=== Run information ===

Scheme: weka.classifiers.bayes.BayesNet -D -Q weka.classifiers.bayes.net.search.local.K2 -- -P 1 -S BAYES -E weka.classifiers.bayes.net.estimate.SimpleEstimator -- -A 0.5

Relation: cleveland-14-heart-disease-weka.filters.supervised.attribute.Discretize-Rfirst-last-precision6

Instances: 303

Attributes: 14

age

sex

cp

trestbps

chol

fbs

restecg

thalach

exang

oldpeak

slope

ca

thal

num

Test mode: split 80.0% train, remainder test

=== Classifier model (full training set) ===

Bayes Network Classifier

not using ADTree

#attributes=14 #classindex=13

Network structure (nodes followed by parents)

age(2): num

sex(2): num

cp(4): num

trestbps(1): num

chol(1): num

fbs(2): num

restecg(3): num

thalach(2): num

exang(2): num

oldpeak(2): num

slope(3): num

ca(2): num

thal(3): num

num(5):

LogScore Bayes: -2464.033252335542

LogScore BDeu: -2643.529380000129

LogScore MDL: -2693.6119414566356

LogScore ENTROPY: -2453.635163625241

LogScore AIC: -2537.635163625242

Time taken to build model: 0.03 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0.01 seconds

=== Summary ===

Correctly Classified Instances 52 85.2459 %

Incorrectly Classified Instances 9 14.7541 %

Kappa statistic 0.7047

Mean absolute error 0.0707

Root mean squared error 0.2098

Relative absolute error 35.1103 %

Root relative squared error 66.3406 %

Total Number of Instances 61

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

0.844 0.138 0.871 0.844 0.857 0.705 0.927 0.898 <50

0.862 0.156 0.833 0.862 0.847 0.705 0.928 0.944 >50\_1

? 0.000 ? ? ? ? ? ? >50\_2

? 0.000 ? ? ? ? ? ? >50\_3

? 0.000 ? ? ? ? ? ? >50\_4

Weighted Avg. 0.852 0.147 0.853 0.852 0.853 0.705 0.928 0.920

=== Confusion Matrix ===

a b c d e <-- classified as

27 5 0 0 0 | a = <50

4 25 0 0 0 | b = >50\_1

0 0 0 0 0 | c = >50\_2

0 0 0 0 0 | d = >50\_3

0 0 0 0 0 | e = >50\_4

MLT WITH 1.89 LEARNING RATE

=== Run information ===

Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.189 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a

Relation: cleveland-14-heart-disease-weka.filters.supervised.attribute.Discretize-Rfirst-last-precision6

Instances: 303

Attributes: 14

age

sex

cp

trestbps

chol

fbs

restecg

thalach

exang

oldpeak

slope

ca

thal

num

Test mode: split 80.0% train, remainder test

=== Classifier model (full training set) ===

Sigmoid Node 0

Inputs Weights

Threshold -0.5502597236570271

Node 5 3.121522680873923

Node 6 4.8403858945374925

Node 7 3.5749979498417486

Node 8 -3.4694653681512877

Node 9 -2.9284177839391394

Node 10 -2.7668394222144745

Node 11 3.3304379517632143

Node 12 5.131977993216974

Node 13 3.8358687204309843

Node 14 -4.496863110445306

Node 15 3.5339910686741076

Node 16 -3.68909135976302

Node 17 -5.824678286217735

Sigmoid Node 1

Inputs Weights

Threshold 0.5511838550267039

Node 5 -3.119884581751837

Node 6 -4.840533334601941

Node 7 -3.572850261599612

Node 8 3.468719291360612

Node 9 2.9287730450042386

Node 10 2.761083713103622

Node 11 -3.3283909557983202

Node 12 -5.132895774300037

Node 13 -3.8364378441300784

Node 14 4.4970526936816375

Node 15 -3.5359143500660055

Node 16 3.6920757473990453

Node 17 5.825113461579564

Sigmoid Node 2

Inputs Weights

Threshold -1.5669767639554137

Node 5 -0.956855276190876

Node 6 -0.8499923207125121

Node 7 -0.7071130495553068

Node 8 -0.6159803389731539

Node 9 -0.7410721928714596

Node 10 -0.6847253177135085

Node 11 -0.9939937378886022

Node 12 -0.7826547432251147

Node 13 -0.7462175442286673

Node 14 -0.7014985499606643

Node 15 -0.7407893340885227

Node 16 -0.6107921677305178

Node 17 -0.7049095867562638

Sigmoid Node 3

Inputs Weights

Threshold -1.628636422453454

Node 5 -0.8664715399943517

Node 6 -0.8156899566899856

Node 7 -0.7078841450427223

Node 8 -0.6836415907519244

Node 9 -0.692626623516739

Node 10 -0.6616115586792203

Node 11 -1.0164698477531335

Node 12 -0.8033526720029881

Node 13 -0.7225639498247712

Node 14 -0.655494594047606

Node 15 -0.7707371587541684

Node 16 -0.6264079900010167

Node 17 -0.7163268763215926

Sigmoid Node 4

Inputs Weights

Threshold -1.6019247593200092

Node 5 -0.913359095451297

Node 6 -0.8646723451995376

Node 7 -0.7472918967225161

Node 8 -0.6215065294681393

Node 9 -0.6482862429073863

Node 10 -0.7204654556159169

Node 11 -1.0048873643967775

Node 12 -0.7827652300009739

Node 13 -0.7643576759831562

Node 14 -0.6554694133738912

Node 15 -0.7426269348307548

Node 16 -0.6541520227021054

Node 17 -0.6941692962092987

Sigmoid Node 5

Inputs Weights

Threshold 0.4589576378681835

Attrib age='(54.5-inf)' 2.8564007494230284

Attrib sex=male -0.06938447159264972

Attrib cp=typ\_angina 0.8989952263670768

Attrib cp=asympt -3.517468720867666

Attrib cp=non\_anginal 2.038183346141979

Attrib cp=atyp\_angina -0.36670256583630056

Attrib trestbps 0.007574859833005064

Attrib chol -0.01056068188326631

Attrib fbs=f 1.1513872765668203

Attrib restecg=left\_vent\_hyper -0.00712351097879922

Attrib restecg=normal 0.39700383376115267

Attrib restecg=st\_t\_wave\_abnormality -0.9221371220014668

Attrib thalach='(147.5-inf)' 0.7956575817621927

Attrib exang=yes -0.10459694077635166

Attrib oldpeak='(1.7-inf)' -0.08656812329147225

Attrib slope=up 0.8435936731170555

Attrib slope=flat 0.5276147923804813

Attrib slope=down -1.841212927921114

Attrib ca='(0.5-inf)' -2.9341823243030456

Attrib thal=fixed\_defect -0.6171073309928662

Attrib thal=normal 1.7376898463961847

Attrib thal=reversable\_defect -1.809229745134956

Sigmoid Node 6

Inputs Weights

Threshold 0.9685676102085152

Attrib age='(54.5-inf)' 0.6227009095490782

Attrib sex=male -1.1096078233420554

Attrib cp=typ\_angina 1.7743026514211535

Attrib cp=asympt -1.1524626558600943

Attrib cp=non\_anginal -1.7096224837313927

Attrib cp=atyp\_angina -0.930505693674628

Attrib trestbps -0.033153940274708735

Attrib chol -0.012171262832913053

Attrib fbs=f 1.6268544981847923

Attrib restecg=left\_vent\_hyper -1.906651751225643

Attrib restecg=normal 2.142158257707002

Attrib restecg=st\_t\_wave\_abnormality -1.193745599165336

Attrib thalach='(147.5-inf)' -1.1573577063672957

Attrib exang=yes 2.2057584067205256

Attrib oldpeak='(1.7-inf)' -0.8208845659454611

Attrib slope=up 0.07536637824258877

Attrib slope=flat 0.1726164386007769

Attrib slope=down -1.215305413626343

Attrib ca='(0.5-inf)' -1.838775674593225

Attrib thal=fixed\_defect -1.3147091966999627

Attrib thal=normal 0.33977603767786474

Attrib thal=reversable\_defect -0.027633945419640715

Sigmoid Node 7

Inputs Weights

Threshold -0.1331454014480067

Attrib age='(54.5-inf)' -0.23087822164236424

Attrib sex=male 0.8844937919458293

Attrib cp=typ\_angina 0.33371366457689944

Attrib cp=asympt 0.25424604079367635

Attrib cp=non\_anginal -1.333526139143999

Attrib cp=atyp\_angina 1.0337371518986533

Attrib trestbps -0.012826103117104248

Attrib chol 0.0026255691493604766

Attrib fbs=f -0.9707319996800486

Attrib restecg=left\_vent\_hyper 0.3018088029933794

Attrib restecg=normal -0.09018814376225552

Attrib restecg=st\_t\_wave\_abnormality 0.004026829307241178

Attrib thalach='(147.5-inf)' -1.7639223088682836

Attrib exang=yes 0.12125356197494978

Attrib oldpeak='(1.7-inf)' 1.9231706937256081

Attrib slope=up -0.6634730794760295

Attrib slope=flat 0.7544078691784881

Attrib slope=down 0.03939697934637287

Attrib ca='(0.5-inf)' 1.7864474527721694

Attrib thal=fixed\_defect 0.30252177225227006

Attrib thal=normal -0.24760465817301613

Attrib thal=reversable\_defect 0.09087666954289753

Sigmoid Node 8

Inputs Weights

Threshold 0.05157498885814458

Attrib age='(54.5-inf)' -0.5255614671678858

Attrib sex=male -0.5204938605449831

Attrib cp=typ\_angina 0.8200811689736247

Attrib cp=asympt -1.7573955854352457

Attrib cp=non\_anginal -1.455330263236091

Attrib cp=atyp\_angina 2.1325395918485177

Attrib trestbps -0.026535141732882184

Attrib chol -0.049598636781153366

Attrib fbs=f 1.1085297030465466

Attrib restecg=left\_vent\_hyper -0.8964304177101002

Attrib restecg=normal 0.7697411352284408

Attrib restecg=st\_t\_wave\_abnormality 0.0306962076674603

Attrib thalach='(147.5-inf)' -2.0088934875099986

Attrib exang=yes 1.2831803180257773

Attrib oldpeak='(1.7-inf)' -0.45870203960130984

Attrib slope=up -0.15950712410691992

Attrib slope=flat 0.04438776904552869

Attrib slope=down -0.03767088199384382

Attrib ca='(0.5-inf)' 0.5602393328373194

Attrib thal=fixed\_defect -0.9431860621712796

Attrib thal=normal 1.8967643588105307

Attrib thal=reversable\_defect -1.0641357977999704

Sigmoid Node 9

Inputs Weights

Threshold 0.445520533836063

Attrib age='(54.5-inf)' 0.7770554440782858

Attrib sex=male 2.8884630607224584

Attrib cp=typ\_angina 0.31012157272080926

Attrib cp=asympt -1.0346827498132203

Attrib cp=non\_anginal 0.26263228896514124

Attrib cp=atyp\_angina -0.48835983370791103

Attrib trestbps 0.0038427644862212076

Attrib chol -0.04653936512939604

Attrib fbs=f 2.0933093455670364

Attrib restecg=left\_vent\_hyper 0.4461197808767434

Attrib restecg=normal -0.5890779423103438

Attrib restecg=st\_t\_wave\_abnormality -0.26507102554990036

Attrib thalach='(147.5-inf)' 0.25475405962424214

Attrib exang=yes 2.47029330769985

Attrib oldpeak='(1.7-inf)' -0.11908932821019991

Attrib slope=up -0.5023696302194226

Attrib slope=flat 0.8372155095014178

Attrib slope=down -0.8127966195942516

Attrib ca='(0.5-inf)' 0.29706826401913833

Attrib thal=fixed\_defect -1.0061725724493107

Attrib thal=normal -0.6033826741122733

Attrib thal=reversable\_defect 1.2737170768102988

Sigmoid Node 10

Inputs Weights

Threshold 0.8179646190881982

Attrib age='(54.5-inf)' 1.4081321769350303

Attrib sex=male 0.9995205265355326

Attrib cp=typ\_angina -0.3954600273245496

Attrib cp=asympt 1.342737863714497

Attrib cp=non\_anginal -2.312826275437357

Attrib cp=atyp\_angina -0.2002544173377185

Attrib trestbps -0.014505574274310422

Attrib chol 0.028683279238420137

Attrib fbs=f 1.012601016055525

Attrib restecg=left\_vent\_hyper 0.6615784468773184

Attrib restecg=normal -0.7847868835100604

Attrib restecg=st\_t\_wave\_abnormality -0.6720232926452308

Attrib thalach='(147.5-inf)' -1.733020818724154

Attrib exang=yes -0.3813154180482525

Attrib oldpeak='(1.7-inf)' 0.930529976822271

Attrib slope=up -0.5321718344471393

Attrib slope=flat 0.18226854390938002

Attrib slope=down -0.4177490745828873

Attrib ca='(0.5-inf)' 1.3214207728009837

Attrib thal=fixed\_defect -0.9274848886953129

Attrib thal=normal -0.43746466260464517

Attrib thal=reversable\_defect 0.6849469863624662

Sigmoid Node 11

Inputs Weights

Threshold 0.12552130457648045

Attrib age='(54.5-inf)' -0.3950488624079735

Attrib sex=male 1.58386901252319

Attrib cp=typ\_angina 1.9281729272829877

Attrib cp=asympt -0.9110768617673559

Attrib cp=non\_anginal -0.8459839087532723

Attrib cp=atyp\_angina -0.4077883598281588

Attrib trestbps -0.018993494992989125

Attrib chol -0.02286921650873627

Attrib fbs=f 1.9192813646770215

Attrib restecg=left\_vent\_hyper 0.93913895966277

Attrib restecg=normal -0.7298325016919576

Attrib restecg=st\_t\_wave\_abnormality -0.29314899222439156

Attrib thalach='(147.5-inf)' -0.4325723304465394

Attrib exang=yes -2.1877880789791124

Attrib oldpeak='(1.7-inf)' -4.23031114207742

Attrib slope=up 2.3458036317710396

Attrib slope=flat -2.029221398762221

Attrib slope=down -0.46717280099770037

Attrib ca='(0.5-inf)' -2.2437855891485823

Attrib thal=fixed\_defect 0.533949340846385

Attrib thal=normal -0.20976534365499752

Attrib thal=reversable\_defect -0.5764494478646576

Sigmoid Node 12

Inputs Weights

Threshold -0.3219308777390438

Attrib age='(54.5-inf)' 0.8881404889676354

Attrib sex=male -0.9106308809325766

Attrib cp=typ\_angina 2.4121842980073707

Attrib cp=asympt -1.9389533887519248

Attrib cp=non\_anginal 1.3574375241366137

Attrib cp=atyp\_angina -1.2542411677793142

Attrib trestbps 0.03374548634922726

Attrib chol 0.022170424091406446

Attrib fbs=f 2.9467353041135818

Attrib restecg=left\_vent\_hyper -0.42638604241626576

Attrib restecg=normal 0.600116266197374

Attrib restecg=st\_t\_wave\_abnormality 0.05006254228862836

Attrib thalach='(147.5-inf)' -1.7662520683774405

Attrib exang=yes -1.6742656082583431

Attrib oldpeak='(1.7-inf)' -0.12209565929959518

Attrib slope=up 1.8437410071230522

Attrib slope=flat 0.45715843174505766

Attrib slope=down -1.9298837063304082

Attrib ca='(0.5-inf)' -4.36246322719384

Attrib thal=fixed\_defect -0.860958755874267

Attrib thal=normal 1.6013299872235467

Attrib thal=reversable\_defect -0.5608754484955267

Sigmoid Node 13

Inputs Weights

Threshold -0.7925814371743686

Attrib age='(54.5-inf)' 1.0790546895076927

Attrib sex=male -0.5241851270335821

Attrib cp=typ\_angina 0.36380875022958226

Attrib cp=asympt 0.9277454151593841

Attrib cp=non\_anginal -0.4499738339634146

Attrib cp=atyp\_angina 0.7617370994925177

Attrib trestbps 0.01707815148496379

Attrib chol -0.00805042357777367

Attrib fbs=f -1.4461818794671648

Attrib restecg=left\_vent\_hyper -0.7941291658579825

Attrib restecg=normal 0.9379261697332749

Attrib restecg=st\_t\_wave\_abnormality 0.5952177137042652

Attrib thalach='(147.5-inf)' -0.8276842839207964

Attrib exang=yes -2.4158545817219688

Attrib oldpeak='(1.7-inf)' 1.346079988662443

Attrib slope=up -0.19210823105089636

Attrib slope=flat 0.6541472459005033

Attrib slope=down 0.3654142920482637

Attrib ca='(0.5-inf)' 0.5162198319375899

Attrib thal=fixed\_defect 0.6486240084920988

Attrib thal=normal -0.5512852817096087

Attrib thal=reversable\_defect 0.6118284749208209

Sigmoid Node 14

Inputs Weights

Threshold 0.6936451932091545

Attrib age='(54.5-inf)' 2.6139842503592114

Attrib sex=male 1.2350994408680513

Attrib cp=typ\_angina -2.419155601437401

Attrib cp=asympt 2.513130110776144

Attrib cp=non\_anginal -1.9422095433878053

Attrib cp=atyp\_angina 0.3741147633466835

Attrib trestbps -0.03909262546651873

Attrib chol -0.020919652061893026

Attrib fbs=f -0.5421805886304263

Attrib restecg=left\_vent\_hyper -2.6211907049265735

Attrib restecg=normal 1.8046481616839303

Attrib restecg=st\_t\_wave\_abnormality -0.02172170878137431

Attrib thalach='(147.5-inf)' 1.9876031359256472

Attrib exang=yes -3.2486206317590396

Attrib oldpeak='(1.7-inf)' 1.7263865479144929

Attrib slope=up 0.06472456181959425

Attrib slope=flat 0.6424236333650586

Attrib slope=down -1.418446792431298

Attrib ca='(0.5-inf)' 2.032357315040831

Attrib thal=fixed\_defect -0.6007823270354942

Attrib thal=normal -2.042825754310936

Attrib thal=reversable\_defect 1.9325771276695536

Sigmoid Node 15

Inputs Weights

Threshold -0.3482218912514913

Attrib age='(54.5-inf)' 2.090223900169288

Attrib sex=male 2.5760280542328418

Attrib cp=typ\_angina -0.7053092754519047

Attrib cp=asympt -0.9146136292869086

Attrib cp=non\_anginal 1.3917447393788094

Attrib cp=atyp\_angina 0.7975265652437218

Attrib trestbps 0.04356312223638416

Attrib chol -0.02550378237397909

Attrib fbs=f -0.992250938143214

Attrib restecg=left\_vent\_hyper 0.7414692102205825

Attrib restecg=normal -0.5939937560847315

Attrib restecg=st\_t\_wave\_abnormality 0.07069492081695448

Attrib thalach='(147.5-inf)' 2.56925705220443

Attrib exang=yes -0.5435316330209852

Attrib oldpeak='(1.7-inf)' 0.1182490912095838

Attrib slope=up -1.490852487123421

Attrib slope=flat 1.3730176923613715

Attrib slope=down 0.42535962253030807

Attrib ca='(0.5-inf)' -1.8011425454670273

Attrib thal=fixed\_defect 1.1948482921900636

Attrib thal=normal -1.1108755492951776

Attrib thal=reversable\_defect 0.057935842149523124

Sigmoid Node 16

Inputs Weights

Threshold 0.1327045063199996

Attrib age='(54.5-inf)' 2.5512667530213315

Attrib sex=male 2.7842423415935156

Attrib cp=typ\_angina 1.571846536201855

Attrib cp=asympt 1.5651000885864614

Attrib cp=non\_anginal -2.3533621241673535

Attrib cp=atyp\_angina -1.0224067382626583

Attrib trestbps 0.037530745633800766

Attrib chol -0.037476353493511944

Attrib fbs=f 2.1030127229653446

Attrib restecg=left\_vent\_hyper -0.2727178322196637

Attrib restecg=normal 0.15477755808289492

Attrib restecg=st\_t\_wave\_abnormality 0.07696766971273229

Attrib thalach='(147.5-inf)' 0.7171865030128745

Attrib exang=yes -1.0244900295621528

Attrib oldpeak='(1.7-inf)' 1.3186484666868434

Attrib slope=up -1.992396623156252

Attrib slope=flat 1.9584391412999023

Attrib slope=down -0.09659272083051466

Attrib ca='(0.5-inf)' -0.09668318779451408

Attrib thal=fixed\_defect 0.3550922027555713

Attrib thal=normal -1.161313495452106

Attrib thal=reversable\_defect 0.7724310383057743

Sigmoid Node 17

Inputs Weights

Threshold -0.5445998772661096

Attrib age='(54.5-inf)' 1.3613521759892129

Attrib sex=male 2.944973882182368

Attrib cp=typ\_angina 2.0730518469402712

Attrib cp=asympt -1.647714753898836

Attrib cp=non\_anginal 0.4174386757245905

Attrib cp=atyp\_angina 0.2365312272395691

Attrib trestbps 0.03520002717912567

Attrib chol -0.03513062798443162

Attrib fbs=f -0.31800242993064864

Attrib restecg=left\_vent\_hyper 0.38270801749758154

Attrib restecg=normal -0.9050422034302398

Attrib restecg=st\_t\_wave\_abnormality 1.0082798762972394

Attrib thalach='(147.5-inf)' -3.420648788144401

Attrib exang=yes 0.05230386290227215

Attrib oldpeak='(1.7-inf)' 0.026612693810533522

Attrib slope=up -1.0734005498412962

Attrib slope=flat 1.7905660266768406

Attrib slope=down -0.1794890668189231

Attrib ca='(0.5-inf)' 1.3084835499905785

Attrib thal=fixed\_defect -1.5143177733576592

Attrib thal=normal 0.4532075997348527

Attrib thal=reversable\_defect 1.560961467453992

Class <50

Input

Node 0

Class >50\_1

Input

Node 1

Class >50\_2

Input

Node 2

Class >50\_3

Input

Node 3

Class >50\_4

Input

Node 4

Time taken to build model: 1.3 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0.01 seconds

=== Summary ===

Correctly Classified Instances 51 83.6066 %

Incorrectly Classified Instances 10 16.3934 %

Kappa statistic 0.6724

Mean absolute error 0.0819

Root mean squared error 0.2499

Relative absolute error 40.6619 %

Root relative squared error 79.0219 %

Total Number of Instances 61

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

0.813 0.138 0.867 0.813 0.839 0.674 0.871 0.867 <50

0.862 0.188 0.806 0.862 0.833 0.674 0.867 0.821 >50\_1

? 0.000 ? ? ? ? ? ? >50\_2

? 0.000 ? ? ? ? ? ? >50\_3

? 0.000 ? ? ? ? ? ? >50\_4

Weighted Avg. 0.836 0.161 0.838 0.836 0.836 0.674 0.869 0.845

=== Confusion Matrix ===

a b c d e <-- classified as

26 6 0 0 0 | a = <50

4 25 0 0 0 | b = >50\_1

0 0 0 0 0 | c = >50\_2

0 0 0 0 0 | d = >50\_3

1. 0 0 0 0 | e = >50\_4

# Voting Classifier consisting of.SimpleLogistic ,.MultilayerPerceptron and Bayesian Network

=== Run information ===

Scheme: weka.classifiers.meta.Vote -S 1 -B "weka.classifiers.functions.SimpleLogistic -I 0 -M 500 -H 50 -W 0.0" -B "weka.classifiers.functions.MultilayerPerceptron -L 1.0 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a" -B "weka.classifiers.bayes.BayesNet -D -Q weka.classifiers.bayes.net.search.local.K2 -- -P 1 -S BAYES -E weka.classifiers.bayes.net.estimate.SimpleEstimator -- -A 0.5" -R MAJ

Relation: cleveland-14-heart-disease-weka.filters.supervised.attribute.Discretize-Rfirst-last-precision6

Instances: 303

Attributes: 14

age

sex

cp

trestbps

chol

fbs

restecg

thalach

exang

oldpeak

slope

ca

thal

num

Test mode: split 80.0% train, remainder test

=== Classifier model (full training set) ===

Vote combines the probability distributions of these base learners:

weka.classifiers.functions.SimpleLogistic -I 0 -M 500 -H 50 -W 0.0

weka.classifiers.functions.MultilayerPerceptron -L 1.0 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a

weka.classifiers.bayes.BayesNet -D -Q weka.classifiers.bayes.net.search.local.K2 -- -P 1 -S BAYES -E weka.classifiers.bayes.net.estimate.SimpleEstimator -- -A 0.5

using the 'Majority Voting' combination rule

All the models:

SimpleLogistic:

Class <50 :

2.63 +

[sex=male] \* -0.94 +

[cp=asympt] \* -1.39 +

[slope=up] \* 0.92 +

[ca='(0.5-inf)'] \* -1.45 +

[thal=normal] \* 0.69

Class >50\_1 :

0.23 +

[sex=male] \* 0.94 +

[cp=asympt] \* 1.39 +

[slope=up] \* -0.93 +

[ca='(0.5-inf)'] \* 1.41 +

[thal=normal] \* -0.74

Class >50\_2 :

-5.06 +

[cp=typ\_angina] \* -0.01 +

[cp=atyp\_angina] \* 0 +

[thal=normal] \* 0

Class >50\_3 :

-5.06 +

[cp=typ\_angina] \* -0.01 +

[cp=atyp\_angina] \* 0 +

[thal=normal] \* 0

Class >50\_4 :

-5.06 +

[cp=typ\_angina] \* -0.01 +

[cp=atyp\_angina] \* 0 +

[thal=normal] \* 0

Sigmoid Node 0

Inputs Weights

Threshold -3.408996028510316

Node 5 -4.637021134121809

Node 6 5.8813370843651605

Node 7 4.760846985580404

Node 8 -2.6182329772424073

Node 9 -1.7960627772949604

Node 10 -4.1359258582953045

Node 11 3.4766837603606437

Node 12 2.0845346719685214

Node 13 -3.7387829638621746

Node 14 -9.776790341461844

Node 15 11.19873155328399

Node 16 -8.899464231967912

Node 17 4.4104875670811445

Sigmoid Node 1

Inputs Weights

Threshold 3.40909409960758

Node 5 4.6370036111921555

Node 6 -5.881238224845014

Node 7 -4.7608648792978165

Node 8 2.6180728358774488

Node 9 1.796064204008571

Node 10 4.135811759691279

Node 11 -3.4767819581513772

Node 12 -2.0845224197662384

Node 13 3.73880082294549

Node 14 9.776826372623455

Node 15 -11.198637066932806

Node 16 8.899423674571052

Node 17 -4.41050281617435

Sigmoid Node 2

Inputs Weights

Threshold -3.2524074609899114

Node 5 -1.1637074062961672

Node 6 -0.8062544018244979

Node 7 -0.8577106505300484

Node 8 -0.9888748844195984

Node 9 -1.034467980228413

Node 10 -0.6544253151985301

Node 11 -1.866761956581577

Node 12 -1.0106407988254593

Node 13 -0.6939489979975927

Node 14 -0.6476720893544523

Node 15 -0.9517387011674167

Node 16 -0.5880481988196058

Node 17 -0.8689800527529891

Sigmoid Node 3

Inputs Weights

Threshold -3.2732002399905524

Node 5 -1.0780076681596729

Node 6 -0.7646670580374396

Node 7 -0.8508629512741194

Node 8 -1.0325386830503458

Node 9 -0.9913517346135774

Node 10 -0.6252151674901902

Node 11 -1.865739334641077

Node 12 -1.0183821112210631

Node 13 -0.6659839451840718

Node 14 -0.5969599498923436

Node 15 -0.9759542736263433

Node 16 -0.5985394952649631

Node 17 -0.8785977118137392

Sigmoid Node 4

Inputs Weights

Threshold -3.2822218581109053

Node 5 -1.1176044144515698

Node 6 -0.8204965787506169

Node 7 -0.8907111448200867

Node 8 -0.993791420603509

Node 9 -0.9612606315904393

Node 10 -0.6920573322498812

Node 11 -1.8575764703445954

Node 12 -1.0040713923837774

Node 13 -0.7170093114717151

Node 14 -0.6062615304310741

Node 15 -0.9480635782873531

Node 16 -0.632225939285402

Node 17 -0.8654888429820209

Sigmoid Node 5

Inputs Weights

Threshold -0.4044098204771695

Attrib age='(54.5-inf)' -2.5038934031222686

Attrib sex=male -3.174365101537107

Attrib cp=typ\_angina 0.5940856655971095

Attrib cp=asympt -1.8875987389678524

Attrib cp=non\_anginal 0.23253247327825893

Attrib cp=atyp\_angina 1.8407228025882534

Attrib trestbps 0.007574859833005064

Attrib chol -0.01056068188326631

Attrib fbs=f -3.8395592710391195

Attrib restecg=left\_vent\_hyper 2.970660935898582

Attrib restecg=normal -2.685957333550051

Attrib restecg=st\_t\_wave\_abnormality 0.04640705677770061

Attrib thalach='(147.5-inf)' -0.889139388925041

Attrib exang=yes 0.6105241333998868

Attrib oldpeak='(1.7-inf)' -1.4122973955204814

Attrib slope=up 0.5459904967719466

Attrib slope=flat -1.4211180580062823

Attrib slope=down 1.2684905571560918

Attrib ca='(0.5-inf)' -2.475022490575194

Attrib thal=fixed\_defect 0.6265449182007959

Attrib thal=normal 1.5261941703646955

Attrib thal=reversable\_defect -1.8672564552908093

Sigmoid Node 6

Inputs Weights

Threshold -0.3597290033688365

Attrib age='(54.5-inf)' 1.0962400894672828

Attrib sex=male 1.6692298189272647

Attrib cp=typ\_angina -0.17254878116318012

Attrib cp=asympt 0.682498517131565

Attrib cp=non\_anginal -0.947365265658159

Attrib cp=atyp\_angina 1.0757205749994792

Attrib trestbps -0.033153940274708735

Attrib chol -0.012171262832913053

Attrib fbs=f -4.4678219855671655

Attrib restecg=left\_vent\_hyper -0.6891229359609906

Attrib restecg=normal 0.8660903885220554

Attrib restecg=st\_t\_wave\_abnormality 0.1930900683322269

Attrib thalach='(147.5-inf)' -0.5394093361806732

Attrib exang=yes -1.5962630048631266

Attrib oldpeak='(1.7-inf)' 1.4583267917405645

Attrib slope=up -1.8791787752445435

Attrib slope=flat 0.9709581384095011

Attrib slope=down 1.2691946536294667

Attrib ca='(0.5-inf)' 0.7427558438858702

Attrib thal=fixed\_defect 2.5354114814951276

Attrib thal=normal -2.350625586641385

Attrib thal=reversable\_defect 0.1483467652072477

Sigmoid Node 7

Inputs Weights

Threshold 0.8288878482494093

Attrib age='(54.5-inf)' 0.5536444913107929

Attrib sex=male -3.1356570328775533

Attrib cp=typ\_angina -1.9342663937877673

Attrib cp=asympt 0.6810532544485197

Attrib cp=non\_anginal -1.6740284380186694

Attrib cp=atyp\_angina 1.291345796088311

Attrib trestbps -0.012826103117104248

Attrib chol 0.0026255691493604766

Attrib fbs=f -3.239151654165526

Attrib restecg=left\_vent\_hyper -3.0571289023582726

Attrib restecg=normal 3.194139562034328

Attrib restecg=st\_t\_wave\_abnormality -0.8833964208351016

Attrib thalach='(147.5-inf)' 2.469836997676998

Attrib exang=yes -4.711911849328261

Attrib oldpeak='(1.7-inf)' 3.743456127900741

Attrib slope=up -0.6314144082108146

Attrib slope=flat -1.0401132020451531

Attrib slope=down 0.8398261296073323

Attrib ca='(0.5-inf)' -0.8042954823102962

Attrib thal=fixed\_defect 2.538642592566218

Attrib thal=normal -4.833873457759733

Attrib thal=reversable\_defect 1.4318655740527413

Sigmoid Node 8

Inputs Weights

Threshold -1.2702063384579823

Attrib age='(54.5-inf)' 0.11562171785866288

Attrib sex=male 2.0166305529441195

Attrib cp=typ\_angina -0.9264660119194706

Attrib cp=asympt 2.379623288739877

Attrib cp=non\_anginal -1.5678595156477997

Attrib cp=atyp\_angina 2.4981598056103382

Attrib trestbps -0.026535141732882184

Attrib chol -0.049598636781153366

Attrib fbs=f -1.831275246053956

Attrib restecg=left\_vent\_hyper 1.2183004762829273

Attrib restecg=normal -1.4655940651099104

Attrib restecg=st\_t\_wave\_abnormality 1.4730818413289037

Attrib thalach='(147.5-inf)' 3.331108827852175

Attrib exang=yes 3.0393698111393834

Attrib oldpeak='(1.7-inf)' -0.16252927675200457

Attrib slope=up -0.4507172316394701

Attrib slope=flat 0.8614935308463919

Attrib slope=down 0.7582147910539543

Attrib ca='(0.5-inf)' 5.382067561876151

Attrib thal=fixed\_defect 1.4263704670600257

Attrib thal=normal -1.4093188098617824

Attrib thal=reversable\_defect 1.2662654927223331

Sigmoid Node 9

Inputs Weights

Threshold -0.5084033021721349

Attrib age='(54.5-inf)' 2.6611332590207644

Attrib sex=male 2.0337284803107933

Attrib cp=typ\_angina 0.7280055063758352

Attrib cp=asympt 0.48733496225276324

Attrib cp=non\_anginal -0.7722429900779437

Attrib cp=atyp\_angina 0.5144614716305763

Attrib trestbps 0.0038427644862212076

Attrib chol -0.04653936512939604

Attrib fbs=f 2.3902398010633896

Attrib restecg=left\_vent\_hyper -1.52558176713654

Attrib restecg=normal 1.471993010869477

Attrib restecg=st\_t\_wave\_abnormality 0.5994834052917448

Attrib thalach='(147.5-inf)' 0.48660148307378204

Attrib exang=yes 0.653409857281682

Attrib oldpeak='(1.7-inf)' 2.324227743450308

Attrib slope=up -1.2246067761284016

Attrib slope=flat 2.179331364982867

Attrib slope=down -0.47875149315854754

Attrib ca='(0.5-inf)' 3.3692140435437143

Attrib thal=fixed\_defect 0.4541321125861632

Attrib thal=normal -0.9200970590443583

Attrib thal=reversable\_defect 1.069793763829384

Sigmoid Node 10

Inputs Weights

Threshold -0.8073682070982869

Attrib age='(54.5-inf)' 0.2064096434105147

Attrib sex=male 0.9243514360221657

Attrib cp=typ\_angina -2.387460342479969

Attrib cp=asympt 2.5768990445246436

Attrib cp=non\_anginal 1.6192605005790466

Attrib cp=atyp\_angina -0.12383640663593218

Attrib trestbps -0.014505574274310422

Attrib chol 0.028683279238420137

Attrib fbs=f -1.136136544198056

Attrib restecg=left\_vent\_hyper 1.0399384188006657

Attrib restecg=normal -1.597418833525824

Attrib restecg=st\_t\_wave\_abnormality 1.3875815116336951

Attrib thalach='(147.5-inf)' 2.056373212306436

Attrib exang=yes 1.1343904138255876

Attrib oldpeak='(1.7-inf)' 1.222901851048245

Attrib slope=up -0.6113311808827623

Attrib slope=flat 0.5652132814269022

Attrib slope=down 0.9037983605217386

Attrib ca='(0.5-inf)' 2.054421801318509

Attrib thal=fixed\_defect 2.2049120247961898

Attrib thal=normal -2.160273106899935

Attrib thal=reversable\_defect 0.8813598112587917

Sigmoid Node 11

Inputs Weights

Threshold 1.055506412129461

Attrib age='(54.5-inf)' -1.225831127791223

Attrib sex=male -2.059398430396936

Attrib cp=typ\_angina 3.2462496430898033

Attrib cp=asympt -1.9993918823087462

Attrib cp=non\_anginal -0.15474322227641263

Attrib cp=atyp\_angina -3.188760956676284

Attrib trestbps -0.018993494992989125

Attrib chol -0.02286921650873627

Attrib fbs=f 2.8803995269138802

Attrib restecg=left\_vent\_hyper -1.4618809509104682

Attrib restecg=normal 1.75473014128221

Attrib restecg=st\_t\_wave\_abnormality -1.3066768321782891

Attrib thalach='(147.5-inf)' -2.096838043734557

Attrib exang=yes -3.038057343342565

Attrib oldpeak='(1.7-inf)' -3.622138354430823

Attrib slope=up 0.994596496062183

Attrib slope=flat -2.0005177991246943

Attrib slope=down -0.07465437247929385

Attrib ca='(0.5-inf)' -3.8529747806201504

Attrib thal=fixed\_defect -0.8475046448730955

Attrib thal=normal -0.8460804055735803

Attrib thal=reversable\_defect 0.47614382182716447

Sigmoid Node 12

Inputs Weights

Threshold -0.45343025266958364

Attrib age='(54.5-inf)' 0.05212840703916871

Attrib sex=male -5.2887786124958645

Attrib cp=typ\_angina -1.8693383864714128

Attrib cp=asympt 2.699855573005867

Attrib cp=non\_anginal -0.7984135930703314

Attrib cp=atyp\_angina 0.8073224220096475

Attrib trestbps 0.03374548634922726

Attrib chol 0.022170424091406446

Attrib fbs=f 0.014327316493485847

Attrib restecg=left\_vent\_hyper 0.20421760290870042

Attrib restecg=normal -0.05907543781326117

Attrib restecg=st\_t\_wave\_abnormality 0.21014997590482712

Attrib thalach='(147.5-inf)' -1.077691127594079

Attrib exang=yes 1.8150337979172473

Attrib oldpeak='(1.7-inf)' -2.277468649134621

Attrib slope=up -0.9175117699389799

Attrib slope=flat 0.3246431608103811

Attrib slope=down 1.0953837165968243

Attrib ca='(0.5-inf)' -2.924938721107953

Attrib thal=fixed\_defect 0.6369509891522949

Attrib thal=normal 2.3042667516485116

Attrib thal=reversable\_defect -2.534595131526719

Sigmoid Node 13

Inputs Weights

Threshold -0.9574986554450843

Attrib age='(54.5-inf)' -2.047010531596359

Attrib sex=male -3.3807434401846055

Attrib cp=typ\_angina 1.021847696861933

Attrib cp=asympt 1.3027958495220404

Attrib cp=non\_anginal 0.13091620444607743

Attrib cp=atyp\_angina -0.5224078833705558

Attrib trestbps 0.01707815148496379

Attrib chol -0.00805042357777367

Attrib fbs=f -0.4870200838024036

Attrib restecg=left\_vent\_hyper -1.279941006588828

Attrib restecg=normal 1.0977336305578487

Attrib restecg=st\_t\_wave\_abnormality 1.0861393118812943

Attrib thalach='(147.5-inf)' -0.3646483180228191

Attrib exang=yes 2.8105699603385568

Attrib oldpeak='(1.7-inf)' 0.18983531352093388

Attrib slope=up -1.8296057570586723

Attrib slope=flat 1.275572095125814

Attrib slope=down 1.5464041871014715

Attrib ca='(0.5-inf)' 0.4038241155196005

Attrib thal=fixed\_defect -0.6022909979333051

Attrib thal=normal -0.8528554482892488

Attrib thal=reversable\_defect 2.447909849326324

Sigmoid Node 14

Inputs Weights

Threshold -1.0979087297125392

Attrib age='(54.5-inf)' -4.216497893941114

Attrib sex=male 1.3202543580626913

Attrib cp=typ\_angina -1.0397823368023802

Attrib cp=asympt 6.082314442302804

Attrib cp=non\_anginal -2.6598534068176938

Attrib cp=atyp\_angina -0.27369112354178526

Attrib trestbps -0.03909262546651873

Attrib chol -0.020919652061893026

Attrib fbs=f -1.4243589918551918

Attrib restecg=left\_vent\_hyper 0.7721034787651533

Attrib restecg=normal -1.0462313417709224

Attrib restecg=st\_t\_wave\_abnormality 1.2274175339034905

Attrib thalach='(147.5-inf)' -1.1049513546201393

Attrib exang=yes -0.30886930897674353

Attrib oldpeak='(1.7-inf)' 0.3747634424356513

Attrib slope=up -1.1661706679767996

Attrib slope=flat -0.19703902194017311

Attrib slope=down 2.443465015591933

Attrib ca='(0.5-inf)' 4.921749872782589

Attrib thal=fixed\_defect 0.2968773728719308

Attrib thal=normal -2.5919399233082174

Attrib thal=reversable\_defect 3.526359241570779

Sigmoid Node 15

Inputs Weights

Threshold -0.9815295343799284

Attrib age='(54.5-inf)' -5.072086365557297

Attrib sex=male -1.7120987291655572

Attrib cp=typ\_angina 0.07101084627782515

Attrib cp=asympt -3.326522077965905

Attrib cp=non\_anginal 3.205892163451421

Attrib cp=atyp\_angina 1.885582754377368

Attrib trestbps 0.04356312223638416

Attrib chol -0.02550378237397909

Attrib fbs=f -0.44506634988232024

Attrib restecg=left\_vent\_hyper 2.2793712522319636

Attrib restecg=normal -2.2471257922147716

Attrib restecg=st\_t\_wave\_abnormality 0.8192325580640814

Attrib thalach='(147.5-inf)' -0.1320681381207633

Attrib exang=yes 5.926188891682696

Attrib oldpeak='(1.7-inf)' -2.931689734604232

Attrib slope=up 0.5377925642686002

Attrib slope=flat 0.21459031920563532

Attrib slope=down 0.18844958742248472

Attrib ca='(0.5-inf)' -2.868400492278252

Attrib thal=fixed\_defect 0.47783399697063317

Attrib thal=normal 1.7053237908441274

Attrib thal=reversable\_defect -1.5310361092269849

Sigmoid Node 16

Inputs Weights

Threshold -1.3209956107090528

Attrib age='(54.5-inf)' 0.5913009900321167

Attrib sex=male 2.244357069326088

Attrib cp=typ\_angina -1.4730841665609102

Attrib cp=asympt -0.8030935410679589

Attrib cp=non\_anginal 0.4671540770270888

Attrib cp=atyp\_angina 4.47760162701807

Attrib trestbps 0.037530745633800766

Attrib chol -0.037476353493511944

Attrib fbs=f -2.044100819777226

Attrib restecg=left\_vent\_hyper -3.358363177670788

Attrib restecg=normal 3.274365907817343

Attrib restecg=st\_t\_wave\_abnormality 1.4967247824584418

Attrib thalach='(147.5-inf)' -4.384580212027111

Attrib exang=yes 5.339743278760445

Attrib oldpeak='(1.7-inf)' -0.3110590080111082

Attrib slope=up -3.2715128506301476

Attrib slope=flat 3.8777154262107993

Attrib slope=down 0.7169473387616542

Attrib ca='(0.5-inf)' 0.40366850881598587

Attrib thal=fixed\_defect 0.5700707326856974

Attrib thal=normal -0.28180484750657986

Attrib thal=reversable\_defect 1.1494659824884792

Sigmoid Node 17

Inputs Weights

Threshold -0.2451838159405205

Attrib age='(54.5-inf)' -0.8100833110925008

Attrib sex=male 1.9204014214155782

Attrib cp=typ\_angina -2.739654841840859

Attrib cp=asympt 4.777779306210438

Attrib cp=non\_anginal -1.255732743247522

Attrib cp=atyp\_angina -0.3019168477675658

Attrib trestbps 0.03520002717912567

Attrib chol -0.03513062798443162

Attrib fbs=f -0.2149777552344612

Attrib restecg=left\_vent\_hyper -1.3678022148668263

Attrib restecg=normal 1.2092712713083988

Attrib restecg=st\_t\_wave\_abnormality 0.3450605725974496

Attrib thalach='(147.5-inf)' -1.8617869416060806

Attrib exang=yes -0.870349044840059

Attrib oldpeak='(1.7-inf)' 0.806653058687219

Attrib slope=up -1.9174604866348008

Attrib slope=flat 2.1974583003026784

Attrib slope=down -0.041737464976895795

Attrib ca='(0.5-inf)' 2.2848382301870944

Attrib thal=fixed\_defect -0.5414411442681203

Attrib thal=normal 0.56606736628395

Attrib thal=reversable\_defect 0.1473900322774077

Class <50

Input

Node 0

Class >50\_1

Input

Node 1

Class >50\_2

Input

Node 2

Class >50\_3

Input

Node 3

Class >50\_4

Input

Node 4

Bayes Network Classifier

not using ADTree

#attributes=14 #classindex=13

Network structure (nodes followed by parents)

age(2): num

sex(2): num

cp(4): num

trestbps(1): num

chol(1): num

fbs(2): num

restecg(3): num

thalach(2): num

exang(2): num

oldpeak(2): num

slope(3): num

ca(2): num

thal(3): num

num(5):

LogScore Bayes: -2464.033252335542

LogScore BDeu: -2643.529380000129

LogScore MDL: -2693.6119414566356

LogScore ENTROPY: -2453.635163625241

LogScore AIC: -2537.635163625242

Time taken to build model: 1.3 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances 53 86.8852 %

Incorrectly Classified Instances 8 13.1148 %

Kappa statistic 0.7371

Mean absolute error 0.0525

Root mean squared error 0.229

Relative absolute error 26.0377 %

Root relative squared error 72.4239 %

Total Number of Instances 61

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

0.875 0.138 0.875 0.875 0.875 0.737 0.869 0.831 <50

0.862 0.125 0.862 0.862 0.862 0.737 0.869 0.809 >50\_1

? 0.000 ? ? ? ? ? ? >50\_2

? 0.000 ? ? ? ? ? ? >50\_3

? 0.000 ? ? ? ? ? ? >50\_4

Weighted Avg. 0.869 0.132 0.869 0.869 0.869 0.737 0.869 0.821

=== Confusion Matrix ===

a b c d e <-- classified as

28 4 0 0 0 | a = <50

4 25 0 0 0 | b = >50\_1

0 0 0 0 0 | c = >50\_2

0 0 0 0 0 | d = >50\_3

0 0 0 0 0 | e = >50\_4

=== Run information ===

Scheme: weka.classifiers.meta.Stacking -X 10 -M "weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4" -S 1 -num-slots 1 -B "weka.classifiers.bayes.BayesNet -D -Q weka.classifiers.bayes.net.search.local.K2 -- -P 1 -S BAYES -E weka.classifiers.bayes.net.estimate.SimpleEstimator -- -A 0.5" -B "weka.classifiers.trees.J48 -C 0.25 -M 2"

Relation: cleveland-14-heart-disease-weka.filters.unsupervised.attribute.Discretize-B10-M-1.0-Rfirst-last-precision6-weka.filters.supervised.attribute.NominalToBinary

Instances: 303

Attributes: 77

age='(-inf-33.8]'

age='(33.8-38.6]'

age='(38.6-43.4]'

age='(43.4-48.2]'

age='(48.2-53]'

age='(53-57.8]'

age='(57.8-62.6]'

age='(62.6-67.4]'

age='(67.4-72.2]'

age='(72.2-inf)'

sex=male

cp=typ\_angina

cp=asympt

cp=non\_anginal

cp=atyp\_angina

trestbps='(-inf-104.6]'

trestbps='(104.6-115.2]'

trestbps='(115.2-125.8]'

trestbps='(125.8-136.4]'

trestbps='(136.4-147]'

trestbps='(147-157.6]'

trestbps='(157.6-168.2]'

trestbps='(168.2-178.8]'

trestbps='(178.8-189.4]'

trestbps='(189.4-inf)'

chol='(-inf-169.8]'

chol='(169.8-213.6]'

chol='(213.6-257.4]'

chol='(257.4-301.2]'

chol='(301.2-345]'

chol='(345-388.8]'

chol='(388.8-432.6]'

chol='(432.6-476.4]'

chol='(476.4-520.2]'

chol='(520.2-inf)'

fbs=f

restecg=left\_vent\_hyper

restecg=normal

restecg=st\_t\_wave\_abnormality

thalach='(-inf-84.1]'

thalach='(84.1-97.2]'

thalach='(97.2-110.3]'

thalach='(110.3-123.4]'

thalach='(123.4-136.5]'

thalach='(136.5-149.6]'

thalach='(149.6-162.7]'

thalach='(162.7-175.8]'

thalach='(175.8-188.9]'

thalach='(188.9-inf)'

exang=yes

oldpeak='(-inf-0.62]'

oldpeak='(0.62-1.24]'

oldpeak='(1.24-1.86]'

oldpeak='(1.86-2.48]'

oldpeak='(2.48-3.1]'

oldpeak='(3.1-3.72]'

oldpeak='(3.72-4.34]'

oldpeak='(4.34-4.96]'

oldpeak='(4.96-5.58]'

oldpeak='(5.58-inf)'

slope=up

slope=flat

slope=down

ca='(-inf-0.3]'

ca='(0.3-0.6]'

ca='(0.6-0.9]'

ca='(0.9-1.2]'

ca='(1.2-1.5]'

ca='(1.5-1.8]'

ca='(1.8-2.1]'

ca='(2.1-2.4]'

ca='(2.4-2.7]'

ca='(2.7-inf)'

thal=fixed\_defect

thal=normal

thal=reversable\_defect

num

Test mode: split 80.0% train, remainder test

=== Classifier model (full training set) ===

Stacking

Base classifiers

Bayes Network Classifier

not using ADTree

#attributes=77 #classindex=76

Network structure (nodes followed by parents)

age='(-inf-33.8]'(1): num

age='(33.8-38.6]'(1): num

age='(38.6-43.4]'(1): num

age='(43.4-48.2]'(1): num

age='(48.2-53]'(1): num

age='(53-57.8]'(1): num

age='(57.8-62.6]'(1): num

age='(62.6-67.4]'(1): num

age='(67.4-72.2]'(1): num

age='(72.2-inf)'(1): num

sex=male(2): num

cp=typ\_angina(1): num

cp=asympt(2): num

cp=non\_anginal(2): num

cp=atyp\_angina(2): num

trestbps='(-inf-104.6]'(1): num

trestbps='(104.6-115.2]'(1): num

trestbps='(115.2-125.8]'(1): num

trestbps='(125.8-136.4]'(1): num

trestbps='(136.4-147]'(1): num

trestbps='(147-157.6]'(1): num

trestbps='(157.6-168.2]'(1): num

trestbps='(168.2-178.8]'(1): num

trestbps='(178.8-189.4]'(1): num

trestbps='(189.4-inf)'(1): num

chol='(-inf-169.8]'(1): num

chol='(169.8-213.6]'(1): num

chol='(213.6-257.4]'(1): num

chol='(257.4-301.2]'(1): num

chol='(301.2-345]'(1): num

chol='(345-388.8]'(1): num

chol='(388.8-432.6]'(1): num

chol='(432.6-476.4]'(1): num

chol='(476.4-520.2]'(1): num

chol='(520.2-inf)'(1): num

fbs=f(1): num

restecg=left\_vent\_hyper(1): num

restecg=normal(1): num

restecg=st\_t\_wave\_abnormality(1): num

thalach='(-inf-84.1]'(1): num

thalach='(84.1-97.2]'(1): num

thalach='(97.2-110.3]'(1): num

thalach='(110.3-123.4]'(1): num

thalach='(123.4-136.5]'(1): num

thalach='(136.5-149.6]'(1): num

thalach='(149.6-162.7]'(1): num

thalach='(162.7-175.8]'(1): num

thalach='(175.8-188.9]'(1): num

thalach='(188.9-inf)'(1): num

exang=yes(2): num

oldpeak='(-inf-0.62]'(2): num

oldpeak='(0.62-1.24]'(1): num

oldpeak='(1.24-1.86]'(1): num

oldpeak='(1.86-2.48]'(1): num

oldpeak='(2.48-3.1]'(2): num

oldpeak='(3.1-3.72]'(1): num

oldpeak='(3.72-4.34]'(1): num

oldpeak='(4.34-4.96]'(1): num

oldpeak='(4.96-5.58]'(1): num

oldpeak='(5.58-inf)'(1): num

slope=up(2): num

slope=flat(2): num

slope=down(1): num

ca='(-inf-0.3]'(2): num

ca='(0.3-0.6]'(1): num

ca='(0.6-0.9]'(1): num

ca='(0.9-1.2]'(1): num

ca='(1.2-1.5]'(1): num

ca='(1.5-1.8]'(1): num

ca='(1.8-2.1]'(2): num

ca='(2.1-2.4]'(1): num

ca='(2.4-2.7]'(1): num

ca='(2.7-inf)'(1): num

thal=fixed\_defect(1): num

thal=normal(2): num

thal=reversable\_defect(2): num

num(5):

LogScore Bayes: -2313.1555271935727

LogScore BDeu: -2437.57975814881

LogScore MDL: -2491.178065183516

LogScore ENTROPY: -2294.0542833934423

LogScore AIC: -2363.0542833934423

J48 pruned tree

------------------

thal=normal <= 0

| cp=asympt <= 0

| | age='(38.6-43.4]' <= 0

| | | ca='(-inf-0.3]' <= 0

| | | | restecg=left\_vent\_hyper <= 0

| | | | | slope=up <= 0: >50\_1 (7.41/1.41)

| | | | | slope=up > 0: <50 (3.0)

| | | | restecg=left\_vent\_hyper > 0: >50\_1 (7.0)

| | | ca='(-inf-0.3]' > 0

| | | | exang=yes <= 0

| | | | | oldpeak='(0.62-1.24]' <= 0: <50 (17.04/2.0)

| | | | | oldpeak='(0.62-1.24]' > 0: >50\_1 (4.0/1.0)

| | | | exang=yes > 0: >50\_1 (4.0/1.0)

| | age='(38.6-43.4]' > 0: <50 (3.0)

| cp=asympt > 0: >50\_1 (90.45/10.0)

thal=normal > 0

| ca='(-inf-0.3]' <= 0

| | cp=asympt <= 0

| | | age='(57.8-62.6]' <= 0: <50 (25.9/4.0)

| | | age='(57.8-62.6]' > 0: >50\_1 (4.0/1.0)

| | cp=asympt > 0

| | | trestbps='(125.8-136.4]' <= 0: >50\_1 (17.0/1.0)

| | | trestbps='(125.8-136.4]' > 0: <50 (3.0/1.0)

| ca='(-inf-0.3]' > 0: <50 (117.21/12.55)

Number of Leaves : 13

Size of the tree : 25

Meta classifier

Logistic Regression with ridge parameter of 1.0E-8

Coefficients...

Class

Variable <50 >50\_1 >50\_2 >50\_3

=========================================================================================================================================

weka.classifiers.bayes.BayesNet-1:<50 0.8706 -1.0036 -0.1669 -0.1669

weka.classifiers.bayes.BayesNet-1:>50\_1 -0.8609 1.0145 0.1575 0.1575

weka.classifiers.bayes.BayesNet-1:>50\_2 -334.5287 -292.217 296.0834 296.0834

weka.classifiers.bayes.BayesNet-1:>50\_3 -334.5287 -292.217 296.0834 296.0834

weka.classifiers.bayes.BayesNet-1:>50\_4 -334.5287 -292.217 296.0834 296.0834

weka.classifiers.trees.J48-2:<50 0.2057 -0.1912 -0.1113 -0.1113

weka.classifiers.trees.J48-2:>50\_1 -0.2057 0.1912 0.1113 0.1113

Intercept 30.6965 30.4995 -10.4102 -10.4102

Odds Ratios...

Class

Variable <50 >50\_1 >50\_2 >50\_3

=========================================================================================================================================

weka.classifiers.bayes.BayesNet-1:<50 2.3882 0.3665 0.8463 0.8463

weka.classifiers.bayes.BayesNet-1:>50\_1 0.4228 2.758 1.1706 1.1706

weka.classifiers.bayes.BayesNet-1:>50\_2 0 0 3.8672520487615295E128 3.867253427163374E128

weka.classifiers.bayes.BayesNet-1:>50\_3 0 0 3.867252012172947E128 3.8672452281238E128

weka.classifiers.bayes.BayesNet-1:>50\_4 0 0 3.867251975969282E128 3.8671885210851954E128

weka.classifiers.trees.J48-2:<50 1.2284 0.8259 0.8946 0.8946

weka.classifiers.trees.J48-2:>50\_1 0.8141 1.2108 1.1178 1.1178

Time taken to build model: 0.25 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances 54 88.5246 %

Incorrectly Classified Instances 7 11.4754 %

Kappa statistic 0.7688

Mean absolute error 0.0941

Root mean squared error 0.2089

Relative absolute error 46.712 %

Root relative squared error 66.0635 %

Total Number of Instances 61

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

0.938 0.172 0.857 0.938 0.896 0.773 0.890 0.809 <50

0.828 0.063 0.923 0.828 0.873 0.773 0.890 0.923 >50\_1

? 0.000 ? ? ? ? ? ? >50\_2

? 0.000 ? ? ? ? ? ? >50\_3

? 0.000 ? ? ? ? ? ? >50\_4

Weighted Avg. 0.885 0.120 0.888 0.885 0.885 0.773 0.890 0.863

=== Confusion Matrix ===

a b c d e <-- classified as

30 2 0 0 0 | a = <50

5 24 0 0 0 | b = >50\_1

0 0 0 0 0 | c = >50\_2

0 0 0 0 0 | d = >50\_3

0 0 0 0 0 | e = >50\_4