

Supplementary materials

Supplementary Table 1 Inter-clusters comparison

Factor	Ore	Cluster 2	Cluster 3	Cluster 4
Age (years)	Cluster 1	a	b	c
	Cluster 2		d	
	Cluster 3			
Sex	Cluster 1			c
	Cluster 2		d	e
	Cluster 3			
Left ventricle diastolic dysfunction	Cluster 1	a	b	c
	Cluster 2		d	e
	Cluster 3			
Atrial fibrillation at the time of single lead ECG registration	Cluster 1	a	b	c
	Cluster 2		d	
	Cluster 3			f
EF (%)	Cluster 1		b	c
	Cluster 2		d	c
	Cluster 3			f
EDV (ml)	Cluster 1	a	b	c
	Cluster 2		d	e
	Cluster 3			
Left atrial volume index (LAVI)	Cluster 1	a	b	c
	Cluster 2		d	e
	Cluster 3			f
Diabetes mellites	Cluster 1	a		c
	Cluster 2			

		Cluster 3			f
Hypertension_0		Cluster 1	a	b	c
		Cluster 2		d	e
		Cluster 3			
Hypertension_1		Cluster 1	a		c
		Cluster 2		d	e
		Cluster 3			
Hypertension_2		Cluster 1	a	b	c
		Cluster 2		d	e
		Cluster 3			
Hypertension_3		Cluster 1	a	b	c
		Cluster 2		d	e
		Cluster 3			
Ischemic disease_0	heart	Cluster 1		b	c
		Cluster 2		d	e
		Cluster 3			f
Ischemic disease_1	heart	Cluster 1		b	c
		Cluster 2		d	e
		Cluster 3			f
Ischemic disease_2	heart	Cluster 1		b	c
		Cluster 2		d	e
		Cluster 3			f
Disturbance of cardiac rhythm and conduction_0		Cluster 1		b	
		Cluster 2		d	

		Cluster 3			f
Disturbance of cardiac rhythm and conduction_1		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
Disturbance of cardiac rhythm and conduction_2		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
CHF_0		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
CHF_1		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
CHF_2		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
CHF_3		Cluster 1	b		
		Cluster 2	d		
		Cluster 3			f
Aortic valve insufficiency_0	a	Cluster 1	b	c	
		Cluster 2	d		
		Cluster 3			f

Aortic valve insufficiency _1	Cluster 1	a	b	c
	Cluster 2		d	
	Cluster 3			f
Aortic valve insufficiency _2	Cluster 1		b	
	Cluster 2		d	
	Cluster 3			f
Aortic valve stenosis _0	Cluster 1		b	
	Cluster 2		d	
	Cluster 3			f
Aortic valve stenosis _1	Cluster 1		b	
	Cluster 2		d	
	Cluster 3			f
Aortic valve stenosis _2	Cluster 1		b	
	Cluster 2		d	
	Cluster 3			f
Mitral valve insufficiency _1	Cluster 1	a	b	c
	Cluster 2			
	Cluster 3			
Mitral valve insufficiency _2	Cluster 1	a	b	
	Cluster 2		d	
	Cluster 3			f

Mitral valve insufficiency _3	Cluster 1	b	
	Cluster 2	d	
	Cluster 3		f
Mitral valve stenosis _0	Cluster 1	b	
	Cluster 2	d	
	Cluster 3		f
Mitral valve stenosis _1	Cluster 1	b	
	Cluster 2	d	
	Cluster 3		f

The letters indicate statically significant P value < 0.05 between the comparative clusters as indicated below: Cluster 1 - cluster 2 is a; cluster 1 - cluster 3 is b; cluster 1 - cluster 4 is c; cluster 2 - cluster 3 is d; cluster 2 - cluster 4 is e; cluster 3 - cluster 4 is f.

Supplementary Table 2 The full feature impotence of the cluster 1

	Feature	Gain	Cover	Frequency
	<char>	<num>	<num>	<num>
1:	Tfi	0.2025820333	0.1129455475	0.039665971
2:	HFQRS	0.0428784299	0.0522193761	0.058455115
3:	RR	0.0409422888	0.0242429095	0.035490605
4:	Beta	0.0327672593	0.0562503525	0.034446764
5:	QRSE4	0.0324404118	0.0436127860	0.033402923
6:	PpeakN	0.0305657620	0.0590309620	0.028183716
7:	Vozrast	0.0304850329	0.0377033915	0.026096033
8:	Tons	0.0285850397	0.0469408450	0.018789144
9:	QTc	0.0279303306	0.0343387284	0.030271399
10:	Rpeak	0.0276768053	0.0199639859	0.031315240
11:	QRS2energy	0.0268285710	0.0239357281	0.014613779
12:	HFNoise	0.0253821006	0.0146461704	0.033402923
13:	Kurenie	0.0234169437	0.0177193560	0.014613779
14:	J80A	0.0230711377	0.0148814485	0.032359081
15:	Speak	0.0226049494	0.0137987195	0.026096033
16:	Pst	0.0214151460	0.0316465037	0.029227557
17:	Sbeta	0.0213495409	0.0302847645	0.027139875
18:	Tpeak	0.0208406512	0.0326477350	0.027139875
19:	QRSst	0.0205850824	0.0340027118	0.022964509
20:	QRSenergy	0.0193180084	0.0167784353	0.011482255
21:	QT_TQ	0.0186839129	0.0132867259	0.025052192
22:	JA	0.0180700161	0.0158085796	0.021920668
23:	HFSNR	0.0177967259	0.0130202849	0.024008351
24:	SA	0.0173182480	0.0161193070	0.031315240
25:	QRSE3	0.0154900155	0.0208700139	0.014613779
26:	QRSw	0.0149387722	0.0152134347	0.028183716

27: RonsF 0.0148913020 0.0170714507 0.018789144
28: QRS12energy 0.0148783026 0.0074874366 0.017745303
29: RoffsF 0.0145852272 0.0172176199 0.022964509
30: VAT 0.0142401309 0.0126815013 0.021920668
31: TA 0.0135070826 0.0110719897 0.015657620
32: SDNN 0.0122181860 0.0118287918 0.019832985
33: QRSE1 0.0116266321 0.0182012381 0.017745303
34: TpTe 0.0101470120 0.0048662720 0.012526096
35: TE1 0.0099876582 0.0087923652 0.016701461
36: Pan 0.0070524597 0.0094310505 0.014613779
37: TE4 0.0067951156 0.0080000848 0.014613779
38: QRSfi 0.0065038029 0.0153465953 0.012526096
39: Tpenergy 0.0063737277 0.0068562343 0.014613779
40: Pan_1 0.0055514152 0.0050870071 0.010438413
41: Toffs 0.0054547466 0.0119747233 0.004175365
42: RA 0.0051697429 0.0056110312 0.012526096
43: TE2 0.0043149294 0.0047944221 0.009394572
44: QRS11energy 0.0033852410 0.0017368459 0.004175365
45: Pol 0.0025121211 0.0031724446 0.004175365
46: TE3 0.0020906307 0.0010518411 0.002087683
47: Tenergy 0.0018136747 0.0014167509 0.004175365
48: Pfi 0.0011732342 0.0006569955 0.003131524
49: QRSE2 0.0011153029 0.0028761768 0.002087683
50: PpeakP 0.0006491061 0.0008603280 0.003131524

Supplementary Table 3 The full feature impotence of the cluster 2

	Feature	Gain	Cover	Frequency
	<char>	<num>	<num>	<num>
1:	QRSfi	0.2062002777	0.1587009083	0.057306590
2:	Vozrast	0.1201942342	0.1483559898	0.083094556
3:	Toffs	0.1060687957	0.1177935596	0.031518625
4:	QRSE1	0.0527311328	0.0738801474	0.045845272
5:	QTc	0.0403073631	0.0379336307	0.057306590
6:	TA	0.0292962304	0.0225912192	0.034383954
7:	JA	0.0261584734	0.0194608466	0.034383954
8:	TpTe	0.0244158806	0.0223476055	0.031518625
9:	Pfi	0.0220567482	0.0273801160	0.028653295
10:	SA	0.0215936745	0.0116722046	0.022922636
11:	RR	0.0212991268	0.0110672112	0.020057307
12:	HFSNR	0.0198479205	0.0276827731	0.031518625
13:	RoffsF	0.0195991764	0.0184406501	0.020057307
14:	HFQRS	0.0190721284	0.0200441055	0.031518625
15:	Sbeta	0.0186048389	0.0147183318	0.037249284
16:	QRSenergy	0.0172422201	0.0211477166	0.020057307
17:	QRSE2	0.0170528312	0.0169052228	0.017191977
18:	Pst	0.0158509000	0.0198078803	0.028653295
19:	RA	0.0156842378	0.0159980851	0.020057307
20:	QRS11energy	0.0156824359	0.0255985254	0.025787966
21:	Beta	0.0135455146	0.0083969943	0.011461318
22:	RonsF	0.0133169215	0.0082391617	0.017191977
23:	Kurenie	0.0128787684	0.0167029616	0.014326648
24:	SDNN	0.0119538424	0.0204861937	0.031518625
25:	Tenergy	0.0111614641	0.0048055040	0.017191977
26:	QRS12energy	0.0105620178	0.0128718917	0.017191977

27: Pan 0.0100504825 0.0041756698 0.017191977
28: QT_TQ 0.0100416741 0.0106549613 0.022922636
29: PpeakP 0.0100278387 0.0066140650 0.020057307
30: Tpeak 0.0088600277 0.0050114467 0.008595989
31: Tfi 0.0083691441 0.0129646278 0.014326648
32: Speak 0.0056521586 0.0078269536 0.014326648
33: PpeakN 0.0054210644 0.0071647481 0.014326648
34: TE2 0.0052583344 0.0037244058 0.011461318
35: TE3 0.0048473542 0.0055948169 0.008595989
36: J80A 0.0043459838 0.0036710286 0.014326648
37: TE1 0.0042782138 0.0056357908 0.008595989
38: QRSst 0.0035665968 0.0050222360 0.005730659
39: HFNoise 0.0034798472 0.0022646562 0.008595989
40: Pol 0.0031668880 0.0035718582 0.002865330
41: Pan_1 0.0018707987 0.0016371779 0.002865330
42: VAT 0.0018332665 0.0020926776 0.011461318
43: QRSw 0.0017588513 0.0014652674 0.005730659
44: Tpenergy 0.0017128188 0.0016170958 0.002865330
45: TE4 0.0013733854 0.0009270113 0.002865330
46: Tons 0.0007475266 0.0014131144 0.005730659
47: QRSE4 0.0005296832 0.0018545636 0.002865330
48: QRSE3 0.0004309059 0.0020663906 0.005730659

Supplementary Table 4 The full feature impotence of the cluster 3

	Feature	Gain	Cover	Frequency
	<char>	<num>	<num>	<num>
1:	Tfi	5.925740e-01	0.2041143404	0.084257206
2:	QTc	5.302401e-02	0.1132747260	0.090909091
3:	Vozrast	4.880126e-02	0.1289355801	0.066518847
4:	Sbeta	2.031384e-02	0.0395061612	0.039911308
5:	QRSE4	1.877258e-02	0.0213145649	0.024390244
6:	QT_TQ	1.824762e-02	0.0124876598	0.031042129
7:	Beta	1.194936e-02	0.0145616525	0.026607539
8:	QRSE3	1.193787e-02	0.0321491099	0.019955654
9:	QRSw	1.154670e-02	0.0339043090	0.044345898
10:	Tpenergy	1.150207e-02	0.0188117976	0.024390244
11:	QRS12energy	1.100438e-02	0.0215965371	0.024390244
12:	Tpeak	1.074657e-02	0.0393382007	0.033259424
13:	HFQRS	1.062122e-02	0.0180683603	0.024390244
14:	QRSst	9.958095e-03	0.0203533843	0.026607539
15:	HFNoise	9.688922e-03	0.0137643826	0.026607539
16:	J80A	9.606908e-03	0.0200960593	0.019955654
17:	QRSenergy	9.513296e-03	0.0136205762	0.015521064
18:	Rpeak	9.448860e-03	0.0113492223	0.024390244
19:	Pst	8.784207e-03	0.0098141643	0.017738359
20:	PpeakN	7.431724e-03	0.0134759491	0.011086475
21:	Tenergy	7.363702e-03	0.0163320948	0.015521064
22:	QRS2energy	7.125141e-03	0.0142093987	0.017738359
23:	SDNN	6.859052e-03	0.0110185346	0.019955654
24:	HFSNR	6.492296e-03	0.0045032335	0.013303769
25:	RA	6.312181e-03	0.0064136892	0.011086475
26:	QRSE2	6.271080e-03	0.0125536235	0.011086475

27: QRS11energy 5.330008e-03 0.0104164787 0.008869180
28: QRSE1 5.064096e-03 0.0079594753 0.015521064
29: RR 4.655114e-03 0.0104282957 0.026607539
30: JA 4.636225e-03 0.0069919521 0.013303769
31: Pfi 4.528075e-03 0.0018970463 0.008869180
32: TA 4.302506e-03 0.0103371972 0.017738359
33: Pan 3.695574e-03 0.0070620109 0.015521064
34: Tons 3.621481e-03 0.0049161779 0.008869180
35: Toffs 3.528017e-03 0.0125065703 0.008869180
36: TpTe 3.325238e-03 0.0085157530 0.013303769
37: RoffsF 3.104555e-03 0.0072146041 0.013303769
38: VAT 2.775352e-03 0.0104836982 0.013303769
39: SA 2.322467e-03 0.0029747358 0.008869180
40: TE2 1.822454e-03 0.0021015350 0.002217295
41: TE3 1.795524e-03 0.0021358190 0.004434590
42: TE4 1.730594e-03 0.0070705742 0.006651885
43: RonsF 1.467117e-03 0.0021540412 0.004434590
44: Kurenje 1.415302e-03 0.0006924830 0.002217295
45: QRSfi 1.386461e-03 0.0058197950 0.013303769
46: PpeakP 1.283067e-03 0.0043207328 0.008869180
47: Pan_1 8.109466e-04 0.0066474682 0.011086475
48: Pol 8.068142e-04 0.0002597888 0.002217295
49: TE1 6.354982e-04 0.0010868558 0.004434590
50: Speak 6.061356e-05 0.0004395996 0.002217295

Supplementary Table 5 The full feature impotence of the cluster 4

	Feature	Gain	Cover	Frequency
	<char>	<num>	<num>	<num>
1:	Tfi	0.2351824870	0.077817770	0.031727380
2:	Vozrast	0.0763267031	0.107247477	0.055229142
3:	PpeakN	0.0513508247	0.068587402	0.027027027
4:	Rpeak	0.0433715448	0.056703432	0.031727380
5:	Pst	0.0353223862	0.039908330	0.047003525
6:	SDNN	0.0344779652	0.045100873	0.047003525
7:	HFQRS	0.0341255619	0.037395763	0.047003525
8:	QTc	0.0287844474	0.025035211	0.032902468
9:	Kurenie	0.0254102540	0.016698458	0.012925969
10:	QRSfi	0.0226883592	0.037137764	0.028202115
11:	QT_TQ	0.0191756153	0.023036462	0.034077556
12:	SA	0.0185302006	0.031787160	0.037602820
13:	QRSE3	0.0179942926	0.035532881	0.024676851
14:	J80A	0.0169356373	0.019890884	0.024676851
15:	Speak	0.0162634351	0.024185362	0.021151586
16:	QRSE1	0.0161310102	0.022792176	0.028202115
17:	Sbeta	0.0160427391	0.019654566	0.024676851
18:	RA	0.0155942695	0.010610311	0.021151586
19:	QRS11energy	0.0149843779	0.014326119	0.018801410
20:	Beta	0.0149831799	0.007210924	0.019976498
21:	QRS2energy	0.0144935465	0.010223219	0.011750881
22:	Pan	0.0144413937	0.012659780	0.019976498
23:	QRSw	0.0139869588	0.016818468	0.025851939
24:	RR	0.0139752798	0.009197138	0.019976498
25:	Toffs	0.0135042647	0.031447661	0.012925969
26:	JA	0.0134838967	0.010503654	0.021151586

27: QRSenergy 0.0129637042 0.011324115 0.017626322
28: QRSE4 0.0121117530 0.024235262 0.016451234
29: Tpenergy 0.0114484108 0.012574326 0.017626322
30: HFSNR 0.0111693303 0.005179998 0.016451234
31: HFNoise 0.0109830684 0.008257954 0.015276146
32: QRS12energy 0.0107577186 0.008383293 0.010575793
33: RoffsF 0.0090437776 0.008378073 0.017626322
34: QRSE2 0.0090195747 0.009150901 0.011750881
35: TA 0.0088308702 0.012120822 0.016451234
36: PpeakP 0.0082916993 0.007106725 0.010575793
37: RonsF 0.0080994939 0.008164296 0.010575793
38: TE2 0.0071207803 0.012194816 0.016451234
39: Pol 0.0062513128 0.005253201 0.008225617
40: VAT 0.0050534593 0.003685856 0.009400705
41: TE1 0.0049396722 0.007384664 0.012925969
42: QRSst 0.0048224345 0.007315925 0.007050529
43: Tpeak 0.0046508918 0.010042808 0.012925969
44: TE4 0.0045923631 0.008805599 0.009400705
45: Tons 0.0039679219 0.005311547 0.008225617
46: TE3 0.0036640213 0.003135817 0.010575793
47: Pfi 0.0016526502 0.003855574 0.008225617
48: Tenergy 0.0014732963 0.002551453 0.004700353
49: TpTe 0.0013143343 0.001761254 0.002350176
50: Pan_1 0.0002168297 0.002316477 0.001175088
