5)	0.8109±0.0464(9)	0.8282±0.0400(7)	0.8301±0.0447(6)	0.8349±0.0368(3)
Cancer wpbc ret	0.3821±0.1112(9)	0.4754±0.0820(4)	0.4789±0.0725(3)	0.4665±0.0716(6)	0.4749±0.0605(5)	0.3904±0.0978(8)	0.4855±0.0643(2)	0.4420±0.0874(7)	**0.4860±0.0627(1)**
Diabetes absent	0.5442±0.0435(9)	0.6251±0.0330(6)	0.6315±0.0337(2)	**0.6316±0.0342(1)**	0.6179±0.0413(7)	0.6126±0.0361(8)	0.6276±0.0339(4)	0.6268±0.0337(5)	0.6302±0.0342(3)
Hepatitis normal	0.4817±0.1292(9)	0.5247±0.1029(6)	0.5188±0.1000(7)	0.5225±0.0970(5)	0.5376±0.0897(4)	0.4826±0.1299(8)	**0.5750±0.0748(1)**	0.5575±0.0865(3)	0.5669±0.0697(2)
Housing MEDV¿35	0.6128±0.0903(8)	0.6507±0.0583(3)	0.6493±0.0601(4)	0.6596±0.0695(2)	**0.6752±0.0647(1)**	0.6417±0.0762(5)	0.6086±0.0473(9)	0.6307±0.0527(7)	0.6365±0.0459(6)
Spectf 0	0.5931±0.0597(9)	0.6439±0.0629(4)	0.6504±0.0514(2)	0.6463±0.0606(3)	0.6362±0.0527(5)	0.6146±0.0535(7)	0.6090±0.0478(8)	0.6276±0.0570(6)	**0.6547±0.0443(1)**
Iris setosa	0.9910±0.0102(6.5)	0.9910±0.0102(6.5)	0.9910±0.0102(6.5)	0.9910±0.0102(6.5)	0.9913±0.0102(4)	0.9933±0.0097(2)	0.9924±0.0099(3)	0.9901±0.0103(9)	**1.0000±0.0000(1)**
Vowel 3	0.5901±0.0928(4)	0.6109±0.0843(2)	0.5315±0.0604(8)	0.5652±0.0955(5)	0.6023±0.0729(3)	**0.7047±0.0962(1)**	0.5334±0.0752(7)	0.5135±0.0638(9)	0.5438±0.0622(6)
Vowel 8	0.0000±0.0000(9)	0.4516±0.0569(3)	**0.4540±0.0508(1)**	0.4325±0.0600(6)	0.4361±0.0499(5)	0.1825±0.1397(8)	0.4151±0.0433(7)	0.4430±0.0475(4)	0.4539±0.0449(2)
Waveform 0	0.7324±0.0301(9)	0.7846±0.0239(7)	0.7922±0.0238(4)	0.7880±0.0222(5)	0.7851±0.0240(6)	0.7800±0.0233(8)	0.8048±0.0162(2)	0.7957±0.0206(3)	**0.8106±0.0153(1)**
BreastTissue24	0.6620±0.1026(9)	0.7435±0.0704(4)	0.7513±0.0651(2)	0.7434±0.0641(5)	0.7467±0.0682(3)	0.7431±0.0622(6)	0.7406±0.0548(8)	0.7413±0.0598(7)	**0.7590±0.0618(1)**
BreastTissue3	0.0000±0.0000(9)	0.3665±0.0962(5)	0.3778±0.0839(2)	0.3588±0.0930(6)	0.3390±0.1150(7)	0.0031±0.0256(8)	**0.4056±0.0750(1)**	0.3678±0.0807(4)	0.3769±0.0768(3)
Ecoli2	0.7416±0.0496(8)	0.7447±0.0333(7)	0.7471±0.0344(4)	0.7412±0.0373(9)	0.7458±0.0361(5)	0.7490±0.0396(3)	**0.7581±0.0337(1)**	0.7509±0.0351(2)	0.7450±0.0336(6)
Ecoli3	0.6352±0.0755(9)	0.7187±0.0431(4)	0.7075±0.0454(7)	0.7180±0.0395(5)	0.7203±0.0425(3)	0.7146±0.0504(6)	0.7237±0.0446(2)	0.7072±0.0463(8)	**0.7262±0.0414(1)**
Glass5	0.3029±0.1580(8.5)	0.5343±0.1319(4)	0.5296±0.1334(6)	0.5332±0.1442(5)	0.5531±0.1257(3)	0.3029±0.1580(8.5)	0.4825±0.0827(7)	**0.5694±0.0922(1)**	0.5658±0.0969(2)
Glass7	0.8149±0.0844(8)	**0.8255±0.0743(1)**	0.8218±0.0663(5)	0.8219±0.0750(4)	0.8247±0.0724(2)	0.8187±0.0761(7)	0.8198±0.0555(6)	0.8008±0.0832(9)	0.8245±0.0603(3)
ImageSegmentation7	0.9947±0.0021(7.5)	0.9955±0.0024(4)	0.9948±0.0040(6)	0.9947±0.0021(7.5)	**0.9962±0.0024(1)**	0.9954±0.0025(5)	0.9957±0.0031(3)	0.9511±0.0338(9)	0.9960±0.0031(2)
ImageSegmentation5	0.5982±0.0265(8)	0.6397±0.0173(5)	0.6401±0.0118(4)	**0.6486±0.0192(1)**	0.6392±0.0176(6)	0.5950±0.1495(9)	0.6158±0.0146(7)	0.6416±0.0127(3)	0.6460±0.0140(2)
LibrasMovement11	0.2055±0.1276(9)	0.3983±0.1098(4)	0.3967±0.1110(6)	0.3965±0.1071(7)	0.3979±0.1172(5)	0.2088±0.1338(8)	0.4192±0.0774(2)	0.4026±0.1120(3)	**0.4357±0.1065(1)**
LibrasMovement15	0.5453±0.1165(2)	0.4776±0.0988(7)	0.4822±0.0988(5)	0.4767±0.0972(8)	0.4779±0.1034(6)	**0.5664±0.1093(1)**	0.4048±0.0780(9)	0.5048±0.0988(3)	0.4951±0.0892(4)
Pageblocks35	0.3514±0.0791(9)	0.5526±0.0378(5)	0.4935±0.0430(7)	0.5650±0.0419(4)	0.5783±0.0398(3)	**0.6316±0.0502(1)**	0.4782±0.0561(8)	0.5010±0.0397(6)	0.5967±0.0360(2)
StatlogVehicleSilhouettes3	0.8904±0.0167(9)	0.9167±0.0157(2)	0.9123±0.0186(6)	0.9150±0.0131(4)	0.9150±0.0148(3)	0.9144±0.0148(5)	**0.9187±0.0185(1)**	0.8967±0.0242(8)	0.9074±0.0187(7)
StatlogVehicleSilhouettes2	0.4149±0.0671(9)	0.6350±0.0291(3)	**0.6409±0.0288(1)**	0.6317±0.0304(4)	0.6252±0.0267(6)	0.5759±0.0321(8)	0.6357±0.0203(2)	0.6167±0.0285(7)	0.6307±0.0239(5)
WallFollowingRobotNavigation4	0.3431±0.0591(9)	0.5433±0.0142(3)	0.5016±0.0223(6)	0.5569±0.0145(2)	0.5383±0.0165(5)	**0.5612±0.0139(1)**	0.4717±0.0143(8)	0.4856±0.0249(7)	0.5353±0.0127(4)
Yeast789	0.1779±0.0694(9)	0.3489±0.0404(5)	0.2663±0.0421(8)	0.3579±0.0432(4)	0.3772±0.0454(2)	**0.3955±0.0734(1)**	0.3254±0.0681(6)	0.3215±0.0481(7)	0.3668±0.0335(3)
Yeast56	0.5140±0.0736(9)	0.6633±0.0324(4)	0.6127±0.0433(6)	0.6842±0.0314(2)	0.6751±0.0308(3)	**0.6944±0.0438(1)**	0.5865±0.0316(8)	0.6048±0.0382(7)	0.6456±0.0312(5)
DMEAntiVirus	0.9417±0.0286(6.5)	0.9417±0.0286(6.5)	0.9417±0.0286(6.5)	0.9417±0.0286(6.5)	0.9417±0.0281(4)	0.8732±0.2455(9)	0.9447±0.0296(2)	0.9439±0.0277(3)	**0.9757±0.0121(1)**
ParkinsonsDC	0.5916±0.0514(5.5)	0.5916±0.0514(5.5)	0.5916±0.0514(5.5)	0.5916±0.0514(5.5)	0.5866±0.0467(8)	0.5918±0.0508(3)	0.5435±0.0357(9)	0.5995±0.0510(2)	**0.6172±0.0353(1)**
GLRCWL1	0.5258±0.1410(6)	0.5258±0.1410(6)	0.5258±0.1410(6)	0.5258±0.1410(6)	0.5249±0.1380(9)	0.5258±0.1410(6)	0.5498±0.1391(2)	0.5266±0.1417(3)	**0.6307±0.1127(1)**
GLRCWL2	0.2068±0.1756(6)	0.2068±0.1756(6)	0.2068±0.1756(6)	0.2068±0.1756(6)	0.2099±0.1726(3)	0.2068±0.1756(6)	0.3091±0.1710(2)	0.2068±0.1740(9)	**0.3852±0.1275(1)**
GLRCNBI1	0.5524±0.1691(7)	0.5524±0.1691(7)	0.5524±0.1691(7)	0.5524±0.1691(7)	0.5544±0.1783(4)	0.5524±0.1691(7)	0.5969±0.1508(2)	0.5572±0.1730(3)	**0.6586±0.1255(1)**
GLRCNBI2	0.2142±0.1632(7)	0.2142±0.1632(7)	0.2142±0.1632(7)	0.2142±0.1632(7)	0.2166±0.1673(4)	0.2142±0.1632(7)	0.3140±0.1214(2)	0.2167±0.1607(3)	**0.3627±0.1136(1)**
Colon 1	0.5056±0.2081(6)	0.5056±0.2081(6)	0.5056±0.2081(6)	0.5056±0.2081(6)	0.5082±0.2062(3)	0.5056±0.2081(6)	0.5835±0.1845(2)	0.5033±0.2065(9)	**0.7187±0.1202(1)**
Leukemia 1	0.7280±0.1084(6)	0.7280±0.1084(6)	0.7280±0.1084(6)	0.7280±0.1084(6)	0.7249±0.1100(9)	0.7280±0.1084(6)	0.8648±0.0990(2)	0.7296±0.1099(3)	**0.9355±0.0471(1)**
Metas 1	0.1562±0.1059(7)	0.1562±0.1059(7)	0.1562±0.1059(7)	0.1562±0.1059(7)	0.1571±0.1061(4)	0.1562±0.1059(7)	0.2230±0.1134(2)	0.1570±0.1058(3)	**0.3674±0.0936(1)**
DrivFace1	0.7104±0.1066(6)	0.7104±0.1066(6)	0.7104±0.1066(6)	0.7104±0.1066(6)	0.6773±0.1217(9)	0.7104±0.1066(6)	0.8196±0.0612(2)	0.7150±0.1060(3)	**0.8356±0.0644(1)**
DrivFace3	0.6733±0.1026(6)	0.6733±0.1026(6)	0.6733±0.1026(6)	0.6733±0.1026(6)	0.6550±0.1021(9)	0.6733±0.1026(6)	0.7895±0.0742(2)	0.6762±0.1038(3)	**0.7947±0.0665(1)**
ARBT6	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	**0.0795±0.1526(1)**	0.0000±0.0000(6)	0.0204±0.0741(2)
ARBT5	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	0.0000±0.0000(5.5)	**0.3178±0.1127(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S5: SVM: average auc

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.0693±0.0866(9)	0.3437±0.0546(4)	0.3402±0.0544(6)	0.3430±0.0495(5)	0.3438±0.0604(2)	0.3277±0.0640(8)	0.3438±0.0615(3)	0.3354±0.0549(7)	**0.3473±0.0629(1)**
Biomed diseased	0.7479±0.0580(3)	**0.7504±0.0510(1)**	0.7417±0.0458(5)	0.7474±0.0450(4)	0.7396±0.0601(7)	0.7200±0.0518(9)	0.7405±0.0528(6)	0.7339±0.0532(8)	0.7489±0.0500(2)
Cancer wpbc ret	0.3870±0.0752(9)	0.4478±0.0674(5)	0.4513±0.0656(4)	0.4448±0.0698(6)	0.4538±0.0674(2)	0.3970±0.0717(8)	**0.4552±0.0617(1)**	0.4295±0.0718(7)	0.4522±0.0634(3)
Diabetes absent	0.4900±0.0363(9)	0.5447±0.0357(5)	0.5477±0.0354(4)	0.5436±0.0318(6)	0.5367±0.0365(7)	0.5252±0.0355(8)	**0.5503±0.0323(1)**	0.5486±0.0294(3)	0.5499±0.0337(2)
Hepatitis normal	0.4517±0.1211(9)	0.4999±0.1089(5)	0.4940±0.0997(7)	0.4994±0.1109(6)	0.5230±0.0943(4)	0.4535±0.1208(8)	**0.5559±0.0862(1)**	0.5296±0.0779(3)	0.5492±0.0805(2)
Housing MEDV¿35	0.5782±0.0898(9)	0.7298±0.0793(5)	0.7269±0.0816(6)	0.7080±0.0808(7)	0.7424±0.0744(4)	0.6237±0.0869(8)	0.7520±0.0479(3)	0.7613±0.0516(2)	**0.7705±0.0557(1)**
Spectf 0	0.5400±0.0628(9)	0.5880±0.0606(4)	0.5936±0.0654(3)	**0.5982±0.0641(1)**	0.5844±0.0663(5)	0.5661±0.0674(7)	0.5525±0.0521(8)	0.5773±0.0602(6)	0.5966±0.0499(2)
Iris setosa	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	1.0000±0.0000(4)	0.9969±0.0106(9)	**0.9997±0.0024(8)**
Vowel 3	0.6203±0.0959(9)	0.6883±0.0817(4)	0.7006±0.0693(3)	0.6867±0.0771(6)	0.6869±0.0833(5)	0.6797±0.0865(7)	0.6477±0.0520(8)	**0.7150±0.0697(1)**	0.7026±0.0573(2)
Vowel 8	0.0012±0.0098(9)	0.6811±0.0534(4)	**0.6881±0.0521(1)**	0.6572±0.0762(6)	0.6672±0.0540(5)	0.2112±0.1540(8)	0.6159±0.0479(7)	0.6820±0.0408(2)	0.6819±0.0430(3)
Waveform 0	0.7114±0.0327(9)	0.7553±0.0247(5)	0.7549±0.0236(4)	0.7550±0.0216(3)	0.7542±0.0254(6)	0.7537±0.0237(7)	0.7278±0.0224(8)	0.7545±0.0210(5)	**0.7572±0.0239(1)**
BreastTissue24	0.7028±0.0741(8)	0.7212±0.0724(2)	0.7185±0.0759(3)	0.7118±0.0740(4)	**0.7233±0.0771(1)**	0.7101±0.0769(6)	0.6598±0.0752(9)	0.7102±0.0724(5)	0.7096±0.0746(7)
BreastTissue3	0.0000±0.0000(9)	**0.4839±0.0709(1)**	0.4789±0.0787(3)	0.4687±0.0944(5)	0.4503±0.0863(6)	0.0047±0.0300(8)	0.4464±0.0713(7)	0.4824±0.0746(2)	0.4744±0.0672(4)
Ecoli2	0.7013±0.0600(9)	0.7573±0.0559(7)	0.7812±0.0456(3)	0.7596±0.0534(6)	0.7603±0.0482(5)	0.7270±0.0542(8)	**0.7815±0.0303(2)**	0.7570±0.0467(7)	0.7710±0.0487(4)
Ecoli3	0.6238±0.0834(9)	0.7924±0.0500(3)	0.7623±0.0469(7)	**0.7990±0.0555(1)**	0.7898±0.0473(4)	0.7825±0.0630(6)	0.7873±0.0338(5)	0.7570±0.0782(8)	0.7961±0.0422(2)
Glass5	0.3003±0.1967(8.5)	0.7106±0.1839(6)	0.7038±0.1892(7)	0.7161±0.1870(5)	0.7596±0.1648(4)	0.3003±0.1967(8.5)	0.7757±0.0927(3)	0.7827±0.1336(2)	**0.7840±0.1231(1)**
Glass7	0.8033±0.1031(8)	0.8307±0.0963(4)	0.8347±0.0916(3)	0.8063±0.1030(7)	0.8258±0.0929(6)	0.7972±0.1075(9)	0.8406±0.0564(2)	0.8299±0.0930(5)	**0.8441±0.0671(1)**
ImageSegmentation7	0.9924±0.0055(5.5)	0.9932±0.0055(3)	0.9922±0.0047(7)	0.9924±0.0055(5.5)	**0.9940±0.0050(1)**	0.9917±0.0052(8)	0.9928±0.0053(4)	0.9674±0.0181(9)	0.9938±0.0053(2)
ImageSegmentation5	0.5501±0.0267(9)	0.7922±0.0207(4)	**0.8038±0.0131(1)**	0.7765±0.0218(6)	0.7959±0.0190(3)	0.6161±0.2463(8)	0.7387±0.0164(7)	0.8025±0.0106(2)	0.7912±0.0168(5)
LibrasMovement11	0.2317±0.1210(9)	0.5377±0.1682(6)	0.5399±0.1714(5)	0.5295±0.1734(7)	0.5740±0.1751(4)	0.2459±0.1289(8)	**0.7121±0.1194(1)**	0.5814±0.1813(3)	0.6421±0.1657(2)
LibrasMovement15	0.5038±0.1151(8)	0.6549±0.1266(4)	**0.6843±0.1233(1)**	0.6408±0.1365(6)	0.5832±0.1388(7)	0.4992±0.1214(9)	0.5721±0.0952(8)...	0.6556±0.1333(5)	0.6802±0.1130(2)
Pageblocks35	0.2848±0.0893(9)	0.8291±0.0369(5)	0.8317±0.0299(4)	0.8338±0.0382(3)	0.8171±0.0437(6)	0.7607±0.0544(7)	0.6723±0.0910(8)	**0.8464±0.0197(1)**	0.8376±0.0388(2)
StatlogVehicleSilhouettes3	0.8982±0.0189(6)	0.9172±0.0192(2)	0.9127±0.0173(5)	**0.9175±0.0183(1)**	0.9159±0.0225(4)	0.9168±0.0203(3)	0.8938±0.0174(8)	0.8884±0.0232(9)	0.8939±0.0219(7)
StatlogVehicleSilhouettes2	0.4468±0.0459(9)	0.6357±0.0279(2)	**0.6384±0.0288(1)**	0.6344±0.0302(3)	0.6316±0.0278(4)	0.5698±0.0345(8)	0.6312±0.0223(5)	0.6215±0.0265(7)	0.6294±0.0244(6)
WallFollowingRobotNavigation4	0.3638±0.0323(9)	0.8172±0.0199(5)	0.7905±0.0277(6)	0.8240±0.0216(4)	0.8292±0.0169(2)	0.8277±0.0202(3)	0.7902±0.0133(7)	0.7777±0.0299(8)	**0.8374±0.0154(1)**
Yeast789	0.1235±0.0437(9)	0.5231±0.0461(2)	0.4890±0.0424(6)	0.5164±0.0459(4)	0.5157±0.0505(5)	0.4415±0.0926(8)	0.4880±0.1179(7)	0.5195±0.0442(3)	**0.5320±0.0459(1)**
Yeast56	0.5546±0.0692(9)	0.7937±0.0313(4)	0.7818±0.0293(7)	0.7957±0.0373(3)	0.8039±0.0329(2)	0.7688±0.0491(8)	0.7888±0.0240(6)	0.7929±0.0266(5)	**0.8090±0.0291(1)**
DMEAntiVirus	0.9662±0.0226(5.5)	0.9662±0.0226(5.5)	0.9662±0.0226(5.5)	0.9662±0.0226(5.5)	0.9654±0.0226(8)	0.8966±0.2515(9)	0.9670±0.0248(3)	0.9681±0.0206(2)	**0.9788±0.0163(1)**
ParkinsonsDC	0.5518±0.0503(5.5)	0.5518±0.0503(5.5)	0.5518±0.0503(5.5)	0.5518±0.0503(5.5)	0.5513±0.0404(8)	0.5520±0.0504(3)	0.4764±0.0405(9)	0.5553±0.0487(2)	**0.5622±0.0309(1)**
GLRCWL1	0.6031±0.1267(5.5)	0.6031±0.1267(5.5)	0.6031±0.1267(5.5)	0.6031±0.1267(5.5)	0.6031±0.1260(5.5)	0.6031±0.1267(5.5)	0.5801±0.1188(9)	**0.6075±0.1235(1)**	0.6067±0.1142(2)
GLRCWL2	0.2981±0.1694(5.5)	0.2981±0.1694(5.5)	0.2981±0.1694(5.5)	0.2981±0.1694(5.5)	0.2946±0.1654(9)	0.2981±0.1694(5.5)	0.3282±0.1536(2)	0.2954±0.1692(8)	**0.4178±0.1427(1)**
GLRCNBI1	0.5922±0.1492(4)	0.5922±0.1492(4)	0.5922±0.1492(4)	0.5922±0.1492(4)	0.5891±0.1549(8)	0.5922±0.1492(4)	0.5878±0.1329(9)	0.5911±0.1474(7)	**0.6289±0.1180(1)**
GLRCNBI2	0.3248±0.1395(6)	0.3248±0.1395(6)	0.3248±0.1395(6)	0.3248±0.1395(6)	0.3244±0.1418(9)	0.3248±0.1395(6)	0.3590±0.1279(2)	0.3301±0.1400(3)	**0.3830±0.1185(1)**
Colon 1	0.6648±0.1226(4.5)	0.6648±0.1226(4.5)	0.6648±0.1226(4.5)	0.6648±0.1226(4.5)	**0.6652±0.1213(1)**	0.6648±0.1226(4.5)	0.6570±0.1120(8)	0.6648±0.1226(4.5)	0.6385±0.1027(9)
Leukemia 1	0.9439±0.0538(4)	0.9439±0.0538(4)	0.9439±0.0538(4)	0.9439±0.0538(4)	0.9439±0.0538(4)	0.9439±0.0538(4)	0.7362±0.1738(9)	0.9439±0.0538(4)	0.8342±0.0789(8)
Metas 1	0.2923±0.0750(6)	0.2923±0.0750(6)	0.2923±0.0750(6)	0.2923±0.0750(6)	0.2933±0.0729(3)	0.2923±0.0750(6)	0.3122±0.0795(2)	0.2920±0.0760(9)	**0.3703±0.0677(1)**
DrivFace1	0.7549±0.1202(5.5)	0.7549±0.1202(5.5)	0.7549±0.1202(5.5)	0.7549±0.1202(5.5)	0.7395±0.1195(9)	0.7549±0.1202(5.5)	0.8815±0.0708(2)	0.7549±0.1230(5.5)	**0.9034±0.0601(1)**
DrivFace3	0.7471±0.1142(6)	0.7471±0.1142(6)	0.7471±0.1142(6)	0.7471±0.1142(6)	0.7401±0.1143(9)	0.7471±0.1142(6)	0.8614±0.0774(2)	0.7498±0.1139(3)	**0.8859±0.0717(1)**
ARBT6	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	0.0000±0.0000(6)	**0.2185±0.2976(1)**	0.0000±0.0000(6)	0.0786±0.0838(2)
ARBT5	0.0067±0.0201(5.5)	0.0067±0.0201(5.5)	0.0067±0.0201(5.5)	0.0067±0.0201(5.5)	0.0257±0.0429(2)	0.0067±0.0201(5.5)	0.0067±0.0201(5.5)	0.0057±0.0188(9)	**0.7459±0.1185(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

VI. Classification performance of neural network (NN)

TABLE S6: NN: average precision

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.4048±0.1891(2)	0.3749±0.0755(6)	0.3633±0.0779(7)	0.3418±0.0705(9)	0.3937±0.0715(4)	**0.4580±0.0869(1)**	0.3826±0.0730(5)	0.3542±0.1011(8)	0.4002±0.0790(3)
Biomed diseased	**0.8580±0.0802(1)**	0.7977±0.0727(3)	0.7521±0.0848(8)	0.7886±0.0711(5)	0.7731±0.0764(6)	0.8281±0.0830(2)	0.7586±0.0719(7)	0.7386±0.0905(9)	0.7958±0.0810(4)
Cancer wpbc ret	**0.4377±0.2394(1)**	0.3975±0.0698(4)	0.3919±0.0668(5)	0.3987±0.0623(3)	0.3840±0.0693(6)	0.4253±0.1397(2)	0.3410±0.0716(9)	0.3667±0.0725(7)	0.3456±0.0724(8)
Diabetes absent	**0.6775±0.0503(1)**	0.5992±0.0477(6)	0.5933±0.0352(8)	0.6040±0.0347(5)	0.6196±0.0367(3)	0.6377±0.0433(2)	0.5956±0.0354(7)	0.5903±0.0422(9)	0.6046±0.0322(4)
Hepatitis normal	**0.5427±0.1866(1)**	0.5204±0.0900(5)	0.5042±0.0945(7)	0.5283±0.0888(4)	0.5376±0.0792(3)	0.5392±0.1797(2)	0.4529±0.0918(9)	0.5135±0.1081(6)	0.4670±0.0748(8)
Housing MEDV¿35	0.6799±0.2150(2)	0.5634±0.0748(5)	0.5536±0.0833(6)	0.5826±0.0997(3)	0.5737±0.0970(4)	**0.6926±0.1024(1)**	0.3809±0.0501(9)	0.4700±0.0672(8)	0.4989±0.0790(7)
Spectf 0	0.5514±0.1654(3)	0.5442±0.0479(5)	**0.5579±0.0474(1)**	0.5563±0.0569(2)	0.5427±0.0569(6)	0.5507±0.0649(4)	0.5416±0.0515(7)	0.5319±0.0531(8)	0.5246±0.0516(9)
Iris setosa	0.9714±0.1678(9)	0.9995±0.0046(7)	1.0000±0.0000(3.5)	1.0000±0.0000(3.5)	1.0000±0.0000(3.5)	1.0000±0.0000(3.5)	1.0000±0.0000(3.5)	0.9887±0.0324(8)	1.0000±0.0000(3.5)
Vowel 3	0.8516±0.1640(2)	0.8146±0.1369(5)	0.8429±0.1219(3)	**0.8589±0.1192(1)**	0.7893±0.1281(6)	0.8321±0.1273(4)	0.4353±0.0946(9)	0.7444±0.1231(7)	0.7102±0.1238(8)
Vowel 8	0.4112±0.3005(8)	**0.6628±0.1669(1)**	0.6434±0.1552(2)	0.6208±0.1716(3)	0.5531±0.1394(4)	0.4470±0.2465(7)	0.2684±0.0554(9)	0.4702±0.1352(6)	0.5125±0.1504(5)
Waveform 0	0.8018±0.0344(2)	0.7849±0.0352(4)	0.7609±0.0317(6)	0.7975±0.0372(3)	0.7789±0.0372(5)	**0.8041±0.0385(1)**	0.7114±0.0441(9)	0.7302±0.0366(8)	0.7393±0.0354(7)
BreastTissue24	**0.6766±0.1398(1)**	0.6356±0.1081(3)	0.6244±0.1331(6)	0.6054±0.1259(8)	0.6388±0.1102(2)	0.6173±0.1399(7)	0.5656±0.0808(9)	0.6266±0.1226(4)	0.6252±0.0808(5)
BreastTissue3	0.0536±0.1147(8)	0.2524±0.0588(4)	0.2516±0.0660(5)	0.2600±0.0537(2)	0.2427±0.0629(6)	0.0336±0.0943(9)	0.2280±0.0780(7)	0.2586±0.0628(3)	**0.2612±0.0509(1)**
Ecoli2	**0.7662±0.0754(1)**	0.6865±0.0569(4)	0.6598±0.0539(7)	0.6981±0.0636(3)	0.6826±0.0605(5)	0.7190±0.0722(2)	0.6109±0.0618(9)	0.6326±0.0518(8)	0.6603±0.0559(6)
Ecoli3	**0.7912±0.0850(1)**	0.7073±0.0944(4)	0.6189±0.1061(7)	0.7201±0.0967(2)	0.6756±0.0854(5)	0.7139±0.1019(3)	0.5832±0.0957(8)	0.5407±0.1190(9)	0.6727±0.0935(6)
Glass5	0.4297±0.3350(7)	0.5279±0.1553(2)	**0.5482±0.1882(1)**	0.5241±0.1553(3)	0.5161±0.1321(4)	0.4486±0.3325(6)	0.2722±0.1034(9)	0.4143±0.1340(8)	0.4673±0.1309(5)
Glass7	**0.8116±0.1716(1)**	0.7728±0.1138(5)	0.7795±0.1034(4)	0.7844±0.1154(3)	0.7606±0.1068(6)	0.8056±0.1107(2)	0.7170±0.1083(8)	0.6551±0.1476(9)	0.7342±0.1183(7)
ImageSegmentation7	0.9985±0.0041(3)	0.9981±0.0042(4)	0.9959±0.0100(6)	0.9985±0.0040(3)	0.9972±0.0045(5)	**0.9985±0.0041(1)**	0.9937±0.0080(7)	0.9122±0.0816(9)	0.9923±0.0095(6)
ImageSegmentation5	**0.7945±0.0680(1)**	0.6080±0.1080(3)	0.6068±0.0980(4)	0.6268±0.1032(2)	0.5685±0.0793(6)	0.5517±0.2012(7)	0.5030±0.0732(9)	0.5095±0.0805(8)	0.5772±0.0903(5)
LibrasMovement11	0.3952±0.3145(4)	0.3986±0.1183(3)	0.4035±0.1127(2)	0.3861±0.1189(6)	0.3734±0.1087(7)	0.3926±0.2627(5)	0.3157±0.0899(9)	**0.4389±0.1554(1)**	0.3730±0.0872(8)
LibrasMovement15	0.7355±0.2714(2)	0.6382±0.1359(6)	0.6359±0.1425(7)	0.7077±0.1350(3)	0.6264±0.1213(8)	**0.7824±0.1809(1)**	0.2502±0.0694(9)	0.6792±0.1369(4)	0.6469±0.1152(5)
Pageblocks35	**0.6882±0.0964(1)**	0.2823±0.0513(5)	0.2170±0.0451(7)	0.2769±0.0529(6)	0.3439±0.0596(3)	0.5434±0.0746(2)	0.0955±0.0235(9)	0.2157±0.0442(8)	0.3367±0.0507(4)
StatlogVehicleSilhouettes3	**0.9244±0.0318(1)**	0.9023±0.0405(2)	0.8904±0.0497(3)	0.8877±0.0540(6)	0.8879±0.0501(5)	0.8899±0.0542(4)	0.7324±0.0545(9)	0.8207±0.0740(8)	0.8550±0.0401(7)
StatlogVehicleSilhouettes2	**0.6013±0.1316(1)**	0.5417±0.0608(4)	0.5323±0.0520(6)	0.5424±0.0439(3)	0.5410±0.0507(5)	0.5539±0.0578(2)	0.4796±0.0473(9)	0.4984±0.0510(8)	0.5152±0.0424(7)
WallFollowingRobotNavigation4	**0.8218±0.0628(1)**	0.7639±0.0600(3)	0.7457±0.0630(4)	0.7965±0.0505(2)	0.6598±0.0615(6)	0.6670±0.0557(5)	0.5043±0.0613(9)	0.5260±0.0706(8)	0.6498±0.0534(7)
Yeast789	**0.5620±0.2944(1)**	0.1641±0.0263(7)	0.1302±0.0151(9)	0.2129±0.0502(4)	0.2584±0.0607(3)	0.4221±0.0965(2)	0.1802±0.1235(5)	0.1365±0.0182(8)	0.1675±0.0273(6)
Yeast56	**0.7002±0.1440(1)**	0.4583±0.0483(5)	0.3860±0.0507(7)	0.5236±0.0497(3)	0.4846±0.0450(4)	0.5964±0.0664(2)	0.3178±0.0529(9)	0.3422±0.0401(8)	0.4296±0.0432(6)
DMEAntiVirus	0.9725±0.0170(3)	0.9722±0.0167(6)	0.9723±0.0166(5)	0.9720±0.0168(7)	**0.9788±0.0184(1)**	0.9340±0.1812(9)	0.9519±0.0962(8)	0.9725±0.0166(4)	0.9726±0.0165(2)
ParkinsonsDC	**0.7188±0.1336(1)**	0.6150±0.0722(3)	0.5948±0.0678(7)	0.6030±0.0713(5)	0.6117±0.0648(4)	0.7128±0.0612(2)	0.4522±0.0525(9)	0.6021±0.0641(6)	0.5549±0.0490(8)
GLRCWL1	0.6284±0.2288(6)	0.6490±0.1659(4)	0.6660±0.1292(2)	0.6600±0.1153(3)	0.6442±0.1158(5)	0.6227±0.2214(7)	0.4083±0.1306(9)	**0.6931±0.1492(1)**	0.6152±0.1405(8)
GLRCWL2	0.2434±0.2043(8)	0.3482±0.1351(3)	0.3546±0.1745(2)	0.3475±0.1814(4)	0.2971±0.1471(6)	0.2655±0.2471(7)	0.2420±0.1095(9)	**0.3656±0.1708(1)**	0.3204±0.1087(5)
GLRCNBI1	0.6575±0.2081(2)	0.6573±0.1485(3)	0.6476±0.1163(5)	0.6407±0.1406(6)	0.6535±0.1618(4)	0.6139±0.2196(7)	0.5272±0.1131(9)	**0.6597±0.1412(1)**	0.5824±0.1358(8)
GLRCNBI2	0.2156±0.2126(9)	0.3247±0.1302(3)	0.3180±0.1151(5)	0.3240±0.1197(4)	0.3352±0.1461(2)	0.2326±0.2005(8)	0.2713±0.1269(7)	**0.3354±0.1385(1)**	0.2936±0.1532(6)
Colon 1	0.6625±0.1895(7)	0.6860±0.1668(4)	0.6718±0.1779(5)	**0.7117±0.1476(1)**	0.7078±0.1566(3)	0.6703±0.1839(6)	0.5947±0.1740(9)	0.7085±0.1653(2)	0.6020±0.1541(8)
Leukemia 1	0.9221±0.1102(5)	0.9279±0.1140(3)	0.9316±0.1130(2)	0.9247±0.1457(4)	0.6973±0.1078(8)	0.8342±0.1383(6)	0.6210±0.2036(9)	**0.9358±0.1368(1)**	0.7699±0.1256(7)
Metas 1	0.4335±0.2006(7)	0.4567±0.0864(3)	**0.4692±0.0935(1)**	0.4536±0.1040(4)	0.4588±0.1011(2)	0.4157±0.1251(8)	0.4056±0.0711(9)	0.4413±0.1064(5)	0.4279±0.1042(6)
DrivFace1	**0.9264±0.0856(1)**	0.8645±0.1002(6)	0.8746±0.0963(3)	0.8671±0.0947(4)	0.8629±0.0809(7)	0.9019±0.0928(2)	0.6648±0.1368(9)	0.8670±0.0867(5)	0.7094±0.1112(8)
DrivFace3	0.8425±0.2077(2)	0.7999±0.1305(7)	0.8051±0.0993(5)	0.8025±0.0949(6)	0.8178±0.0882(3)	**0.8560±0.1270(1)**	0.6136±0.1104(9)	0.8055±0.0878(4)	0.6653±0.0937(8)
ARBT6	0.0000±0.0000(8.5)	**0.5738±0.4904(1)**	0.4974±0.4963(2)	0.0000±0.0000(8.5)	0.0220±0.0079(6)	0.0194±0.1263(7)	0.0258±0.0407(5)	0.2571±0.4402(3)	0.2213±0.0869(4)
ARBT5	0.2417±0.4076(8)	0.8466±0.1612(3)	0.8604±0.1280(2)	0.3126±0.4297(5)	0.0535±0.0149(9)	0.2845±0.4075(6)	0.2421±0.3900(7)	**0.9461±0.1419(1)**	0.4029±0.0815(4)

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S7: NN: average recall

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.1507±0.1070(9)	0.5264±0.1228(3)	0.4996±0.1221(6)	0.5132±0.1163(4)	0.5104±0.1108(5)	0.3943±0.0923(8)	**0.5589±0.1459(1)**	0.5325±0.1580(2)	0.4939±0.1221(7)
Biomed diseased	0.7550±0.0880(9)	0.8091±0.0743(5)	0.8234±0.0675(3)	0.8091±0.0798(6)	0.8074±0.0661(7)	0.7801±0.0742(8)	0.8147±0.1114(4)	**0.8359±0.0718(1)**	0.8242±0.0718(2)
Cancer wpbc ret	0.2764±0.2163(9)	0.5596±0.1318(6)	0.5888±0.1384(4)	0.5689±0.1139(5)	0.5559±0.1241(7)	0.3832±0.1735(8)	**0.6224±0.1411(1)**	0.5932±0.1284(3)	0.6168±0.1375(2)
Diabetes absent	0.5663±0.0869(9)	0.7287±0.0657(5)	0.7487±0.0635(2)	0.7179±0.0573(6)	0.6952±0.0536(7)	0.6681±0.0499(8)	**0.7497±0.0536(1)**	0.7299±0.0700(4)	0.7338±0.0580(3)
Hepatitis normal	0.4384±0.1998(9)	0.6295±0.1238(7)	0.6420±0.1285(6)	0.6554±0.1431(5)	0.6714±0.1239(3)	0.4705±0.2063(8)	**0.7420±0.1254(1)**	0.6786±0.1472(4)	0.7045±0.1403(2)
Housing MEDV¿35	0.5351±0.2002(9)	0.7756±0.1053(6)	0.7976±0.0934(4)	0.7506±0.1046(7)	0.7952±0.0948(5)	0.6643±0.0985(8)	**0.9012±0.0635(1)**	0.8482±0.0857(2)	0.8435±0.0896(3)
Spectf 0	0.4881±0.2147(9)	0.7635±0.1316(5)	0.7547±0.0975(7)	0.7660±0.1001(4)	0.7596±0.1054(6)	0.7237±0.1085(8)	**0.8863±0.0839(1)**	0.7790±0.1078(3)	0.8237±0.0795(2)
Iris setosa	0.9714±0.1678(9)	0.9994±0.0048(6.5)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9989±0.0067(8)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9994±0.0048(6.5)	1.0000±0.0000(3)
Vowel 3	0.7280±0.2134(9)	0.9155±0.0944(6)	0.9369±0.0799(5)	0.9125±0.1031(7)	0.9405±0.0844(4)	0.7976±0.1380(8)	0.9655±0.0793(1.5)	0.9583±0.0723(3)	0.9655±0.0610(1.5)
Vowel 8	0.2869±0.2586(9)	0.7940±0.1085(6)	0.8155±0.0974(4)	0.7786±0.1084(7)	0.8042±0.1125(5)	0.3827±0.2111(8)	0.8607±0.1090(3)	**0.8714±0.0842(1)**	0.8696±0.0818(2)
Waveform 0	0.8188±0.0507(9)	0.8678±0.0375(6)	0.8872±0.0416(4)	0.8587±0.0372(7)	0.8721±0.0335(5)	0.8554±0.0440(8)	0.9133±0.0389(3)	0.9178±0.0309(2)	**0.9213±0.0287(1)**
BreastTissue24	0.7352±0.2281(9)	0.8914±0.1130(4)	0.8752±0.1531(5)	0.8705±0.1885(6)	0.9038±0.1044(3)	0.8467±0.1849(8)	**0.9552±0.0619(1)**	0.8695±0.2022(7)	0.9114±0.0884(2)
BreastTissue3	0.0365±0.0902(9)	0.6889±0.2337(6)	0.7000±0.2512(5)	0.7048±0.2339(3)	0.6651±0.2527(7)	0.0603±0.1981(8)	0.7032±0.2971(4)	0.7302±0.2298(2)	**0.7476±0.2089(1)**
Ecoli2	0.7455±0.0948(9)	0.8545±0.0726(6)	0.8914±0.0670(4)	0.8534±0.0770(7)	0.8669±0.0741(5)	0.8038±0.0834(8)	**0.9195±0.0558(1)**	0.9139±0.0672(2)	0.8959±0.0676(3)
Ecoli3	0.7396±0.1539(9)	0.8824±0.0686(4)	0.8819±0.0666(5)	0.8681±0.0710(7)	0.8758±0.0690(6)	0.8665±0.0833(8)	0.8945±0.0737(2)	**0.9055±0.0562(1)**	0.8934±0.0622(3)
Glass5	0.3381±0.3069(9)	0.7429±0.2352(7)	0.7524±0.2001(6)	0.7643±0.2016(5)	0.7738±0.1750(4)	0.3833±0.3139(8)	0.8524±0.1872(2)	**0.8595±0.1646(1)**	0.8381±0.1725(3)
Glass7	0.7837±0.1762(9)	0.8571±0.1032(6)	0.8724±0.1038(3)	0.8439±0.1123(7)	0.8714±0.0992(4)	0.8316±0.1067(8)	**0.8949±0.0737(1)**	0.8622±0.1110(5)	0.8949±0.0737(1)
ImageSegmentation7	0.9911±0.0042(9)	0.9930±0.0051(3.5)	0.9930±0.0050(3.5)	0.9913±0.0047(8)	0.9945±0.0049(2)	0.9917±0.0047(6)	0.9926±0.0047(5)	0.9914±0.0078(7)	**0.9952±0.0049(1)**
ImageSegmentation5	0.6206±0.0962(9)	0.9446±0.0302(4)	0.9650±0.0210(2)	0.9281±0.0303(6)	0.9371±0.0314(5)	0.7719±0.1923(8)	0.8284±0.1631(7)	**0.9803±0.0162(1)**	0.9559±0.0289(3)
LibrasMovement11	0.2214±0.1833(9)	0.7012±0.2102(3)	0.6726±0.1879(6)	0.6417±0.2023(7)	0.6940±0.2060(5)	0.2726±0.1940(8)	**0.7988±0.1688(1)**	0.7012±0.2088(4)	0.7750±0.2018(2)
LibrasMovement15	0.5821±0.2735(9)	0.8357±0.1454(2)	0.8250±0.1434(3)	0.8107±0.1560(6)	0.7786±0.1623(7)	0.6119±0.1794(8)	0.8238±0.1492(4)	0.8226±0.1397(5)	**0.8857±0.1362(1)**
Pageblocks35	0.3771±0.1169(9)	0.8722±0.0483(4)	0.8895±0.0405(2)	0.8581±0.0574(6)	0.8374±0.0504(7)	0.7181±0.0646(8)	0.8879±0.1215(3)	**0.9151±0.0349(1)**	0.8676±0.0499(5)
StatlogVehicleSilhouettes3	0.9308±0.0311(9)	0.9602±0.0212(4)	0.9526±0.0218(8)	0.9544±0.0261(6)	0.9529±0.0283(7)	0.9545±0.0229(5)	0.9748±0.0267(2)	0.9688±0.0262(3)	**0.9765±0.0174(1)**
StatlogVehicleSilhouettes2	0.3937±0.1614(9)	0.7614±0.0573(4)	0.7787±0.0631(2)	0.7511±0.0643(6)	0.7497±0.0765(7)	0.6327±0.0681(8)	0.7694±0.0727(5)	**0.7894±0.0692(1)**	0.7861±0.0572(3)
WallFollowingRobotNavigation4	0.7784±0.1070(9)	0.8973±0.0303(5)	0.8920±0.0295(6)	0.8853±0.0321(7)	0.9239±0.0239(4)	0.8846±0.0324(8)	0.9483±0.0243(2)	**0.9545±0.0299(1)**	0.9422±0.0239(3)
Yeast789	0.1269±0.0968(9)	0.6367±0.0812(4)	0.6867±0.0980(2)	0.5738±0.0901(6)	0.5602±0.0710(7)	0.4381±0.0954(8)	0.5796±0.1673(5)	**0.6983±0.0699(1)**	0.6408±0.0775(3)
Yeast56	0.5742±0.1468(9)	0.8438±0.0532(4)	0.8568±0.0461(3)	0.8264±0.0511(7)	0.8480±0.0461(5)	0.7833±0.0539(8)	**0.9055±0.0367(1)**	0.8903±0.0383(2)	0.8581±0.0507(6)
DMEAntiVirus	0.9488±0.0495(6)	0.9615±0.0315(4)	0.9631±0.0340(3)	0.9540±0.0378(5)	0.8980±0.0596(9)	0.9131±0.1635(8)	0.9464±0.0570(7)	0.9726±0.0286(2)	**0.9774±0.0233(1)**
ParkinsonsDC	0.4905±0.1683(9)	0.7079±0.0416(6)	0.7231±0.0612(3)	0.7092±0.0524(5)	0.7144±0.0553(4)	0.5857±0.0695(8)	**0.7798±0.0919(1)**	0.7031±0.0624(7)	0.7570±0.0456(2)
GLRCWL1	0.5786±0.2812(9)	0.7429±0.2004(2)	0.7300±0.1806(3)	0.6986±0.1740(6)	0.6871±0.1888(7)	0.5943±0.2745(8)	0.7114±0.2243(4)	0.7086±0.2041(5)	**0.7743±0.1983(1)**
GLRCWL2	0.2531±0.2348(8)	0.4429±0.2022(3)	0.4143±0.2108(4)	0.4082±0.1857(5)	0.3980±0.2357(6)	0.2000±0.1890(9)	0.4673±0.2729(2)	0.3939±0.2208(7)	**0.5449±0.2349(1)**
GLRCNBI1	0.5814±0.2538(8)	0.7086±0.2125(4)	0.7214±0.1768(3)	0.6929±0.1883(5)	0.6600±0.2224(7)	0.5757±0.2651(9)	**0.7829±0.1926(1)**	0.6929±0.1944(6)	0.7586±0.2150(2)
GLRCNBI2	0.2143±0.2186(9)	0.4735±0.2377(3)	0.4612±0.2052(4)	0.4469±0.2119(5)	0.4122±0.1954(6)	0.2571±0.2366(8)	**0.5347±0.2780(1)**	0.3857±0.2011(7)	0.4918±0.2500(2)
Colon 1	0.6156±0.2394(9)	0.7273±0.2145(4)	0.7286±0.2197(3)	0.7208±0.2014(5)	0.7130±0.1931(6)	0.6883±0.2360(7)	0.7584±0.2242(2)	0.6649±0.2360(8)	**0.7792±0.1998(1)**
Leukemia 1	0.8774±0.1578(6)	**0.9381±0.0760(1)**	0.9083±0.1286(5)	0.9190±0.1404(4)	0.7500±0.1636(9)	0.8167±0.1492(8)	0.8357±0.2490(7)	0.9226±0.0831(3)	0.9369±0.1240(2)
Metas 1	0.2689±0.1709(9)	0.4398±0.1595(3)	0.4286±0.1314(4)	0.4118±0.1378(7)	0.4161±0.1408(5)	0.3335±0.1989(8)	**0.5267±0.1767(1)**	0.4155±0.1913(6)	0.4988±0.1852(2)
DrivFace1	0.7198±0.1662(9)	0.8264±0.1247(3)	0.8220±0.1280(5)	0.8242±0.1208(4)	0.8154±0.1252(6)	0.7484±0.1410(8)	0.9011±0.0890(2)	0.7945±0.1227(7)	**0.9264±0.0833(1)**
DrivFace3	0.5830±0.2172(9)	0.8321±0.1001(5)	0.8464±0.1002(3)	0.8393±0.1029(4)	0.8259±0.1074(6)	0.7054±0.1505(8)	0.9223±0.0841(2)	0.8196±0.1067(7)	**0.9241±0.0689(1)**
ARBT6	0.0000±0.0000(8.5)	0.1095±0.1233(5)	0.0000±0.0000(8.5)	0.1324±0.2246(6)	0.0143±0.1013(7)	0.2738±0.3522(3)	0.0452±0.0799(4)	**0.5643±0.1992(1)**	0.5643±0.1992(1)
ARBT5	0.0867±0.1814(8)	0.5495±0.1767(2)	0.5343±0.1756(3)	0.1324±0.2246(6)	0.4876±0.1302(4)	0.1029±0.2104(7)	0.0848±0.1909(9)	0.3305±0.1424(5)	**0.8781±0.0908(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S8: NN: average f-measure

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival <5yr	0.2057±0.1276(9)	0.4301±0.0823(4)	0.4135±0.0836(7)	0.4050±0.0750(8)	0.4355±0.0667(2)	0.4135±0.0631(6)	**0.4408±0.0683(1)**	0.4154±0.1033(5)	0.4322±0.0793(3)
Biomed diseased	0.7973±0.0589(4)	0.7992±0.0470(2)	0.7810±0.0523(7)	0.7946±0.0497(5)	0.7856±0.0435(6)	0.7982±0.0442(3)	0.7783±0.0921(8)	0.7781±0.0539(9)	**0.8046±0.0435(1)**
Cancer wpbc ret	0.2969±0.1739(9)	0.4580±0.0764(3)	**0.4619±0.0710(1)**	0.4607±0.0557(2)	0.4458±0.0693(4)	0.3818±0.1283(8)	0.4329±0.0769(7)	0.4428±0.0596(5)	0.4366±0.0782(6)
Diabetes absent	0.6119±0.0605(9)	0.6545±0.0353(4)	0.6600±0.0318(3)	0.6545±0.0319(5)	0.6537±0.0312(6)	0.6509±0.0347(7)	**0.6626±0.0320(1)**	0.6502±0.0409(8)	0.6614±0.0295(2)
Hepatitis normal	0.4638±0.1697(9)	0.5608±0.0745(4)	0.5534±0.0779(5)	0.5761±0.0920(2)	**0.5867±0.0638(1)**	0.4788±0.1736(8)	0.5522±0.0771(6)	0.5713±0.0875(3)	0.5520±0.0690(7)
Housing MEDV<35	0.5823±0.1875(8)	0.6462±0.0607(5)	0.6467±0.0648(4)	0.6472±0.0722(3)	0.6590±0.0695(2)	**0.6684±0.0563(1)**	0.5326±0.0473(9)	0.5998±0.0563(7)	0.6212±0.0655(6)
Spectf 0	0.4997±0.1723(9)	0.6271±0.0830(6)	0.6376±0.0487(3)	0.6401±0.0529(2)	0.6283±0.0531(5)	0.6217±0.0690(7)	0.6086±0.0420(8)	0.6342±0.0512(4)	**0.6431±0.0436(1)**
Iris setosa	0.9714±0.1678(9)	0.9994±0.0034(6)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9994±0.0034(7)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9938±0.0172(8)	1.0000±0.0000(3)
Vowel 3	0.7748±0.1880(8)	0.8554±0.1063(3)	**0.8825±0.0867(1)**	0.8795±0.0947(2)	0.8520±0.0957(4)	0.8087±0.1154(7)	0.5956±0.0992(9)	0.8315±0.0916(5)	0.8124±0.0941(6)
Vowel 8	0.3175±0.2583(9)	**0.7097±0.1270(1)**	0.7050±0.1099(2)	0.6782±0.1340(3)	0.6465±0.1209(4)	0.3984±0.2086(8)	0.4061±0.0687(7)	0.5993±0.1182(6)	0.6327±0.1292(5)
Waveform 0	0.8086±0.0233(8)	0.8231±0.0174(3)	0.8180±0.0180(6)	0.8257±0.0171(2)	0.8215±0.0201(4)	**0.8274±0.0185(1)**	0.7980±0.0208(9)	0.8123±0.0205(7)	0.8194±0.0189(5)
BreastTissue24	0.6829±0.1610(9)	0.7305±0.0738(3)	0.7167±0.1079(4)	0.6998±0.1315(8)	**0.7374±0.0691(1)**	0.7027±0.1350(7)	0.7048±0.0578(6)	0.7101±0.1407(5)	0.7352±0.0522(2)
BreastTissue3	0.0374±0.0772(8)	0.3651±0.0918(4)	0.3647±0.1016(5)	0.3746±0.0879(3)	0.3501±0.0977(6)	0.0334±0.0876(9)	0.3382±0.1213(7)	0.3789±0.0961(2)	**0.3827±0.0756(1)**
Ecoli2	0.7490±0.0507(7)	0.7575±0.0338(3)	0.7549±0.0315(5)	**0.7636±0.0399(1)**	0.7598±0.0376(2)	0.7532±0.0426(6)	0.7309±0.0414(9)	0.7449±0.0379(8)	0.7570±0.0357(4)
Ecoli3	0.7500±0.1226(6)	0.7790±0.0553(2)	0.7210±0.0753(7)	**0.7813±0.0597(1)**	0.7585±0.0613(5)	0.7752±0.0616(3)	0.6987±0.0632(8)	0.6667±0.0914(9)	0.7617±0.0592(4)
Glass5	0.3433±0.2742(9)	0.5999±0.1615(4)	**0.6096±0.1514(1)**	0.6015±0.1395(3)	0.6034±0.1167(2)	0.3786±0.2792(8)	0.4004±0.1194(7)	0.5444±0.1214(6)	0.5835±0.1166(5)
Glass7	0.7892±0.1548(7)	0.8030±0.0719(5)	**0.8147±0.0653(1)**	0.8051±0.0871(3)	0.8047±0.0762(4)	0.8104±0.0815(2)	0.7892±0.0693(8)	0.7306±0.1142(9)	0.7993±0.0784(6)
ImageSegmentation7	0.9948±0.0027(5)	0.9955±0.0032(2)	0.9944±0.0050(6)	0.9949±0.0031(4)	**0.9958±0.0029(1)**	0.9951±0.0030(3)	0.9931±0.0044(8)	0.9483±0.0477(9)	0.9937±0.0050(7)
ImageSegmentation5	0.6935±0.0740(6)	0.7342±0.0799(3)	0.7399±0.0737(2)	**0.7435±0.0753(1)**	0.7048±0.0636(5)	0.6156±0.1838(9)	0.6207±0.0573(8)	0.6668±0.0692(7)	0.7154±0.0700(4)
LibrasMovement11	0.2505±0.1805(9)	0.4954±0.1255(2)	0.4895±0.1023(4)	0.4685±0.1192(6)	0.4711±0.1047(5)	0.2979±0.1904(8)	0.4444±0.0919(7)	**0.5150±0.1305(1)**	0.4929±0.0958(3)
LibrasMovement15	0.6218±0.2439(8)	0.7152±0.1242(4)	0.7081±0.1251(5)	**0.7426±0.1189(1)**	0.6799±0.1062(6)	0.6673±0.1619(7)	0.3783±0.0859(9)	0.7361±0.1206(3)	0.7386±0.1032(2)
Pageblocks35	0.4729±0.1127(4)	0.4235±0.0548(5)	0.4159±0.0616(6)	0.3464±0.0556(8)	0.4842±0.0588(2)	**0.6132±0.0469(1)**	0.1715±0.0388(9)	0.3467±0.0569(7)	0.4818±0.0478(3)
StatlogVehicleSilhouettes3	0.9271±0.0235(2)	**0.9298±0.0248(1)**	0.9196±0.0298(4)	0.9190±0.0346(5)	0.9184±0.0315(6)	0.9203±0.0355(3)	0.8354±0.0409(9)	0.8869±0.0507(8)	0.9112±0.0250(7)
StatlogVehicleSilhouettes2	0.4572±0.1562(9)	**0.6309±0.0513(1)**	0.6305±0.0472(2)	0.6285±0.0428(3)	0.6271±0.0546(4)	0.5882±0.0502(8)	0.5891±0.0487(7)	0.6096±0.0512(6)	0.6209±0.0384(5)
WallFollowingRobotNavigation4	0.7955±0.0940(4)	0.8234±0.0336(2)	0.8103±0.0372(3)	**0.8373±0.0305(1)**	0.7678±0.0417(5)	0.7586±0.0344(7)	0.6559±0.0510(9)	0.6755±0.0637(8)	0.7676±0.0363(6)
Yeast789	0.1928±0.1272(9)	0.2588±0.0292(5)	0.2176±0.0196(8)	0.3047±0.0483(3)	0.3471±0.0554(2)	**0.4194±0.0745(1)**	0.2366±0.0753(6)	0.2273±0.0237(7)	0.2636±0.0327(4)
Yeast56	0.6209±0.1326(3)	0.5912±0.0377(5)	0.5295±0.0465(7)	0.6384±0.0351(2)	0.6149±0.0363(4)	**0.6742±0.0469(1)**	0.4675±0.0474(9)	0.4924±0.0934(8)	0.5703±0.0367(6)
DMEAntiVirus	0.9596±0.0259(6)	0.9665±0.0179(4)	0.9673±0.0189(3)	0.9624±0.0210(5)	0.9355±0.0333(8)	0.9209±0.1718(9)	0.9447±0.0759(7)	0.9723±0.0173(2)	**0.9748±0.0151(1)**
ParkinsonsDC	0.5638±0.1666(9)	0.6549±0.0420(2)	0.6481±0.0392(3)	0.6477±0.0419(4)	**0.6549±0.0349(1)**	0.6384±0.0410(7)	0.5669±0.0379(8)	0.6442±0.0347(5)	0.6385±0.0374(6)
GLRCWL1	0.5708±0.2274(8)	0.6827±0.1644(3)	**0.6832±0.1293(1)**	0.6617±0.1073(5)	0.6466±0.1201(6)	0.5767±0.2210(7)	0.4951±0.1332(9)	0.6829±0.1450(2)	0.6696±0.1333(4)
GLRCWL2	0.2258±0.1801(8)	0.3768±0.1401(2)	0.3603±0.1484(3)	0.3542±0.1399(5)	0.3227±0.1543(6)	0.2099±0.1782(9)	0.3026±0.1349(7)	0.3556±0.1520(4)	**0.3863±0.1354(1)**
GLRCNBI1	0.5834±0.1919(8)	0.6629±0.1441(2)	**0.6672±0.1066(1)**	0.6400±0.1195(4)	0.6394±0.1500(6)	0.5690±0.2132(9)	0.6135±0.1135(7)	0.6586±0.1372(3)	0.6399±0.1451(5)
GLRCNBI2	0.1916±0.1635(9)	**0.3679±0.1431(1)**	0.3590±0.1229(3)	0.3623±0.1343(2)	0.3532±0.1330(4)	0.2210±0.1706(8)	0.3418±0.1428(7)	0.3436±0.1430(6)	0.3454±0.1432(5)
Colon 1	0.6008±0.1837(9)	0.6807±0.1686(3)	0.6720±0.1721(4)	**0.6946±0.1538(1)**	0.6906±0.1454(2)	0.6548±0.1825(7)	0.6424±0.1633(8)	0.6594±0.1890(6)	0.6679±0.1529(5)
Leukemia 1	0.8916±0.1298(5)	**0.9272±0.0824(1)**	0.9151±0.1089(4)	0.9177±0.1359(3)	0.7126±0.1129(8)	0.8147±0.1187(7)	0.6928±0.2002(9)	0.9195±0.1023(2)	0.8373±0.1059(6)
Metas 1	0.3038±0.1480(9)	0.4317±0.0912(4)	0.4378±0.0936(3)	0.4186±0.0948(6)	0.4197±0.0966(5)	0.3446±0.1390(8)	**0.4421±0.0824(1)**	0.4103±0.1235(7)	0.4393±0.1094(2)
DrivFace1	0.7968±0.1237(8)	0.8382±0.0901(2)	**0.8391±0.0877(1)**	0.8377±0.0828(3)	0.8324±0.0869(4)	0.8095±0.0957(6)	0.7557±0.0957(9)	0.8220±0.0827(5)	0.7970±0.0804(7)
DrivFace3	0.6684±0.1924(9)	0.8084±0.1085(4)	**0.8189±0.0726(1)**	0.8137±0.0691(3)	0.8154±0.0701(2)	0.7639±0.1250(7)	0.7296±0.0856(8)	0.8066±0.0711(5)	0.7685±0.0654(6)
ARBT6	0.0000±0.0000(8.5)	0.1887±0.1759(2)	0.1665±0.1728(3)	0.0000±0.0000(8.5)	0.0421±0.0152(6)	0.0112±0.0684(7)	0.0437±0.0650(5)	0.0765±0.1334(4)	**0.3073±0.1120(1)**
ARBT5	0.1117±0.2140(7)	**0.6462±0.1507(1)**	0.6338±0.1229(2)	0.1676±0.2571(5)	0.0963±0.0263(9)	0.1181±0.1966(6)	0.1087±0.2026(8)	0.4715±0.1537(4)	0.5472±0.0875(3)

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S9: NN: average g-mean

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival <5yr	0.3343±0.1575(9)	0.5840±0.0836(3)	0.5718±0.0820(5)	0.5621±0.0749(6)	**0.5883±0.0664(1)**	0.5597±0.0558(8)	0.5817±0.0924(4)	0.5615±0.1158(7)	0.5841±0.0764(2)
Biomed diseased	0.8351±0.0487(6)	0.8452±0.0381(2)	0.8313±0.0597(7)	0.8426±0.0404(3)	0.8355±0.0348(5)	0.8400±0.0352(4)	0.8312±0.0793(8)	0.8305±0.0553(9)	**0.8502±0.0344(1)**
Cancer wpbc ret	0.4190±0.2091(9)	**0.6320±0.0700(1)**	0.6310±0.0866(2)	0.6287±0.0794(3)	0.6168±0.0759(4)	0.5324±0.1409(8)	0.6037±0.0909(7)	0.6102±0.0773(5)	0.6042±0.1127(6)
Diabetes absent	0.6917±0.0506(9)	0.7266±0.0444(7)	0.7333±0.0285(3)	0.7304±0.0268(4)	0.7301±0.0260(5)	0.7271±0.0307(6)	**0.7363±0.0276(1)**	0.7252±0.0353(8)	0.7359±0.0245(2)
Hepatitis normal	0.5963±0.1894(9)	0.7210±0.0623(6)	0.7164±0.0785(7)	0.7347±0.0843(4)	**0.7438±0.0620(1)**	0.6156±0.1891(8)	0.7359±0.0723(3)	0.7382±0.0782(2)	0.7329±0.0628(5)
Housing MEDV<35	0.6925±0.2038(9)	0.8488±0.0550(6)	0.8585±0.0491(5)	0.8369±0.0574(7)	0.8597±0.0488(4)	0.7987±0.0563(8)	0.8701±0.0282(2)	0.8698±0.0416(3)	**0.8727±0.0447(1)**
Spectf 0	0.6123±0.1874(9)	0.7529±0.0825(6)	0.7617±0.0433(3)	0.7634±0.0456(2)	0.7542±0.0451(5)	0.7465±0.0589(7)	0.7349±0.0486(8)	0.7608±0.0454(4)	**0.7704±0.0366(1)**
Iris setosa	0.9714±0.1678(9)	0.9996±0.0027(6)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9994±0.0034(7)	1.0000±0.0000(3)	1.0000±0.0000(3)	0.9965±0.0095(8)	1.0000±0.0000(3)
Vowel 3	0.8334±0.1621(9)	0.9437±0.0554(6)	0.9575±0.0452(3)	0.9455±0.0576(5)	0.9549±0.0476(4)	0.8820±0.0817(8)	0.9134±0.0545(7)	0.9598±0.0399(2)	**0.9602±0.0373(1)**
Vowel 8	0.4414±0.2894(9)	0.8664±0.0652(4)	0.8756±0.0523(3)	0.8540±0.0677(6)	0.8607±0.0676(5)	0.5638±0.2182(8)	0.8027±0.0581(7)	0.8769±0.0513(2)	**0.8837±0.0542(1)**
Waveform 0	0.8564±0.0211(9)	0.8731±0.0144(4)	0.8724±0.0155(6)	0.8733±0.0136(3)	0.8727±0.0163(5)	0.8738±0.0160(2)	0.8597±0.0161(8)	0.8714±0.0160(7)	**0.8770±0.0141(1)**
BreastTissue24	0.7689±0.1543(9)	0.8195±0.0761(3)	0.8074±0.1156(4)	0.7902±0.1506(8)	0.8280±0.0623(2)	0.7952±0.1349(7)	0.8023±0.0761(6)	0.8058±0.1393(5)	**0.8318±0.0423(1)**
BreastTissue3	0.0730±0.1451(8)	0.6118±0.1251(4)	0.6070±0.1363(5)	0.6261±0.1026(3)	0.5873±0.1506(6)	0.0547±0.1425(9)	0.5585±0.1866(7)	0.6294±0.1234(2)	**0.6295±0.0956(1)**
Ecoli2	0.8297±0.0469(9)	0.8664±0.0290(7)	0.8744±0.0252(3)	0.8686±0.0338(5)	0.8706±0.0307(4)	0.8497±0.0312(8)	0.8683±0.0260(6)	0.8749±0.0289(2)	**0.8768±0.0272(1)**
Ecoli3	0.8354±0.1108(9)	**0.9038±0.0323(1)**	0.8861±0.0375(6)	0.8990±0.0348(3)	0.8962±0.0370(5)	0.8964±0.0408(4)	0.8827±0.0351(7)	0.8692±0.0453(8)	0.9029±0.0306(2)
Glass5	0.4654±0.3373(9)	0.8288±0.1492(7)	0.8370±0.1271(5)	0.8432±0.1211(4)	0.8513±0.0984(3)	0.5142±0.3296(8)	0.8343±0.1135(6)	**0.8817±0.0910(1)**	0.8783±0.0930(2)
Glass7	0.8582±0.1605(9)	0.9033±0.0530(5)	0.9122±0.0513(3)	0.8982±0.0619(6)	0.9100±0.0540(4)	0.8939±0.0583(7)	0.9165±0.0360(2)	0.8845±0.0735(8)	**0.9184±0.0394(1)**
ImageSegmentation7	0.9954±0.0021(8)	0.9963±0.0026(3)	0.9961±0.0024(4)	0.9955±0.0024(7)	**0.9970±0.0024(1)**	0.9957±0.0024(6)	0.9957±0.0024(5)	0.9869±0.0109(9)	0.9969±0.0024(2)
ImageSegmentation5	0.7748±0.0597(8)	0.9166±0.0275(2)	**0.9251±0.0232(1)**	0.9143±0.0262(4)	0.9061±0.0264(5)	0.7712±0.2066(9)	0.8397±0.0283(7)	0.9042±0.0292(6)	0.9148±0.0255(3)
LibrasMovement11	0.3958±0.2404(9)	0.7911±0.1243(4)	0.7785±0.1044(6)	0.7578±0.1202(7)	0.7846±0.1157(5)	0.4569±0.2329(8)	0.8264±0.0861(2)	0.7931±0.1184(3)	**0.8272±0.1079(1)**
LibrasMovement15	0.7148±0.2511(9)	0.8932±0.0867(2)	0.8869±0.0858(4)	0.8828±0.0903(5)	0.8605±0.0939(6)	0.7666±0.1251(8)	0.8177±0.0792(7)	0.8896±0.0814(3)	**0.9200±0.0775(1)**
Pageblocks35	0.6027±0.1095(9)	0.9042±0.0238(3)	0.8994±0.0218(4)	0.8963±0.0318(5)	0.8940±0.0265(6)	0.8393±0.0369(7)	0.8178±0.0730(8)	**0.9102±0.0229(1)**	0.9087±0.0232(2)
StatlogVehicleSilhouettes3	0.9516±0.0173(7)	**0.9616±0.0139(1)**	0.9552±0.0155(5)	0.9555±0.0194(4)	0.9549±0.0184(6)	0.9560±0.0199(3)	0.9229±0.0257(9)	0.9454±0.0295(8)	0.9589±0.0134(2)
StatlogVehicleSilhouettes2	0.5735±0.1631(9)	0.7661±0.0407(2)	**0.7685±0.0386(1)**	0.7644±0.0353(3)	0.7632±0.0453(4)	0.7193±0.0401(8)	0.7366±0.0453(7)	0.7540±0.0463(6)	0.7628±0.0324(5)
WallFollowingRobotNavigation4	0.8740±0.0787(9)	0.9384±0.0148(5)	0.9347±0.0145(6)	0.9337±0.0166(7)	0.9459±0.0115(3)	0.9266±0.0156(8)	0.9432±0.0116(4)	0.9484±0.0199(2)	**0.9543±0.0115(1)**
Yeast789	0.3131±0.1677(9)	0.7105±0.0317(3)	0.6990±0.0428(6)	0.7003±0.0465(5)	0.7057±0.0395(4)	0.6442±0.0751(8)	0.6533±0.0852(7)	0.7114±0.0260(2)	**0.7150±0.0349(1)**
Yeast56	0.7366±0.1485(9)	0.8855±0.0241(3)	0.8800±0.0211(7)	0.8845±0.0246(5)	**0.8914±0.0227(1)**	0.8679±0.0289(8)	0.8842±0.0155(6)	0.8853±0.0149(4)	0.8885±0.0227(2)
DMEAntiVirus	0.9705±0.0255(6)	0.9772±0.0161(4)	0.9780±0.0173(3)	0.9733±0.0193(5)	0.9449±0.0314(8)	0.9350±0.1665(9)	0.9623±0.0530(7)	0.9828±0.0148(2)	**0.9853±0.0121(1)**
ParkinsonsDC	0.6553±0.1617(9)	0.7715±0.0269(3)	0.7704±0.0277(4)	0.7675±0.0284(5)	**0.7728±0.0250(1)**	0.7309±0.0380(7)	0.7146±0.0437(8)	0.7647±0.0269(6)	0.7721±0.0286(2)
GLRCWL1	0.6641±0.2331(7)	0.7751±0.1641(2)	**0.7813±0.1113(1)**	0.7632±0.0931(5)	0.7523±0.1052(6)	0.6573±0.2488(8)	0.5911±0.1706(9)	0.7729±0.1384(4)	0.7740±0.1333(3)
GLRCWL2	0.3474±0.2569(8)	0.5702±0.1530(2)	0.5480±0.1720(3)	0.5393±0.1651(4)	0.4999±0.1977(6)	0.3266±0.2546(9)	0.4866±0.1920(7)	0.5230±0.1992(5)	**0.5930±0.1491(1)**
GLRCNBI1	0.6728±0.2029(8)	0.7618±0.1236(2)	**0.7695±0.0901(1)**	0.7444±0.1139(5)	0.7373±0.1415(6)	0.6663±0.2159(9)	0.7293±0.1347(7)	0.7563±0.1327(3)	0.7480±0.1501(4)
GLRCNBI2	0.3142±0.2471(9)	0.5542±0.1771(2)	0.5448±0.1687(4)	**0.5615±0.1526(1)**	0.5467±0.1506(3)	0.3465±0.2591(8)	0.5302±0.1934(6)	0.5287±0.1666(7)	0.5340±0.1904(5)
Colon 1	0.6512±0.2010(9)	0.7294±0.1815(3)	0.7042±0.2152(7)	**0.7498±0.1433(1)**	0.7435±0.1507(2)	0.7045±0.1963(6)	0.6713±0.1998(8)	0.7232±0.1700(4)	0.7200±0.1639(5)
Leukemia 1	0.9122±0.1060(5)	**0.9377±0.0958(1)**	0.9319±0.0900(2)	0.9314±0.1299(3)	0.7785±0.0933(8)	0.8535±0.0952(7)	0.7361±0.2082(9)	0.9124±0.1793(4)	0.8820±0.0894(6)
Metas 1	0.4258±0.1629(9)	0.5482±0.0884(2)	**0.5620±0.0783(1)**	0.5437±0.0812(5)	0.5452±0.0840(4)	0.4655±0.1446(8)	0.5410±0.1009(6)	0.5226±0.1337(7)	0.5475±0.1181(3)
DrivFace1	0.8406±0.1060(9)	0.9033±0.0717(3)	0.9008±0.0747(5)	0.9023±0.0692(4)	0.8972±0.0738(6)	0.8595±0.0814(8)	0.9370±0.0478(2)	0.8858±0.0713(7)	**0.9524±0.0436(1)**
DrivFace3	0.7381±0.1871(9)	0.9029±0.0665(5)	0.9125±0.0560(3)	0.9085±0.0576(4)	0.9017±0.0600(6)	0.8310±0.0989(8)	0.9420±0.0450(2)	0.8979±0.0601(7)	**0.9472±0.0354(1)**
ARBT6	0.0000±0.0000(8.5)	0.2578±0.2307(3)	0.2359±0.2324(5)	0.0000±0.0000(8.5)	0.5086±0.1008(2)	0.0187±0.1173(7)	0.2463±0.3022(4)	0.1074±0.1849(6)	**0.7061±0.1646(1)**
ARBT5	0.1432±0.2576(9)	0.7247±0.1442(2)	0.7185±0.1193(3)	0.2061±0.3004(6)	0.5029±0.0718(5)	0.1718±0.2670(7)	0.1464±0.2518(8)	0.5583±0.1362(4)	**0.8971±0.0695(1)**

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.

TABLE S10: NN: average auc

Dataset	Ori	SMOTE	ADASYN	MWMOTE	INOS	AMDO	SWIM	GDO	SCOS
Survival ¡5yr	0.5987±0.0909(9)	0.6346±0.0725(5)	0.6193±0.0676(6)	0.6119±0.0903(8)	0.6501±0.0638(2)	**0.6502±0.0551(1)**	0.6367±0.0772(4)	0.6186±0.0965(7)	0.6423±0.0775(3)
Biomed diseased	0.9251±0.0275(6)	0.9264±0.0266(5)	0.9226±0.0473(8)	0.9271±0.0301(4)	0.9243±0.0271(7)	0.9279±0.0247(3)	0.9283±0.0404(2)	0.9222±0.0374(9)	**0.9318±0.0227(1)**
Cancer wpbc ret	0.6585±0.0888(9)	**0.7072±0.0647(1)**	0.7043±0.0582(2)	0.6996±0.0574(3)	0.6883±0.0556(4)	0.6666±0.0936(8)	0.6708±0.0851(7)	0.6810±0.0655(5)	0.6740±0.0783(6)
Diabetes absent	0.8128±0.0272(8)	0.8136±0.0333(6)	0.8157±0.0254(5)	0.8134±0.0274(7)	0.8183±0.0227(3)	**0.8213±0.0297(1)**	0.8169±0.0269(4)	0.8081±0.0358(9)	0.8184±0.0261(2)
Hepatitis normal	0.8038±0.0798(8)	0.8203±0.0526(5)	0.8100±0.0600(7)	0.8205±0.0743(4)	**0.8393±0.0402(1)**	0.7989±0.0831(9)	0.8234±0.0734(3)	0.8248±0.0674(2)	0.8161±0.0523(6)
Housing MEDV¿35	0.9039±0.1173(9)	0.9433±0.0269(5)	0.9484±0.0229(3)	0.9374±0.0292(7)	**0.9502±0.0236(1)**	0.9358±0.0325(8)	0.9411±0.0225(6)	0.9465±0.0249(4)	0.9493±0.0242(2)
Spectf 0	0.8334±0.0376(8)	0.8457±0.0283(6)	**0.8547±0.0262(1)**	0.8493±0.0359(4)	0.8467±0.0388(5)	0.8367±0.0433(7)	0.8280±0.0372(9)	0.8503±0.0291(3)	0.8524±0.0282(2)
Iris setosa	0.9981±0.0158(9)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)	1.0000±0.0000(4.5)
Vowel 3	0.9500±0.0724(9)	0.9837±0.0329(5)	0.9887±0.0307(2)	0.9812±0.0424(6)	0.9854±0.0332(4)	0.9523±0.0533(8)	0.9753±0.0416(7)	0.9873±0.0301(3)	**0.9910±0.0220(1)**
Vowel 8	0.8326±0.1349(9)	0.9429±0.0464(2)	**0.9441±0.0394(1)**	0.9322±0.0504(5)	0.9369±0.0431(4)	0.8508±0.0988(8)	0.8777±0.0506(7)	0.9317±0.0435(6)	0.9409±0.0414(3)
Waveform 0	0.9460±0.0104(6)	0.9512±0.0092(3)	0.9457±0.0106(7)	0.9522±0.0101(2)	0.9493±0.0114(5)	**0.9552±0.0073(1)**	0.9457±0.0127(8)	0.9400±0.0136(9)	0.9509±0.0117(4)
BreastTissue24	0.9038±0.0561(4)	0.9057±0.0458(3)	0.8997±0.0854(7)	0.8916±0.0755(9)	0.9065±0.0509(2)	0.8966±0.0608(8)	0.9023±0.0459(6)	0.9025±0.0438(5)	**0.9129±0.0283(1)**
BreastTissue3	0.6154±0.1448(9)	0.6748±0.0768(6)	0.6867±0.0561(2)	**0.6898±0.0624(1)**	0.6781±0.0575(5)	0.6385±0.1234(8)	0.6547±0.1130(7)	0.6792±0.0704(4)	0.6852±0.0591(3)
Ecoli2	0.9515±0.0145(6)	0.9548±0.0131(3)	0.9535±0.0112(5)	0.9543±0.0147(4)	**0.9551±0.0132(1)**	0.9512±0.0114(7)	0.9453±0.0246(9)	0.9485±0.0177(8)	0.9551±0.0109(2)
Ecoli3	0.9453±0.0217(5)	**0.9504±0.0224(1)**	0.9420±0.0287(7)	0.9468±0.0231(3)	0.9455±0.0235(4)	0.9433±0.0264(6)	0.9395±0.0251(8)	0.9382±0.0262(9)	0.9481±0.0228(2)
Glass5	0.8313±0.1864(9)	0.9257±0.0829(4)	**0.9428±0.0629(1)**	0.9171±0.0787(6)	0.9225±0.0966(5)	0.8613±0.1560(8)	0.9087±0.0868(7)	0.9282±0.0600(3)	0.9410±0.0550(2)
Glass7	0.9446±0.0405(8)	0.9465±0.0381(7)	0.9521±0.0377(2)	**0.9547±0.0311(1)**	0.9476±0.0342(5)	0.9496±0.0341(4)	0.9508±0.0404(3)	0.9323±0.0614(9)	0.9470±0.0378(6)
ImageSegmentation7	0.9989±0.0013(4)	0.9988±0.0016(7)	0.9993±0.0009(2)	0.9988±0.0015(6)	**0.9995±0.0010(1)**	0.9989±0.0013(5)	0.9982±0.0020(8)	0.9975±0.0030(9)	0.9991±0.0012(3)
ImageSegmentation5	0.9539±0.0194(6)	0.9663±0.0159(2)	0.9651±0.0191(4)	0.9654±0.0151(3)	0.9607±0.0146(5)	0.8892±0.1635(9)	0.9351±0.0177(8)	0.9497±0.0264(7)	**0.9678±0.0138(1)**
LibrasMovement11	0.8893±0.0644(8)	0.9113±0.0632(6)	0.9099±0.0566(7)	0.9120±0.0441(5)	0.9199±0.0484(3)	0.8885±0.1237(9)	0.9186±0.0386(4)	0.9199±0.0540(2)	**0.9234±0.0432(1)**
LibrasMovement15	0.8851±0.1343(9)	0.9584±0.0663(3)	0.9585±0.0517(2)	0.9467±0.0792(6)	0.9350±0.0792(7)	0.8980±0.1241(7)	0.8877±0.0905(8)	0.9556±0.0792(4)	**0.9665±0.0654(1)**
Pageblocks35	0.9401±0.0212(8)	0.9648±0.0116(2)	0.9609±0.0146(5)	0.9579±0.0231(6)	0.9634±0.0132(4)	0.9521±0.0184(7)	0.9115±0.0610(9)	**0.9661±0.0129(1)**	0.9640±0.0123(3)
StatlogVehicleSilhouettes3	0.9897±0.0059(3)	**0.9909±0.0053(1)**	0.9891±0.0070(4)	0.9881±0.0071(7)	0.9890±0.0078(5)	0.9890±0.0096(6)	0.9822±0.0170(9)	0.9830±0.0177(8)	0.9903±0.0052(2)
StatlogVehicleSilhouettes2	0.8035±0.0666(9)	0.8506±0.0378(3)	**0.8515±0.0374(1)**	0.8511±0.0310(2)	0.8479±0.0389(4)	0.8220±0.0497(7)	0.8179±0.0443(8)	0.8310±0.0480(6)	0.8424±0.0325(5)
WallFollowingRobotNavigation4	0.9809±0.0092(8)	0.9875±0.0048(2)	0.9865±0.0051(4)	0.9858±0.0062(5)	0.9874±0.0045(3)	0.9808±0.0073(9)	0.9855±0.0048(6)	0.9825±0.0106(7)	**0.9889±0.0046(1)**
Yeast789	0.7611±0.0907(8)	0.7970±0.0332(4)	0.7928±0.0331(5)	0.7894±0.0360(7)	0.7992±0.0300(3)	0.7912±0.0385(6)	0.7538±0.0640(9)	0.8041±0.0306(2)	**0.8051±0.0335(1)**
Yeast56	0.9239±0.1134(9)	0.9456±0.0147(4)	0.9433±0.0168(7)	0.9443±0.0160(6)	0.9479±0.0158(2)	0.9447±0.0175(5)	0.9428±0.0172(8)	0.9469±0.0142(3)	**0.9485±0.0153(1)**
DMEAntiVirus	0.9959±0.0049(6)	0.9969±0.0023(4)	0.9970±0.0021(2)	0.9965±0.0037(5)	**0.9975±0.0035(1)**	0.9805±0.0829(9)	0.9955±0.0090(7)	0.9944±0.0080(8)	0.9969±0.0023(3)
ParkinsonsDC	0.8316±0.0620(8)	0.8643±0.0268(2)	0.8634±0.0240(4)	0.8633±0.0232(5)	**0.8667±0.0206(1)**	0.8538±0.0257(7)	0.8211±0.0364(9)	0.8606±0.0202(6)	0.8639±0.0243(3)
GLRCWL1	0.8574±0.0849(7)	0.8740±0.0767(4)	0.8772±0.0785(2)	0.8744±0.0554(3)	0.8643±0.0582(6)	0.8365±0.1149(8)	0.7063±0.1458(9)	**0.9004±0.0468(1)**	0.8706±0.0698(5)
GLRCWL2	0.6355±0.1233(7)	0.6981±0.1025(3)	**0.7204±0.1077(1)**	0.6916±0.1020(4)	0.6618±0.1106(6)	0.6267±0.1273(8)	0.6159±0.1152(9)	0.7185±0.1032(2)	0.6915±0.0956(5)
GLRCNBI1	0.8522±0.1120(8)	0.8940±0.0681(3)	**0.8984±0.0515(1)**	0.8787±0.0742(5)	0.8883±0.0745(4)	0.8421±0.1393(9)	0.8555±0.0631(7)	0.8949±0.0848(2)	0.8757±0.0874(6)
GLRCNBI2	0.6270±0.1324(8)	0.6986±0.1027(4)	0.7003±0.0863(3)	0.6935±0.0789(5)	**0.7128±0.0854(1)**	0.6164±0.1424(9)	0.6560±0.1109(7)	0.7028±0.0842(2)	0.6642±0.1149(6)
Colon 1	0.7836±0.1351(8)	0.8140±0.1229(5)	0.8156±0.1220(4)	0.8277±0.1062(3)	**0.8456±0.0786(1)**	0.8058±0.1164(6)	0.7715±0.1625(9)	0.8296±0.1155(2)	0.7991±0.1388(7)
Leukemia 1	0.9761±0.0572(3)	**0.9864±0.0267(1)**	0.9796±0.0817(2)	0.9730±0.0824(4)	0.8942±0.0605(8)	0.9423±0.0648(7)	0.8769±0.1681(9)	0.9715±0.0804(5)	0.9632±0.0684(6)
Metas 1	0.6155±0.0845(7)	0.6506±0.0625(3)	**0.6575±0.0652(1)**	0.6464±0.0657(4)	0.6527±0.0516(2)	0.6082±0.1002(8)	0.6077±0.0743(9)	0.6449±0.0601(5)	0.6208±0.0803(6)
DrivFace1	0.9884±0.0203(8)	0.9946±0.0108(5)	0.9957±0.0041(2)	0.9949±0.0061(4)	**0.9957±0.0046(1)**	0.9881±0.0240(9)	0.9908±0.0124(7)	0.9945±0.0076(6)	0.9951±0.0042(3)
DrivFace3	0.9653±0.0458(9)	0.9767±0.0514(7)	0.9835±0.0151(2)	0.9819±0.0187(4)	0.9808±0.0176(6)	0.9691±0.0371(8)	0.9813±0.0190(5)	0.9831±0.0150(3)	**0.9844±0.0147(1)**
ARBT6	0.7198±0.1955(6)	0.9652±0.0615(3)	0.9754±0.0248(2)	0.7159±0.1678(7)	0.5273±0.1130(9)	0.7380±0.2096(5)	0.6761±0.1756(8)	**0.9805±0.0154(1)**	0.9131±0.0752(4)
ARBT5	0.8268±0.2054(8)	0.9825±0.0488(3)	0.9879±0.0061(2)	0.8373±0.1891(6)	0.5132±0.0791(9)	0.8314±0.1961(7)	0.8429±0.2007(5)	**0.9897±0.0057(1)**	0.9586±0.0512(4)

A stratified k-fold cross validation (k=2 in experience) is used for 35 times that 70 (2 × 35) runs are conducted. Thus for each table cell, the mean and standard deviation of corresponding performance on 70 runs are first recorded and then its rank among all methods is followed in one bracket. The best rank for each row is highlighted as bold.