

Supplementary Table S1 correlation_matrix

The correlation_matrix provided presents the relationships between various continuous and binary variables in our dataset as correlation coefficients.

- The correlation coefficient ranges from -1 to 1.
 - 1** indicates a perfect positive correlation, meaning as one variable increases, the other also increases.
 - 1** indicates a perfect negative correlation, meaning as one variable increases, the other decreases.
 - 0** indicates no correlation, meaning the variables do not have a linear relationship.

	Age	Muscle.Pain	Taste.Smell	CKD	O2sat.Ventilator	NEUT
Age	1.00000000	-0.087297630	-0.052745099	0.085697833	-0.08510409	0.141066305
Muscle.Pain	-0.08729763	1.000000000	0.053301588	-0.039536487	-0.01030588	-0.053708603
Taste.Smell	-0.05274510	0.053301588	1.000000000	-0.016240351	-0.04076954	-0.022938683
CKD	0.08569783	-0.039536487	-0.016240351	1.000000000	0.05509670	0.034147421
O2sat.Ventilator	-0.08510409	-0.010305880	-0.040769539	0.055096704	1.000000000	-0.117466780
NEUT	0.14106630	-0.053708603	-0.022938683	0.034147421	-0.11746678	1.000000000
NA.	-0.01944164	0.003800895	0.008587861	-0.024871923	-0.03652063	-0.043917306
P	0.05179567	-0.081696603	-0.010086905	0.144909654	-0.09205876	0.036782446
FBS	0.03345589	0.087651114	0.032541462	0.019072638	-0.16613844	0.042879872
ESR	0.07712505	0.029402218	-0.030585684	0.036722767	-0.05506594	0.059668889
LACTATE	0.02557615	-0.020955318	0.003526150	0.014683144	-0.14797598	0.119036692
PROCALCITONIN	-0.01508498	-0.044929287	0.077878183	0.038917993	-0.06142094	0.023934594
Ferritin	0.05917608	-0.019956622	-0.046571667	0.016323176	-0.06229512	0.114601665
TIBC	-0.14410547	-0.032241224	-0.027006194	-0.008325373	0.04078179	-0.009086587
DDIMER	0.10318183	-0.112465018	0.024537041	0.012350827	-0.05542996	0.078612210
	NA.	P	FBS	ESR	LACTATE	PROCALCITONIN
Age	-0.019441642	0.051795671	0.033455888	0.07712505	0.025576154	-0.01508498
Muscle.Pain	0.003800895	-0.081696603	0.087651114	0.02940222	-0.020955318	-0.04492929
Taste.Smell	0.008587861	-0.010086905	0.032541462	-0.03058568	0.003526150	0.07787818
CKD	-0.024871923	0.144909654	0.019072638	0.03672277	0.014683144	0.03891799
O2sat.Ventilator	-0.036520629	-0.092058763	-0.166138442	-0.05506594	-0.147975981	-0.06142094
NEUT	-0.043917306	0.036782446	0.042879872	0.05966889	0.119036692	0.02393459
NA.	1.000000000	0.043894755	-0.047588478	-0.07989206	0.061960229	-0.06542993
P	0.043894755	1.000000000	-0.007200489	0.01308422	0.038986468	0.06260184
FBS	-0.047588478	-0.007200489	1.000000000	0.09112815	0.221991623	0.06297464
ESR	-0.079892056	0.013084219	0.091128149	1.000000000	-0.012787336	0.01876977
LACTATE	0.061960229	0.038986468	0.221991623	-0.01278734	1.000000000	0.19725957
PROCALCITONIN	-0.065429934	0.062601840	0.062974638	0.01876977	0.197259570	1.00000000
Ferritin	-0.061055930	-0.035792926	0.086378891	0.25754899	-0.015918349	0.02085211
TIBC	0.102302636	0.020261119	0.005719059	-0.35198131	0.006359734	0.01212575
DDIMER	0.012738894	0.097270382	-0.030800780	0.04277593	0.137653833	0.16263024
	Ferritin	TIBC	DDIMER			
Age	0.05917608	-0.144105466	0.10318183			
Muscle.Pain	-0.01995662	-0.032241224	-0.11246502			
Taste.Smell	-0.04657167	-0.027006194	0.02453704			
CKD	0.01632318	-0.008325373	0.01235083			
O2sat.Ventilator	-0.06229512	0.040781792	-0.05542996			
NEUT	0.11460167	-0.009086587	0.07861221			
NA.	-0.06105593	0.102302636	0.01273889			
P	-0.03579293	0.020261119	0.09727038			
FBS	0.08637889	0.005719059	-0.03080078			
ESR	0.25754899	-0.351981312	0.04277593			
LACTATE	-0.01591835	0.006359734	0.13765383			
PROCALCITONIN	0.02085211	0.012125747	0.16263024			
Ferritin	1.00000000	-0.335739662	0.12435005			
TIBC	-0.33573966	1.000000000	-0.11644540			
DDIMER	0.12435005	-0.116445399	1.00000000			

Supplementary Table S2 p_values of correlation_matrix

	Age	Muscle.Pain	Taste.Smell	CKD	O2sat.Ventilator	NEUT
Age	NA	1.501125e-09	2.648160e-04	2.973310e-09	3.819912e-09	0.000000e+00
Muscle.Pain	1.501125e-09	NA	2.277830e-04	6.271513e-03	4.763368e-01	2.038367e-04
Taste.Smell	2.648160e-04	2.277830e-04	NA	2.617080e-01	4.824102e-03	1.128786e-01
CKD	2.973310e-09	6.271513e-03	2.617080e-01	NA	1.387693e-04	1.825299e-02
O2sat.Ventilator	3.819912e-09	4.763368e-01	4.824102e-03	1.387693e-04	NA	4.440892e-16
NEUT	0.000000e+00	2.038367e-04	1.128786e-01	1.825299e-02	4.440892e-16	NA
NA.	1.790643e-01	7.928113e-01	5.528633e-01	8.560709e-02	1.158301e-02	2.394453e-03
P	3.413086e-04	1.557576e-08	4.857570e-01	0.000000e+00	1.826512e-10	1.099962e-02
FBS	2.074375e-02	1.288597e-09	2.448877e-02	1.874587e-01	0.000000e+00	3.030996e-03
ESR	9.414461e-08	4.212538e-02	3.450519e-02	1.113025e-02	1.399701e-04	3.673738e-05
LACTATE	7.710620e-02	1.475398e-01	8.074823e-01	3.102330e-01	0.000000e+00	0.000000e+00
PROCALCITONIN	2.971768e-01	1.893761e-03	7.047397e-08	7.135641e-03	2.152016e-05	9.807938e-02
Ferritin	4.259203e-05	1.678209e-01	1.281540e-03	2.592827e-01	1.639283e-05	1.776357e-15

TIBC	0.000000e+00	2.583994e-02	6.195701e-02	5.650649e-01	4.811377e-03	5.300422e-01
DDIMER	8.713030e-13	6.217249e-15	8.990721e-02	3.933619e-01	1.263666e-04	5.300683e-08
	NA.	P	FBS	ESR	LACTATE	PROCALCITONIN
Age	1.790643e-01	3.413086e-04	2.074375e-02	9.414461e-08	7.710620e-02	2.971768e-01
Muscle.Pain	7.928113e-01	1.557576e-08	1.288597e-09	4.212538e-02	1.475398e-01	1.893761e-03
Taste.Smell	5.528633e-01	4.857570e-01	2.448877e-02	3.450519e-02	8.074823e-01	7.047397e-08
CKD	8.560709e-02	0.000000e+00	1.874587e-01	1.113025e-02	3.102330e-01	7.135641e-03
O2sat.Ventilator	1.158301e-02	1.826512e-10	0.000000e+00	1.399701e-04	0.000000e+00	2.152016e-05
NEUT	2.394453e-03	1.099962e-02	3.030996e-03	3.673738e-05	0.000000e+00	9.807938e-02
NA.	NA	2.406877e-03	1.000217e-03	3.206319e-08	1.820178e-05	6.000102e-06
P	2.406877e-03	NA	6.187687e-01	3.658769e-01	7.034973e-03	1.488744e-05
FBS	1.000217e-03	6.187687e-01	NA	2.780576e-10	0.000000e+00	1.323484e-05
ESR	3.206319e-08	3.658769e-01	2.780576e-10	NA	3.768556e-01	1.945628e-01
LACTATE	1.820178e-05	7.034973e-03	0.000000e+00	3.768556e-01	NA	0.000000e+00
PROCALCITONIN	6.000102e-06	1.488744e-05	1.323484e-05	1.945628e-01	0.000000e+00	NA
Ferritin	2.408474e-05	1.335115e-02	2.226005e-09	0.000000e+00	2.712855e-01	1.495447e-01
TIBC	1.358469e-12	1.614270e-01	6.926814e-01	0.000000e+00	6.603038e-01	4.020417e-01
DDIMER	3.786660e-01	1.607470e-11	3.325486e-02	3.102618e-03	0.000000e+00	0.000000e+00
	Ferritin	TIBC	DDIMER			
Age	4.259203e-05	0.000000e+00	8.713030e-13			
Muscle.Pain	1.678209e-01	2.583994e-02	6.217249e-15			
Taste.Smell	1.281540e-03	6.195701e-02	8.990721e-02			
CKD	2.592827e-01	5.650649e-01	3.933619e-01			
O2sat.Ventilator	1.639283e-05	4.811377e-03	1.263666e-04			
NEUT	1.776357e-15	5.300422e-01	5.300683e-08			
NA.	2.408474e-05	1.358469e-12	3.786660e-01			
P	1.335115e-02	1.614270e-01	1.607470e-11			
FBS	2.226005e-09	6.926814e-01	3.325486e-02			
ESR	0.000000e+00	0.000000e+00	3.102618e-03			
LACTATE	2.712855e-01	6.603038e-01	0.000000e+00			
PROCALCITONIN	1.495447e-01	4.020417e-01	0.000000e+00			
Ferritin	NA	0.000000e+00	0.000000e+00			
TIBC	0.000000e+00	NA	6.661338e-16			
DDIMER	0.000000e+00	6.661338e-16	NA			

Supplementary Table S3

The estimated average accuracy and variance of our sixteen machine learning algorithms with 100 number of resamples were in below lists.

Accuracy

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
GLM	0.6736527	0.7072437	0.7215569	0.7221487	0.7395210	0.7634731	0
LDA	0.6736527	0.7090513	0.7234695	0.7234333	0.7408526	0.7634731	0
lasso	0.6796407	0.7120431	0.7253731	0.7264838	0.7432836	0.7611940	0
ridge	0.6776119	0.7095808	0.7223881	0.7227180	0.7365269	0.7604790	0
elastic_net	0.6805970	0.7132183	0.7253731	0.7257972	0.7410448	0.7664671	0
KNN	0.8388060	0.8776119	0.8892216	0.8893286	0.9011976	0.9221557	0
NB	0.6846847	0.7223881	0.7313433	0.7351518	0.7514970	0.7791045	0
SVM	0.8383234	0.8655711	0.8776119	0.8764105	0.8865672	0.9129129	0
CART	0.5988024	0.6649254	0.6811393	0.6802070	0.6985075	0.7253731	0
NN	0.7155689	0.7373134	0.7492537	0.7529141	0.7707257	0.8083832	0

Kappa

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
GLM	0.3460392	0.4126772	0.4433229	0.4427093	0.4772888	0.5255852	0
LDA	0.3454748	0.4157950	0.4456997	0.4450576	0.4803869	0.5256194	0
lasso	0.3580384	0.4219649	0.4496134	0.4514308	0.4843940	0.5222476	0
ridge	0.3519845	0.4167147	0.4433026	0.4435285	0.4706052	0.5201322	0
elastic_net	0.3578582	0.4243359	0.4493970	0.4499947	0.4795152	0.5316747	0
KNN	0.6782742	0.7553677	0.7786958	0.7787599	0.8024164	0.8441717	0
NB	0.3647694	0.4411057	0.4594546	0.4668493	0.4997112	0.5554639	0
SVM	0.6774793	0.7310449	0.7552358	0.7528599	0.7733565	0.8255316	0
CART	0.2030911	0.3316516	0.3616270	0.3606800	0.3967955	0.4477692	0
NN	0.4295423	0.4742659	0.4968801	0.5054105	0.5402978	0.6162711	0

Listing 1: Output of model resample statistics for base model types (GLM, LDA, lasso, ridge, elastic_net, KNN, NB, SVM, CART, NN)

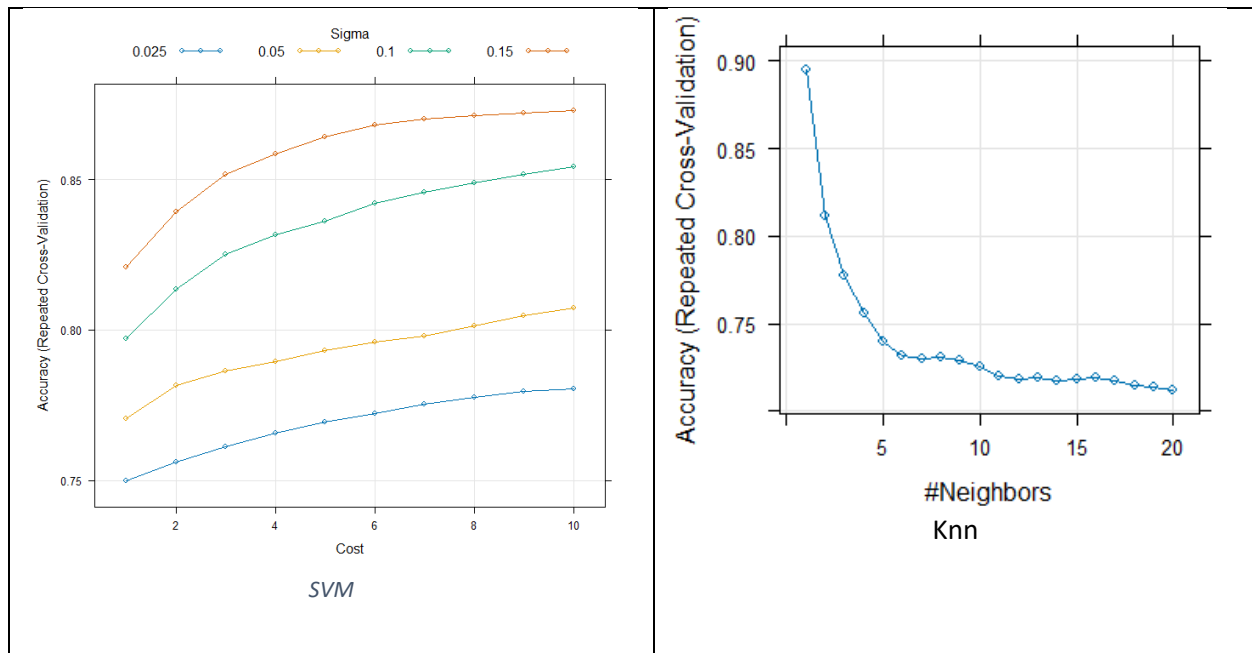
Accuracy

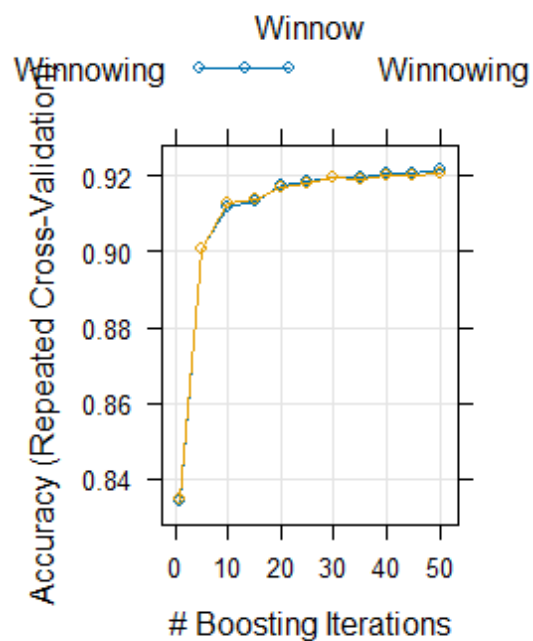
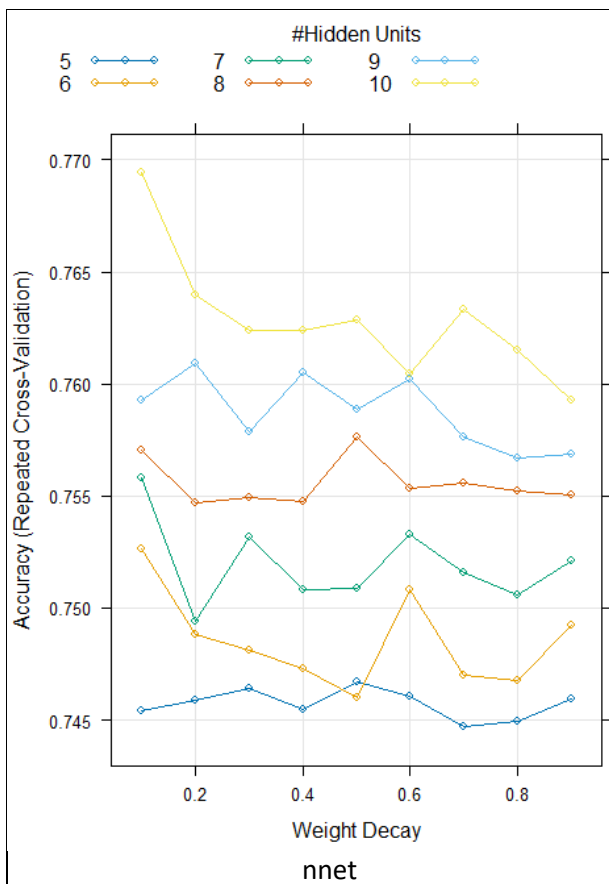
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
AdaBoost	0.8865672	0.9194030	0.9283582	0.9280748	0.9371727	0.9640719	0
C5.0	0.8862275	0.9124922	0.9223881	0.9217922	0.9341317	0.9610778	0
gbm	0.7904192	0.8353293	0.8477612	0.8487850	0.8649660	0.9044776	0
xgb	0.8802395	0.9044061	0.9134328	0.9135731	0.9222138	0.9461078	0
rf	0.8865672	0.9134328	0.9251497	0.9230751	0.9320404	0.9550898	0
treebag	0.8682635	0.8985075	0.9088212	0.9093248	0.9192220	0.9489489	0

Kappa

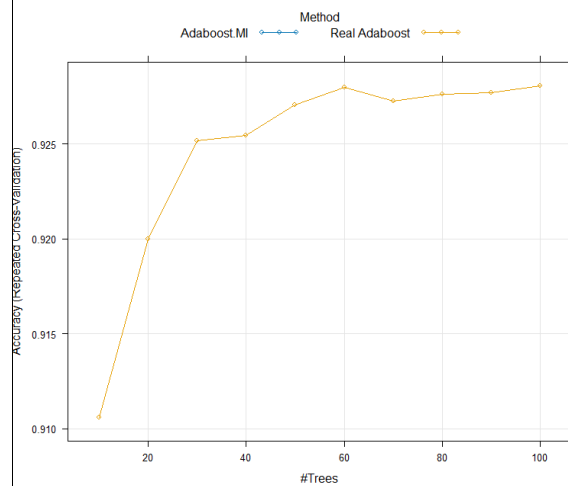
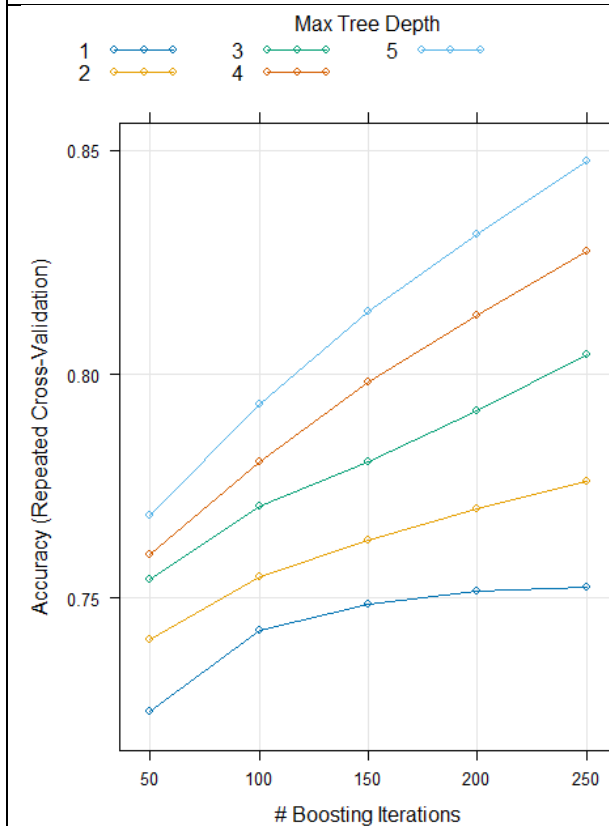
	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	NA's
AdaBoost	0.7728003	0.8386636	0.8565899	0.8560320	0.8742444	0.9280198	0
C5.0	0.7727484	0.8249712	0.8448825	0.8435788	0.8682776	0.9221054	0
gbm	0.5806579	0.6707589	0.6954328	0.6974266	0.7294522	0.8088241	0
xgb	0.7608906	0.8087176	0.8269166	0.8272662	0.8445470	0.8922156	0
rf	0.7732455	0.8268996	0.8500090	0.8461348	0.8640969	0.9102762	0
treebag	0.7370926	0.7971144	0.8176621	0.8188025	0.8385908	0.8980496	0

Listing 2: Output of model resample statistics for ensemble model types (AdaBoost, C5.0, gbm, xgb, rf, treebag)

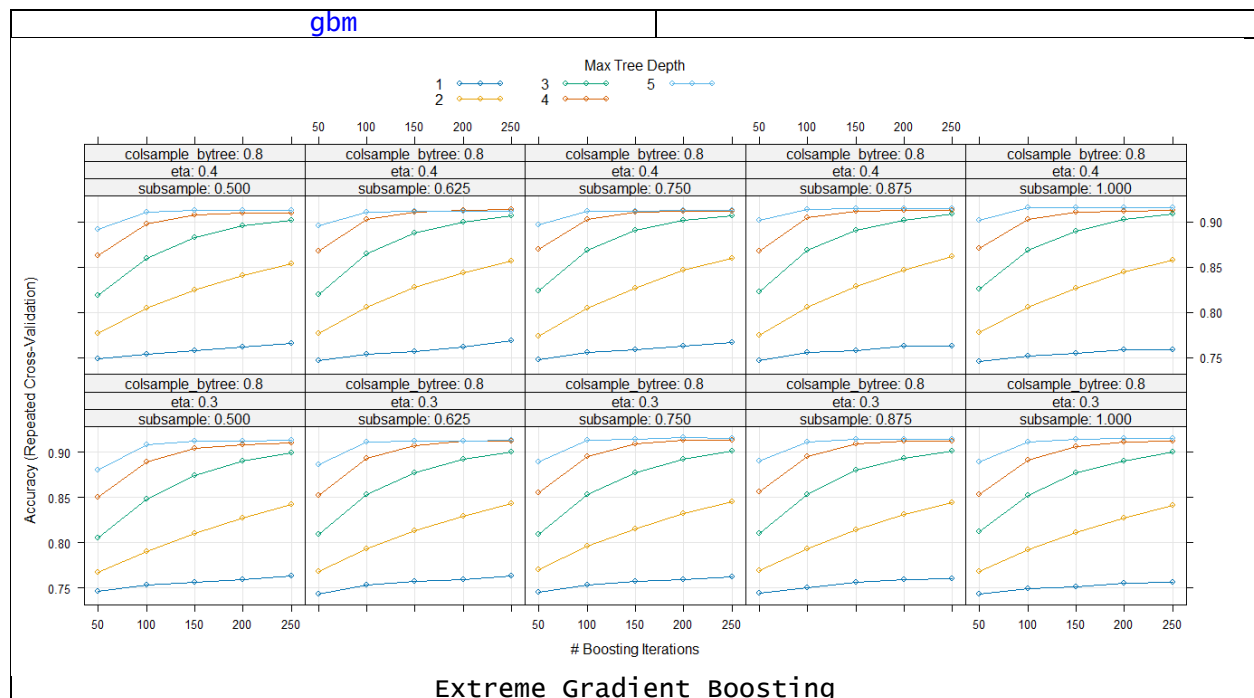




c5.0



AdaBoost



Supplementary Figure S1 Tune Parameters for selected models

Supplementary Table S4 Output of Pairwise Comparisons to Measure Agreement/Disagreement for Two Classifiers

- Disagreement measure

	predictions_glm	predictions_lda	predictions_glmnet	predictions_ridge	predictions_elastic_net	predictions_nb
predictions_glm	0.00000000	0.01116539	0.03210048	0.03000698	0.03419399	0.1584089
predictions_lda	0.01116539	0.00000000	0.02930914	0.03140265	0.03140265	0.1612003
predictions_glmnet	0.03210048	0.02930914	0.00000000	0.05233775	0.003489184	0.1681786
predictions_ridge	0.03000698	0.03140265	0.05233775	0.00000000	0.05303559	0.1451500
predictions_elastic_net	0.03419399	0.03140265	0.003489184	0.05303559	0.00000000	0.1660851
predictions_nb	0.1584089	0.16120028	0.168178646	0.14515003	0.166085136	0.0000000
predictions_rpart	0.19818562	0.19120726	0.175854850	0.21423587	0.179344033	0.2686671
predictions_knn	0.28332170	0.28332170	0.281926029	0.27983252	0.284019539	0.2644801
predictions_svm	0.24633636	0.24354501	0.244940684	0.24145150	0.245638521	0.2330775
predictions_nnet	0.17096999	0.16817865	0.177948360	0.16887648	0.181437544	0.2121424
predictions_adaboost	0.40683880	0.40823447	0.406838800	0.40334962	0.408932310	0.3949756
predictions.C5.0	0.41172366	0.41451500	0.411723657	0.41381717	0.413817167	0.4166085
predictions.gbm	0.44801117	0.44940684	0.446615492	0.44033496	0.447313329	0.4459177
predictions.xgb	0.42986741	0.43126308	0.431263084	0.42219121	0.431960921	0.4110258
predictions.rf	0.40544313	0.40963015	0.405443126	0.40893231	0.407536636	0.4187020
predictions.treebag	0.43545010	0.43684578	0.435450105	0.42637823	0.436147941	0.4305652
predictions_rpart	0.1981856	0.2833217	0.2463364	0.1709700	0.4068388	0.41172366
predictions_knn	0.1912073	0.2833217	0.2435450	0.1681786	0.4082345	0.41451500
predictions_glmnet	0.1758548	0.2819260	0.2449407	0.1779484	0.4068388	0.41172366
predictions_ridge	0.2142359	0.2798325	0.2414515	0.1688765	0.4033496	0.41381717
predictions_elastic_net	0.1793440	0.2840195	0.2456385	0.1814375	0.4089323	0.41381717
predictions_nb	0.2686671	0.2644801	0.2330775	0.2121424	0.3949756	0.41660851
predictions_rpart	0.0000000	0.3321703	0.3119330	0.2393580	0.4180042	0.43126308
predictions_knn	0.3321703	0.0000000	0.1639916	0.2742498	0.4110258	0.41451500
predictions_svm	0.3119330	0.1639916	0.0000000	0.2316818	0.3977669	0.39706909
predictions_nnet	0.2393580	0.2742498	0.2316818	0.0000000	0.4075366	0.41102582
predictions_adaboost	0.4180042	0.4110258	0.3977669	0.4075366	0.0000000	0.14584787
predictions.C5.0	0.4312631	0.4145150	0.3970691	0.4110258	0.1458479	0.00000000
predictions.gbm	0.4535939	0.4326588	0.4403350	0.4515003	0.3886950	0.40474529
predictions.xgb	0.4410328	0.4173064	0.4152128	0.4235869	0.3845080	0.40614096
predictions.rf	0.4207955	0.4096301	0.4033496	0.4103280	0.1242149	0.05792045
predictions.treebag	0.4466155	0.4145150	0.4138172	0.4333566	0.3886950	0.39357990
predictions.xgb	0.4298674	0.40544313	0.4354501			
predictions_lda	0.4312631	0.40963015	0.4368458			
predictions_glmnet	0.4312631	0.40544313	0.4354501			
predictions_ridge	0.4221912	0.40893231	0.4263782			
predictions_elastic_net	0.4319609	0.40753664	0.4361479			
predictions_nb	0.4110258	0.41870202	0.4305652			
predictions_rpart	0.4410328	0.42079553	0.4466155			
predictions_knn	0.4173064	0.40963015	0.4145150			
predictions_svm	0.4152128	0.40334962	0.4138172			
predictions_nnet	0.4235869	0.41032798	0.4333566			
predictions_adaboost	0.3845080	0.12421493	0.3886950			
predictions.C5.0	0.4061410	0.05792045	0.3935799			
predictions.gbm	0.1200279	0.39567341	0.1939986			
predictions.xgb	0.0000000	0.39986043	0.1912073			
predictions.rf	0.3998604	0.00000000	0.3942777			
predictions.treebag	0.1912073	0.39427774	0.0000000			

- Yule's or Q-statistic

Yule's coefficient serves as a quantitative measure of agreement between two raters. When its value approaches zero, it indicates a significant degree of disagreement between the two evaluators. The Q-statistic operates within the range of the correlation coefficient, defined as $-1 \leq Q \leq 1$. Thus, Q values that are closer to 1 suggest that the two measures exhibit a high level of concordance, whereas values approaching -1 indicate that the predictions made by the two models are in substantial opposition to one another. When Q values are nearer to 0, it signifies a very weak association between the two raters.

	predictions_glm	predictions_lda	predictions_glmnet	predictions_ridge	predictions_elastic_net	predictions_nb	
predictions_glm	0.000000000	0.99727411	0.997666246	0.99815525	0.99728921	0.926942351	
predictions_lda	0.99727411	0.000000000	0.998120725	0.99802377	0.99776129	0.924150381	
predictions_glmnet	0.997666246	0.998120725	0.000000000	0.99332201	0.99998287	0.912796573	
predictions_ridge	0.998155246	0.998023774	0.993322012	0.000000000	0.99320192	0.938199408	
predictions_elastic_net	0.997289212	0.997761292	0.999982868	0.99320192	0.000000000	0.916254697	
predictions_nb	0.926942351	0.924150381	0.912796573	0.93819941	0.91625470	0.000000000	
predictions_rpart	0.870089204	0.880902448	0.901890576	0.84214240	0.89733698	0.719923635	
predictions_knn	0.677959356	0.679028995	0.677845414	0.68042397	0.67326813	0.702335066	
predictions_svm	0.775742382	0.783268452	0.775240003	0.78028750	0.77499379	0.780214575	
predictions_nnet	0.907899960	0.911601129	0.898007218	0.90941995	0.89346828	0.842070630	
predictions_adaboost	0.137039315	0.132968916	0.122827251	0.12956129	0.11666941	0.077118644	
predictions_C5.0	0.138126335	0.126693400	0.126046923	0.10427534	0.11968245	-0.001210476	
predictions_gbm	0.009495444	0.004987495	0.006498195	0.02930591	0.00673884	-0.071388822	
predictions_xgb	0.046575884	0.042348257	0.026278461	0.06368707	0.02739575	0.036840106	
predictions_rf	0.162005630	0.143292252	0.149516711	0.11985338	0.14323596	-0.030820491	
predictions_treebag	0.036602717	0.032293958	0.024879635	0.06197295	0.02566296	-0.044384357	
	predictions_rpart	predictions_knn	predictions_svm	predictions_nnet	predictions_adaboost	predictions_C5.0	predictions_gbm
predictions_glm	0.870089204	0.677959356	0.77574238	0.90789996	0.13703932	0.13812633	0.009449544
predictions_lda	0.880902448	0.679028995	0.78326845	0.91160113	0.13296892	0.126693400	0.004987485
predictions_glmnet	0.901890576	0.677845414	0.77524000	0.89800722	0.12282725	0.126046923	0.006498195
predictions_ridge	0.842142401	0.680423965	0.78028750	0.90941995	0.12956129	0.104275336	0.029305913
predictions_elastic_net	0.897336984	0.673268127	0.77499379	0.89346828	0.11666941	0.119682454	0.006736840
predictions_nb	0.719923635	0.702335066	0.78021457	0.84207063	0.07711864	-0.001210476	-0.071388822
predictions_rpart	0.000000000	0.517800043	0.58613172	0.79322756	0.07916008	0.038474217	-0.015841008
predictions_knn	0.517800043	0.000000000	0.90721215	0.69736385	-0.01810865	0.012704174	0.001413721
predictions_svm	0.586931716	0.907212147	0.00000000	0.80322760	0.03213563	0.087112314	-0.061182640
predictions_nnet	0.793227562	0.697363845	0.80322760	0.00000000	0.10995760	0.122079226	-0.024413266
predictions_adaboost	0.079160077	-0.018108652	0.03213563	0.10995760	0.00000000	0.921983243	0.138049836
predictions_C5.0	0.038474217	0.012704174	0.08711231	0.12207923	0.92198324	0.000000000	0.088313184
predictions_gbm	0.015841008	0.001413721	-0.06118264	-0.02441327	0.13804984	0.088313184	0.000000000
predictions_xgb	-0.00958713	0.002592505	-0.01207389	0.05939539	0.05048068	-0.02947057	0.959358289
predictions_rf	0.084154150	0.024699554	0.03388706	0.11562497	0.94538121	0.990395668	0.125083020
predictions_treebag	-0.018550365	0.047072703	0.02764424	0.02844841	0.06553435	0.088780219	0.862889871
	predictions_xgb	predictions_rf	predictions_treebag				
predictions_glm	0.046575884	0.162005630	0.03660272				
predictions_lda	0.042348257	0.143292252	0.03229396				
predictions_glmnet	0.026278461	0.149516711	0.02487964				
predictions_ridge	0.063687069	0.119853380	0.06197295				
predictions_elastic_net	0.027395753	0.143235963	0.02566296				
predictions_nb	0.036840106	-0.030820491	-0.04438436				
predictions_rpart	-0.00958713	0.084154150	-0.01855036				
predictions_knn	0.002592505	0.004961958	0.04707270				
predictions_svm	-0.012073888	0.033887059	0.02764424				
predictions_nnet	0.059395594	0.115624967	0.02844841				
predictions_adaboost	0.050480679	0.945381211	0.06553435				
predictions_C5.0	-0.02947057	0.990395668	0.08878022				
predictions_gbm	0.059358289	0.125083020	0.86288987				
predictions_xgb	0.000000000	0.004961958	0.04707270				
predictions_rf	-0.004961958	0.000000000	0.06751431				
predictions_treebag	0.857362789	0.067514310	0.00000000				

- Cohen's statistic

Cohen's statistic is a metric that evaluates the probability of agreement between two classifiers attributable to chance or coincidence. Cohen's kappa can assume negative values, indicating varying degrees of agreement. A kappa value of 1 signifies complete agreement between the classifiers, while a value of 0 suggests that the observed agreement is solely due to chance. Conversely, a negative value indicates that the level of agreement is less than what would be anticipated by random chance.

	predictions_glm	predictions_lda	predictions_glmnet	predictions_ridge	predictions_elastic_net	predictions_nb	
predictions_glm	0.000000000	0.975792539	0.930107641	0.93447081	0.925644287	0.645912863	
predictions_lda	0.975792539	0.000000000	0.936241618	0.93148575	0.931773529	0.6400957648	
predictions_glmnet	0.930107641	0.936241618	0.000000000	0.88528426	0.992386172	0.6223020835	
predictions_ridge	0.934470808	0.931485745	0.885284257	0.000000000	0.883914924	0.6726693682	
predictions_elastic_net	0.925644287	0.931773529	0.992386172	0.88391492	0.000000000	0.6726621760	
predictions_nb	0.645912864	0.640095765	0.622302084	0.67266937	0.672662176	0.000000000	
predictions_rpart	0.570315765	0.585794460	0.617449707	0.53258053	0.610351041	0.4001596081	
predictions_knn	0.366975092	0.367113960	0.367135267	0.36924286	0.363556604	0.3842484833	
predictions_svm	0.445985537	0.452942753	0.446374068	0.45186589	0.445834331	0.4523387243	
predictions_nnet	0.626954165	0.633773389	0.610313368	0.62899716	0.603214497	0.5221593826	
predictions_adaboost	0.056846238	0.055110522	0.050819786	0.05366936	0.048216095	0.0313011325	
predictions_C5.0	0.059571136	0.054535155	0.054210061	0.04463552	0.051428769	-0.0005005421	
predictions_gbm	0.004223456	0.002229396	0.002896332	0.01306493	0.003006546	-0.0306092014	
predictions_xgb	0.019877197	0.018066545	0.011170190	0.02718821	0.011652562	0.0153891201	
predictions_rf	0.069350503	0.061122874	0.063833639	0.05085393	0.061086927	-0.0125491083	
predictions_treebag	0.015911517	0.014035620	0.010781713	0.02695221	0.011129452	-0.0186081020	
	predictions_rpart	predictions_knn	predictions_svm	predictions_nnet	predictions_adaboost	predictions_C5.0	predictions_gbm
predictions_glm	0.5703157646	0.3669750924	0.445985537	0.62695416	0.056846238	0.0595711359	0.0042234557
predictions_lda	0.5857944596	0.3671139597	0.452942753	0.63377339	0.055110522	0.0545351549	0.0022293965
predictions_glmnet	0.6174497071	0.3671352675	0.446374068	0.61031337	0.050819786	0.0542100612	0.0028963322
predictions_ridge	0.5325805283	0.3692428605	0.451865888	0.62899716	0.053669360	0.0446355193	0.0130649328
predictions_elastic_net	0.6103510407	0.3635566041	0.445834331	0.60321450	0.048216095	0.0514287692	0.0030065460
predictions_nb	0.4001596081	0.3842484833	0.452338724	0.52215938	0.031301132	-0.0005005421	-0.0306092014
predictions_rpart	0.0000000000	0.2586991251	0.299327824	0.322497882	0.032497882	0.0163345551	-0.0070666029
predictions_knn	0.2586991251	0.0000000000	0.614919297	0.38255445	-0.007217279	0.0052681399	0.0006119208
predictions_svm	0.2993278239	0.6149192972	0.000000000	0.47470326	0.012851625	0.0363739504	-0.0259999614
predictions_nnet	0.4782093133	0.3825544488	0.474703265	0.000000000	0.045379363	0.0524370050	-0.0108283845
predictions_adaboost	0.0324978823	-0.0072172785	0.012851625	0.04537936	0.000000000	0.6269526020	0.0569973713
predictions_C5.0	0.0163345551	0.0052681399	0.036373950	0.05243700	0.626952602	0.000000000	0.0373126203
predictions_gbm	-0.0070666029	-0.0006119208	-0.025999961	-0.01082838	0.056997371	0.0373126203	0.000000000
predictions_xgb	-0.0041779024	0.0010771013	-0.004964505	-0.01082838	0.019944120	-0.0091940059	0.7151903269
predictions_rf	0.0355316748	0.0101576483	0.013863252	0.04903120	0.079194975	0.8543936302	0.0526984031
predictions_treebag	-0.0080147017	0.0200276768	0.011624134	0.01231974	0.026265354	0.0368659640	0.5450617016

	predictions.xgb	predictions.rf	predictions.treebag
predictions.glm	0.019877197	0.069350503	0.015911517
predictions_lda	0.018066545	0.061122874	0.014035620
predictions_glmnet	0.011170190	0.063833639	0.010781713
predictions_ridge	0.027188214	0.050853933	0.026952207
predictions_elastic_net	0.011652562	0.061086927	0.011129452
predictions_nb	0.015389120	-0.012549108	-0.018608102
predictions_rpart	-0.004177902	0.035531675	-0.008014702
predictions_knn	0.001077101	0.010157648	0.020027677
predictions_svm	-0.004964505	0.013863258	0.011624134
predictions_nnet	0.025348114	0.049031204	0.012319741
predictions.adaboost	0.019944120	0.679194975	0.026265354
predictions.C5.0	-0.009194006	0.854393630	0.036865964
predictions.gbm	0.715190327	0.052698403	0.545061702
predictions.xgb	0.000000000	-0.001976842	0.533404476
predictions.rf	-0.001976842	0.000000000	0.027650843
predictions.treebag	0.533404476	0.027650843	0.000000000

- Double-fault measure

The Double_Fault measure quantifies the disagreement between two sets of predictions. A Double_Fault value of 1 would mean that the two sets of predictions completely disagree with each other. This means that for every observation, if one prediction is correct, the other one is incorrect. Conversely, a Double_Fault value of 0 would indicate perfect agreement between the two sets of predictions, meaning that they are identical. When the Double_Fault value is above 0.8, it suggests that the two sets of predictions are significantly different and disagree on a large number of observations.

	predictions.glm	predictions_lda	predictions_glmnet	predictions_ridge	predictions_elastic_net	predictions_nb
predictions.glm	0.0000000	0.8569435	0.8527565	0.8534543	0.8527565	0.8387997
predictions_lda	0.8569435	0.0000000	0.8527565	0.8527565	0.8527565	0.8381019
predictions_glmnet	0.8527565	0.8527565	0.0000000	0.8499651	0.8534543	0.8353105
predictions_ridge	0.8534543	0.8527565	0.8499651	0.0000000	0.8499651	0.8381019
predictions_elastic_net	0.8527565	0.8527565	0.8534543	0.8499651	0.0000000	0.8353105
predictions_nb	0.8387997	0.8381019	0.8353105	0.8381019	0.8353105	0.0000000
predictions_rpart	0.8374040	0.8374040	0.8353105	0.8339149	0.8353105	0.8248430
predictions_knn	0.8248430	0.8241452	0.8227495	0.8241452	0.8227495	0.8227495
predictions_svm	0.8262387	0.8255408	0.8234473	0.8262387	0.8234473	0.8262387
predictions_nnet	0.8394976	0.8381019	0.8360084	0.8387997	0.8360084	0.8318214
predictions.adaboost	0.8251222	0.8025122	0.8018144	0.8004187	0.8018144	0.8004187
predictions.C5.0	0.8087927	0.8080949	0.8066992	0.8066992	0.8066992	0.8046057
predictions.gbm	0.8164689	0.8157711	0.8143754	0.8150733	0.8143754	0.8094906
predictions.xgb	0.8108863	0.8101884	0.8080949	0.8094906	0.8080949	0.8073971
predictions.rf	0.8101884	0.8094906	0.8080949	0.8080949	0.8080949	0.8066992
predictions.treebag	0.8073971	0.8073971	0.8066992	0.8073971	0.8066992	0.8025122
predictions_rpart	0.8374040	0.8248430	0.8262387	0.8394976	0.8025122	0.8087927
predictions_lda	0.8374040	0.8241452	0.8255408	0.8381019	0.8025122	0.8157711
predictions_glmnet	0.8353105	0.8227495	0.8234473	0.8360084	0.8018144	0.8143754
predictions_ridge	0.8339149	0.8241452	0.8262387	0.8387997	0.8004187	0.8150733
predictions_elastic_net	0.8353105	0.8227495	0.8234473	0.8360084	0.8018144	0.8143754
predictions_nb	0.8248430	0.8227495	0.8262387	0.8318214	0.8004187	0.8094906
predictions_rpart	0.0000000	0.8192603	0.8164689	0.8304257	0.8039079	0.8094906
predictions_knn	0.8192603	0.0000000	0.8339149	0.8276343	0.7990230	0.8060014
predictions_svm	0.8164689	0.8339149	0.0000000	0.8290300	0.7990230	0.8080949
predictions_nnet	0.8304257	0.8276343	0.8290300	0.0000000	0.8018144	0.8108863
predictions.adaboost	0.8039079	0.7990230	0.7990230	0.8018144	0.0000000	0.8039079
predictions.C5.0	0.8094906	0.8060014	0.8060014	0.8080949	0.8227495	0.8046057
predictions.gbm	0.8143754	0.8115841	0.8080949	0.8108863	0.8039079	0.0000000
predictions.xgb	0.8108863	0.8066992	0.8046057	0.8087927	0.7997209	0.8450803
predictions.rf	0.8087927	0.8066992	0.8053036	0.8073971	0.8241452	0.8066992
predictions.treebag	0.8053036	0.8066992	0.8039079	0.8039079	0.7990230	0.8325192
predictions.xgb	0.8101884	0.8094906	0.8073971	0.8066992	0.8025122	0.8011165
predictions_lda	0.8101884	0.8080949	0.8080949	0.8066992	0.8025122	0.8011165
predictions_glmnet	0.8080949	0.8080949	0.8080949	0.8066992	0.8025122	0.8011165
predictions_ridge	0.8094906	0.8080949	0.8080949	0.8066992	0.8025122	0.8011165
predictions_elastic_net	0.8080949	0.8080949	0.8080949	0.8066992	0.8025122	0.8011165
predictions_nb	0.8073971	0.8066992	0.8066992	0.8025122	0.8025122	0.8011165
predictions_rpart	0.8108863	0.8087927	0.8053036	0.8039079	0.8039079	0.8039079
predictions_knn	0.8066992	0.8066992	0.8066992	0.8039079	0.8039079	0.8039079
predictions_svm	0.8046057	0.8053036	0.8039079	0.8039079	0.8039079	0.8039079
predictions_nnet	0.8087927	0.8073971	0.8039079	0.8039079	0.8039079	0.8039079
predictions.adaboost	0.7997209	0.8241452	0.7990230	0.8011165	0.8011165	0.8011165
predictions.C5.0	0.7997209	0.8429867	0.825192	0.825192	0.825192	0.825192
predictions.gbm	0.8450803	0.8066992	0.8269365	0.8269365	0.8269365	0.8269365
predictions.xgb	0.0000000	0.8025122	0.8018144	0.0000000	0.0000000	0.0000000
predictions.rf	0.8025122	0.0000000	0.8018144	0.0000000	0.0000000	0.0000000
predictions.treebag	0.8269365	0.8018144	0.0000000	0.0000000	0.0000000	0.0000000

Supplementary Table S5 Feature importance analysis results

	feature	importance.05	importance	importance.95	permutation.error
1	Age	1.8729017	1.8992806	1.930456	0.2367713
2	NEUT	1.3098321	1.3453237	1.347242	0.1677130
3	P	1.2954436	1.3165468	1.325659	0.1641256
4	Ferritin	1.2115108	1.2685851	1.276259	0.1581465
5	O2sat.Ventilator	1.2258993	1.2374101	1.246043	0.1542601
6	LACTATE	1.1405276	1.1870504	1.217746	0.1479821
7	PROCALCITONIN	1.1539568	1.1558753	1.183213	0.1440957
8	DDIMER	1.1438849	1.1462830	1.159712	0.1428999
9	TIBC	1.1103118	1.1294964	1.135731	0.1408072
10	FBS	1.1223022	1.1270983	1.164508	0.1405082
11	Muscle.Pain	1.0700240	1.0791367	1.085851	0.1345291
12	ESR	1.0724221	1.0791367	1.099760	0.1345291
13	NA.	1.0201439	1.0503597	1.061391	0.1309417
14	Taste.Smell	0.9942446	1.0000000	1.001918	0.1246637
15	CKD	0.9928058	0.9952038	1.000000	0.1240658

Supplementary Table S6 Interaction effects of several clinical features with age on survival outcomes

	.feature	.class	.interaction
	<char>	<fctr>	<num>
1:	Muscle.Pain:Age	Alive	0.107484003
2:	Muscle.Pain:Age	Dead	0.107484003
3:	Taste.Smell:Age	Alive	0.048351279
4:	Taste.Smell:Age	Dead	0.048351279
5:	CKD:Age	Alive	0.004719824
6:	CKD:Age	Dead	0.004719824
7:	O2sat.Ventilator:Age	Alive	0.177557098
8:	O2sat.Ventilator:Age	Dead	0.177557098
9:	NEUT:Age	Alive	0.213951655
10:	NEUT:Age	Dead	0.213951655
11:	NA.:Age	Alive	0.100106824
12:	NA.:Age	Dead	0.100106824
13:	P:Age	Alive	0.220256603
14:	P:Age	Dead	0.220256603
15:	FBS:Age	Alive	0.116707323
16:	FBS:Age	Dead	0.116707323
17:	ESR:Age	Alive	0.110493978

18:	ESR:Age	Dead	0.110493978
19:	LACTATE:Age	Alive	0.138187846
20:	LACTATE:Age	Dead	0.138187846
21:	PROCALCITONIN:Age	Alive	0.121031985
22:	PROCALCITONIN:Age	Dead	0.121031985
23:	Ferritin:Age	Alive	0.200644927
24:	Ferritin:Age	Dead	0.200644927
25:	TIBC:Age	Alive	0.153809914
26:	TIBC:Age	Dead	0.153809914
27:	DDIMER:Age	Alive	0.132547047
28:	DDIMER:Age	Dead	0.132547047
	.feature	.class	.interaction

Supplementary Table S7 The SHAP values

	feature	class	phi	phi.var	feature.value
1	Muscle.Pain	Alive	0.00	0.00000000	Muscle.Pain=No
2	Taste.Smell	Alive	0.00	0.00000000	Taste.Smell=No
3	CKD	Alive	0.00	0.00000000	CKD=No
4	Age	Alive	0.18	0.15061224	Age=-0.346153846153846
5	o2sat.Ventilator	Alive	0.02	0.02000000	o2sat.Ventilator=0.166666666666667
6	NEUT	Alive	0.08	0.07510204	NEUT=-0.967741935483871
7	NA.	Alive	0.08	0.07510204	NA.=0.333333333333333
8	P	Alive	0.04	0.03918367	P=-0.166666679912144
9	FBS	Alive	0.00	0.00000000	FBS=0.574468085106383
10	ESR	Alive	0.00	0.00000000	ESR=-0.333333333333333
11	LACTATE	Alive	-0.02	0.02000000	LACTATE=0.471042507437369
12	PROCALCITONIN	Alive	0.02	0.02000000	PROCALCITONIN=0.249999986370889
13	Ferritin	Alive	0.00	0.00000000	Ferritin=-0.224914434725919
14	TIBC	Alive	0.04	0.08000000	TIBC=0.927007299270073
15	DDIMER	Alive	0.00	0.00000000	DDIMER=0.669709543568465
16	Muscle.Pain	Dead	0.00	0.00000000	Muscle.Pain=No
17	Taste.Smell	Dead	0.00	0.00000000	Taste.Smell=No
18	CKD	Dead	0.00	0.00000000	CKD=No
19	Age	Dead	-0.18	0.15061224	Age=-0.346153846153846
20	o2sat.Ventilator	Dead	-0.02	0.02000000	o2sat.Ventilator=0.166666666666667
21	NEUT	Dead	-0.08	0.07510204	NEUT=-0.967741935483871
22	NA.	Dead	-0.08	0.07510204	NA.=0.333333333333333
23	P	Dead	-0.04	0.03918367	P=-0.166666679912144
24	FBS	Dead	0.00	0.00000000	FBS=0.574468085106383
25	ESR	Dead	0.00	0.00000000	ESR=-0.333333333333333

26	LACTATE	Dead	0.02	0.02000000	LACTATE=0.471042507437369
27	PROCALCITONIN	Dead	-0.02	0.02000000	PROCALCITONIN=0.249999986370889
28	Ferritin	Dead	0.00	0.00000000	Ferritin=-0.224914434725919
29	TIBC	Dead	-0.04	0.08000000	TIBC=0.927007299270073
30	DDIMER	Dead	0.00	0.00000000	DDIMER=0.669709543568465