INFO 8000- Final Project

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```
rm(list=ls())
cat("\14")
```

```
wd<-getwd()
setwd(wd)

event<-read.csv("event.csv")

event<-na.omit(event)

newdata <- event[which(event$ebt_snap=='1'),]

event1<-aggregate(newdata[, 2:4], list(newdata$hhnum), sum)
names(event1)[1]<-"hhnum"

# Household data set
hh<-read.csv("household.csv")
hh<-na.omit(hh)


hh1 <- hh[ which(hh$snapnowhh=='1' & hh$snapnowreport ==1),]


#joining two data set by hhnum
#finaldata<-hh1[hh1$hhnum%in%event1$Group.1,]

#event1[!event1$Group.1%in%hh1$hhnum,]

final.data<-merge(hh1, event1)

# remove duplicate household if any..
final.data<-final.data[!duplicated(final.data$hhnum), ]
```

```
#recoding region variable
final.data$region[final.data$region==1]="Northeast"
final.data$region[final.data$region==2]="Midwest"
final.data$region[final.data$region==3]="South"
final.data$region[final.data$region==4]="West"

#recoding rural variable
final.data$rural[final.data$rural==1]="Rural"
final.data$rural[final.data$rural==0]="Urban"

# recoding adjtfscat variable
final.data$adltfscat[final.data$adltfscat==1]="High"
final.data$adltfscat[final.data$adltfscat==2]="Marginal"
final.data$adltfscat[final.data$adltfscat==3]="Low"
```

```
final.data$adltfscat[final.data$adltfscat==4]="very low"
```

I categorized total weekly food expenditure on food at home based on Official USDA Food Plans,based on weekly food expenditure for a family of 4 (which is average household size in our data) is $129.5. I am interested to examine the proportion of hosehold that have met the food expenditure requirement on the basis of Thrifty Food Plan and Dietary Guidelines of america.

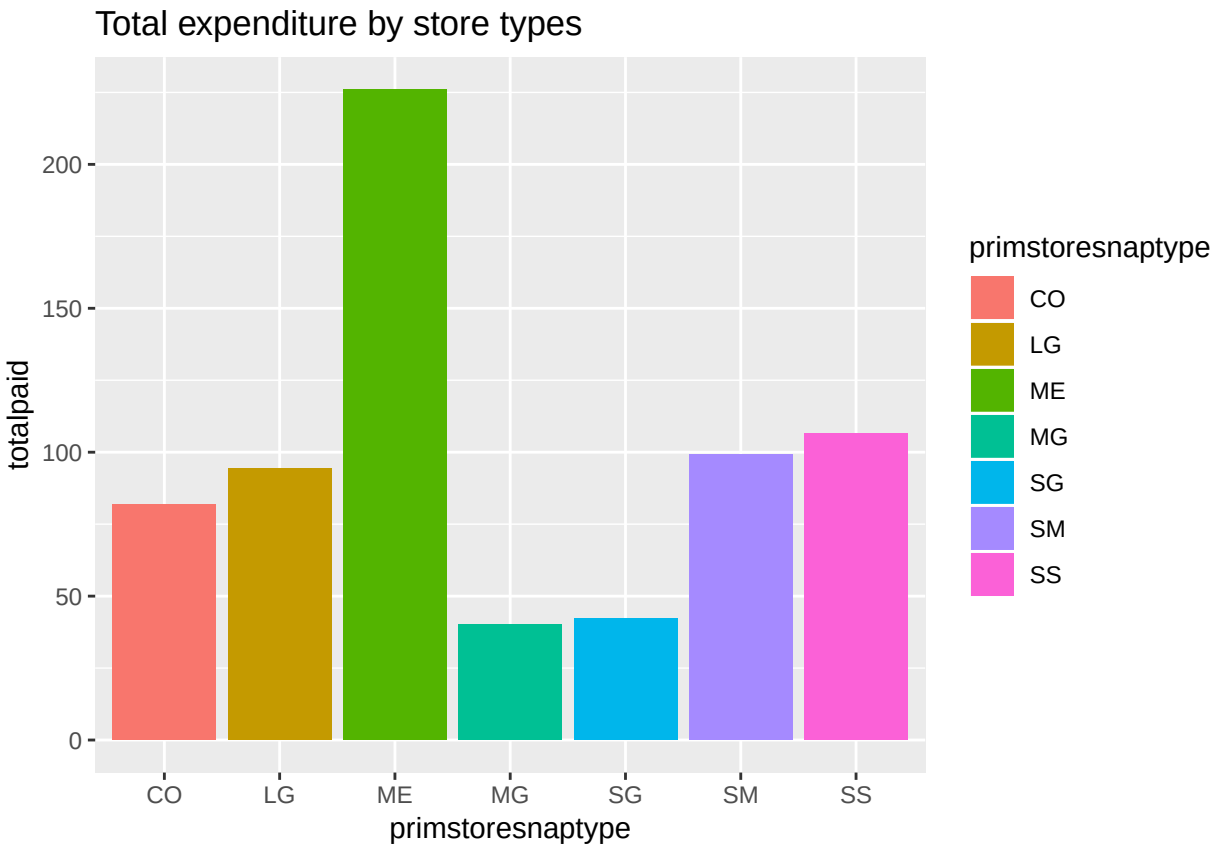
```
final.data$total.paid <- ifelse(final.data$totalpaid > 129,
                        c("1"), c("0"))

# converting numeric variable into factor
final.data$total.paid<-as.factor(final.data$total.paid)

final.data$region<-as.factor(final.data$region)
final.data$hhsize<-as.factor(final.data$hhsize)
final.data$rural <-as.factor(final.data$rural)
final.data$targetgroup<-as.factor(final.data$targetgroup)
final.data$selfemployhh<-as.factor(final.data$selfemployhh)
final.data$housingown<-as.factor(final.data$housingown)

final.data$liqassets<-as.factor(final.data$liqassets)
final.data$anyvehicle<-as.factor(final.data$anyvehicle)
final.data$foodsufficient<-as.ordered(final.data$foodsufficient)
final.data$grocerylistfreq<-as.factor(final.data$grocerylistfreq)
final.data$anyvegetarian<-as.factor(final.data$anyvegetarian)
final.data$nutritioneduc<-as.factor(final.data$nutritioneduc)
final.data$eathealthyhh<-as.factor(final.data$eathealthyhh)
final.data$adltfscat<-as.ordered(final.data$adltfscat)
final.data$dietstatuspr<-as.factor(final.data$dietstatuspr)
```

Exploratory data analysis

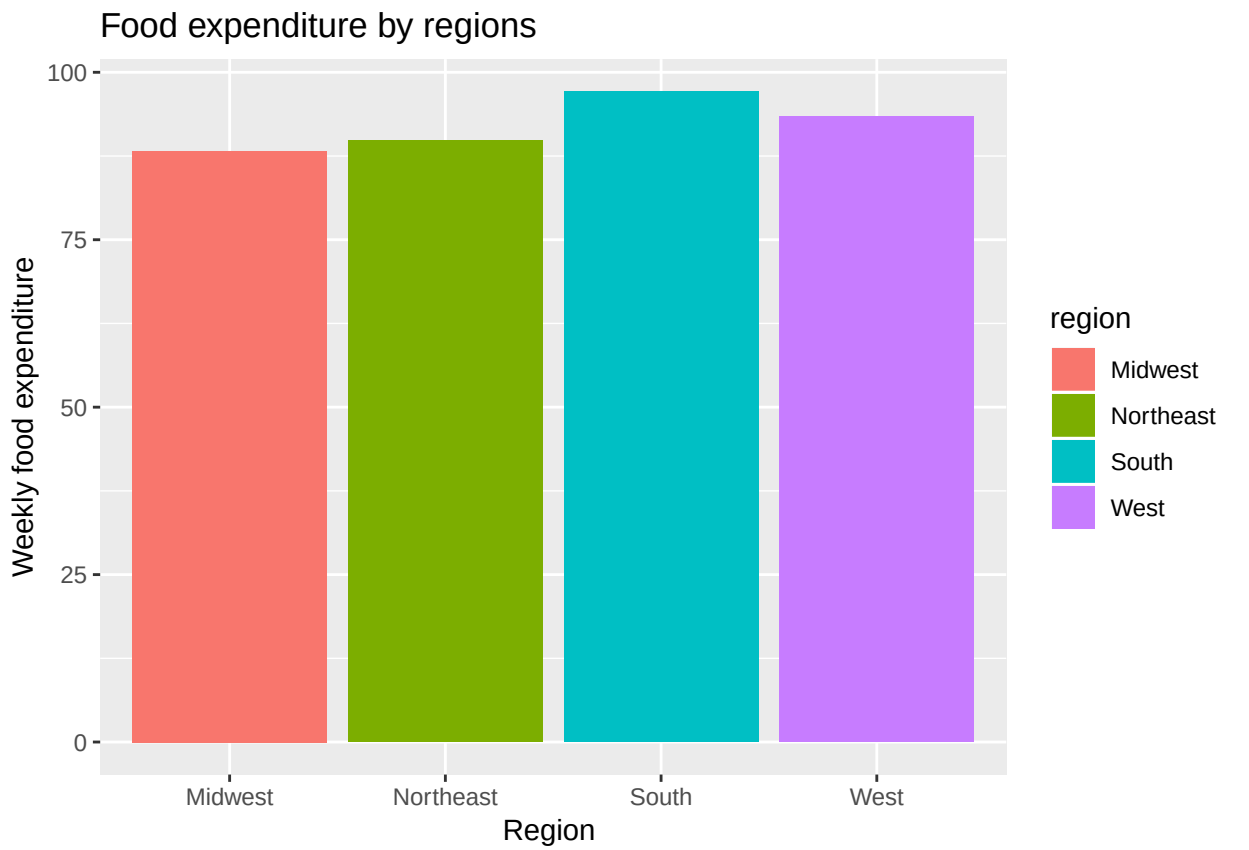
```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.5.1
```

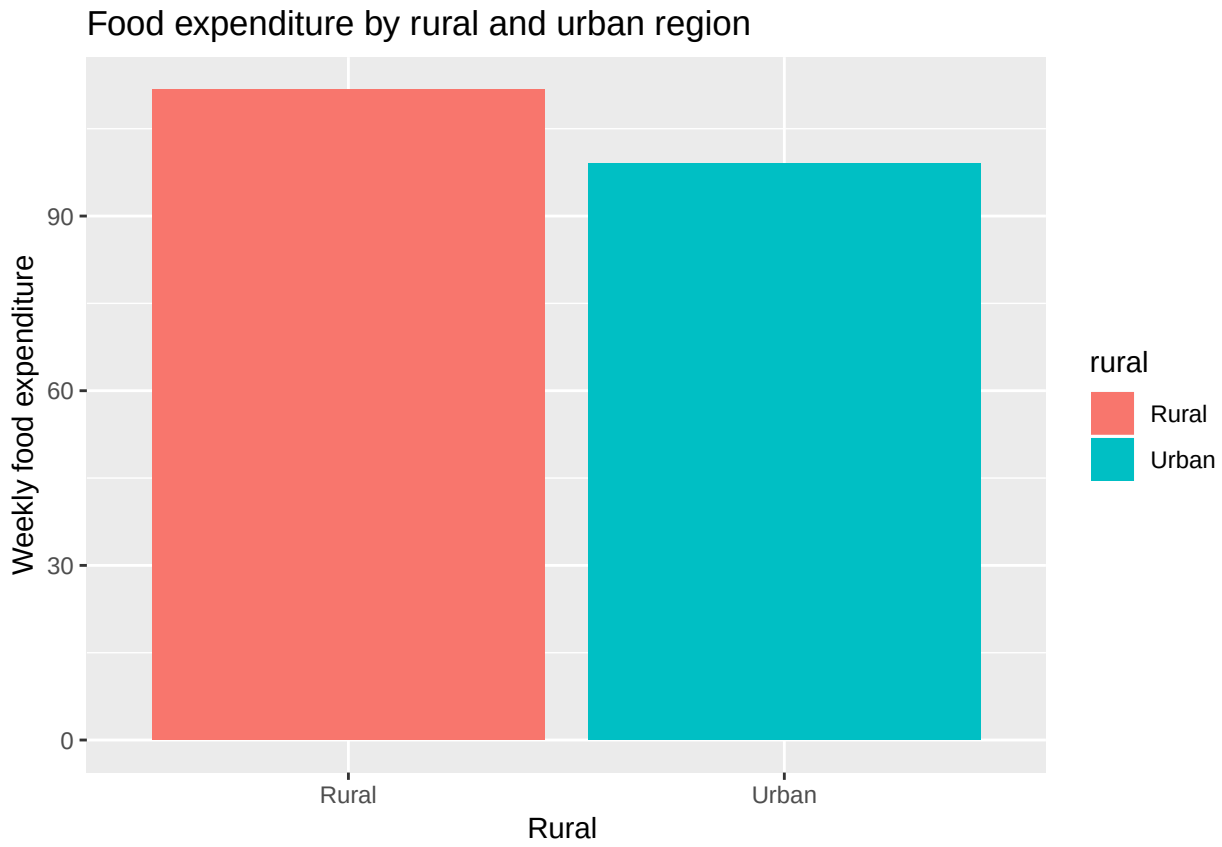
```
g2<-ggplot(final.data) +
  geom_bar(aes(primstoresnaptype,totalpaid, fill =primstoresnaptype), stat = "summary", fun.y = "mean")
g2 + labs(title = "Total expenditure by store types", xlab="Store type", ylab="Weekly food expenditure $
```



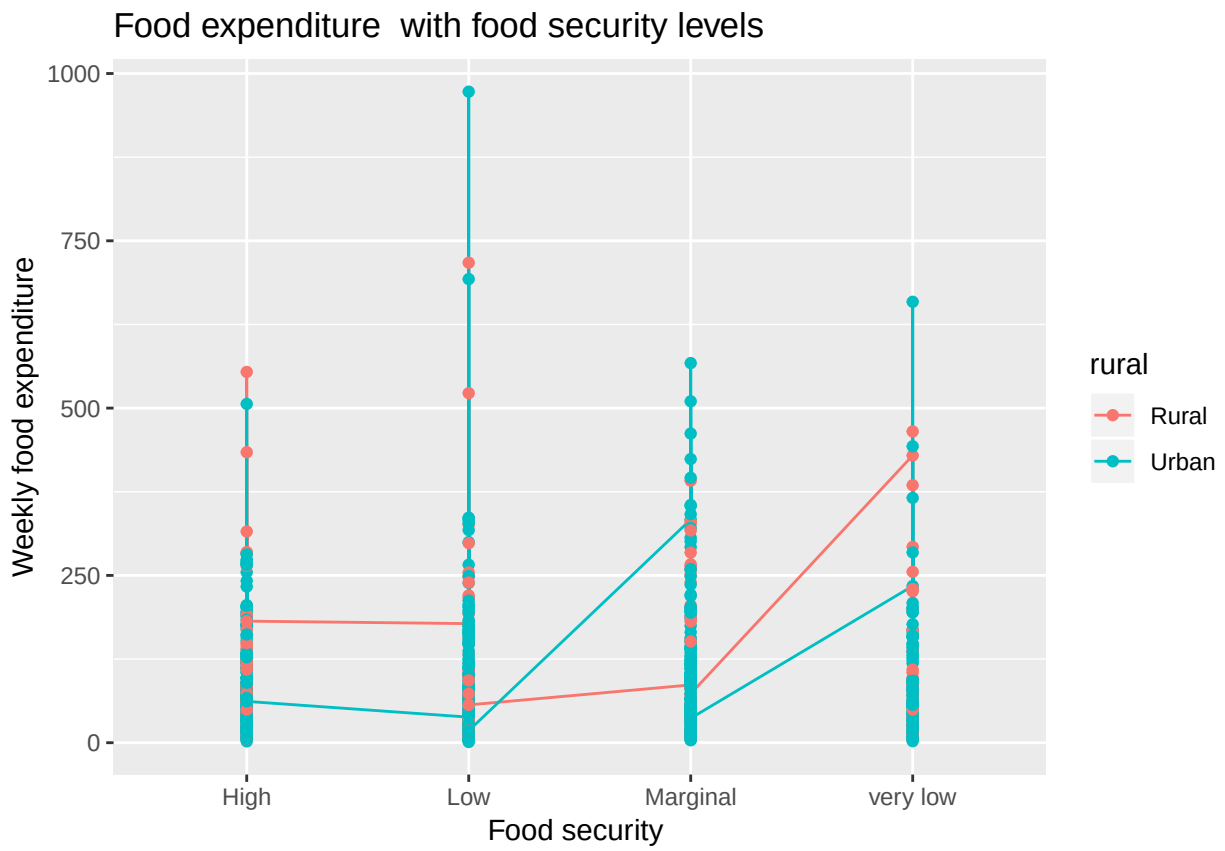

```
g3<-ggplot(data =final.data) +
  geom_bar(aes(region,ebt_snapamt, fill=region), stat = "summary", fun.y = "mean")
g3 + labs(x="Region ", y="Weekly food expenditure",title = "Food expenditure by regions")
```



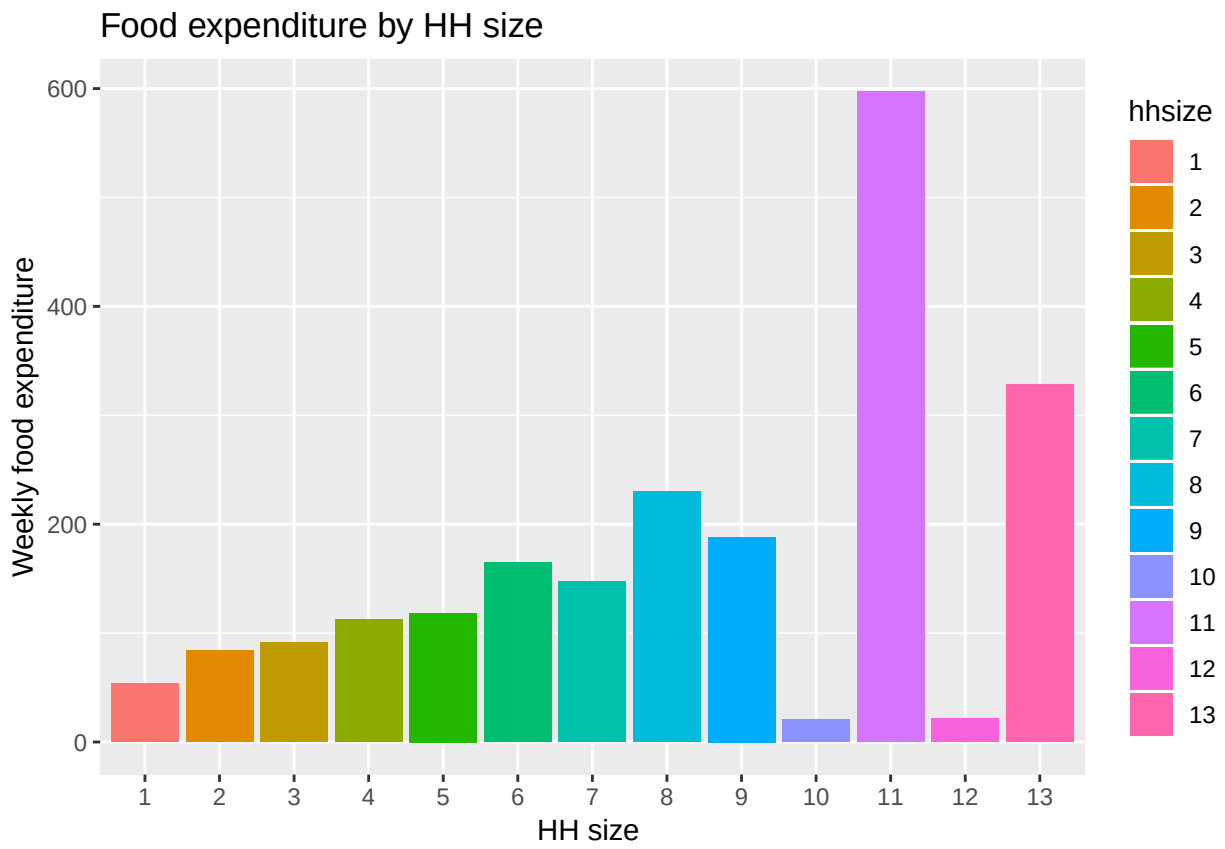

```
g4<-ggplot(data =final.data) +
  geom_bar(aes(rural,totalpaid, fill=rural), stat = "summary", fun.y = "mean")
g4 + labs(x="Rural ", y="Weekly food expenditure",title = "Food expenditure by rural and urban region")
```




```
  g5<-ggplot(final.data, aes(x=adltfscat, y=totalpaid, group=rural)) +
  geom_line(aes(color=rural))+
  geom_point(aes(color=rural))
g5+labs(x="Food security ", y="Weekly food expenditure",title = "Food expenditure  with food security le
```




```
g6<-ggplot(data =final.data) +
  geom_bar(aes(hhsize,totalpaid, fill=hhsize), stat = "summary", fun.y = "mean")
g6 + labs(x="HH size ", y="Weekly food expenditure",title = "Food expenditure by HH size")
```



Predicting model using mechine learning

```
library(caret)
```

```
## Warning: package 'caret' was built under R version 3.5.1
```

```
## Loading required package: lattice
```

```
library(randomForest)
```

```
## Warning: package 'randomForest' was built under R version 3.5.1
```

```
## randomForest 4.6-14
```

```
## Type rfNews() to see new features/changes/bug fixes.
```

```
##
## Attaching package: 'randomForest'
```

```
## The following object is masked from 'package:ggplot2':
##
##     margin
```

```
require(e1071)
```

```
## Loading required package: e1071
```

```
## Warning: package 'e1071' was built under R version 3.5.1
```

```r
set.seed(1337)

# tainControl function
train_control<-trainControl(method = "cv", number=10)

# create an index to partition data
index <- createDataPartition(final.data$total.paid, p=0.75, list=FALSE)

# spliting data in to training and testing groups
trainSet <- final.data[ index,] # 75 of data as training data and remaining test data.
testSet <- final.data[-index,]

#Feature selection using rfe in caret
#control <- rfeControl(functions = rfFuncs,method = "repeatedcv",repeats = 3,verbose = FALSE)

outcomeName<-'total.paid'

#Feature selection using rfe in caret

control <- rfeControl(functions = rfFuncs,
                      method = "repeatedcv",
                      repeats = 3,
                      verbose = FALSE)
predictors<-names(trainSet)[!names(trainSet) %in% outcomeName]
spend_Pred_Profile <- rfe(trainSet[,predictors], trainSet[,outcomeName],
                          rfeControl = control)
spend_Pred_Profile
```

```
##
## Recursive feature selection
##
## Outer resampling method: Cross-Validated (10 fold, repeated 3 times)
##
## Resampling performance over subset size:
##
##  Variables Accuracy  Kappa AccuracySD KappaSD Selected
##          4   0.9977 0.9942   0.006014 0.01498        *
##          8   0.9965 0.9914   0.008384 0.02063
##         16   0.9971 0.9928   0.006581 0.01647
##         29   0.9959 0.9897   0.008754 0.02187
##
## The top 4 variables (out of 4):
##    totalpaid, ebt_snapamt, itemstot, povthresh_hh
```

Total potential predictors

predictors<-c(“hhsize”, “region”, “rural”, “itemstot”, “anyvegetarian”,“inchhavg_r”, “liqassets”, “selfemployhh”, “anyvehicle”, “largeexp”,“adltfscat”, “foodsufficient”, “dietstatuspr”, “grocerylistfreq”, “primstoresnaptype”, “primstoredist_d”, “nutritioneduc”)

Using several combinations of explatory variabls here I finalize following variables in the final model.

```
predictors<-c("hhsize", "itemstot", "inchhavg_r", "grocerylistfreq", "primstoredist_d")

names(getModelInfo())
```

```
##   [1] "ada"                 "AdaBag"              "AdaBoost.M1"
##   [4] "adaboost"            "amdai"               "ANFIS"
##   [7] "avNNet"              "awnb"                "awtan"
##  [10] "bag"                 "bagEarth"            "bagEarthGCV"
##  [13] "bagFDA"              "bagFDAGCV"           "bam"
##  [16] "bartMachine"         "bayesglm"            "binda"
##  [19] "blackboost"          "blasso"              "blassoAveraged"
##  [22] "bridge"              "brnn"                "BstLm"
##  [25] "bstSm"               "bstTree"             "C5.0"
##  [28] "C5.0Cost"            "C5.0Rules"           "C5.0Tree"
##  [31] "cforest"             "chaid"               "CSimca"
##  [34] "ctree"               "ctree2"              "cubist"
##  [37] "dda"                 "deepboost"           "DENFIS"
##  [40] "dnn"                 "dwdLinear"           "dwdPoly"
##  [43] "dwdRadial"           "earth"               "elm"
##  [46] "enet"                "evtree"              "extraTrees"
##  [49] "fda"                 "FH.GBML"             "FIR.DM"
##  [52] "foba"                "FRBCS.CHI"           "FRBCS.W"
##  [55] "FS.HGD"              "gam"                 "gamboost"
##  [58] "gamLoess"            "gamSpline"           "gaussprLinear"
##  [61] "gaussprPoly"         "gaussprRadial"       "gbm_h2o"
##  [64] "gbm"                 "gcvEarth"            "GFS.FR.MOGUL"
##  [67] "GFS.LT.RS"           "GFS.THRIFT"          "glm.nb"
##  [70] "glm"                 "glmboost"            "glmnet_h2o"
##  [73] "glmnet"              "glmStepAIC"          "gpls"
##  [76] "hda"                 "hdda"                "hdrda"
##  [79] "HYFIS"               "icr"                 "J48"
##  [82] "JRip"                "kernelpls"           "kknn"
##  [85] "knn"                 "krlsPoly"            "krlsRadial"
##  [88] "lars"                "lars2"               "lasso"
##  [91] "lda"                 "lda2"                "leapBackward"
##  [94] "leapForward"         "leapSeq"             "Linda"
##  [97] "lm"                  "lmStepAIC"           "LMT"
## [100] "loclda"              "logicBag"            "LogitBoost"
## [103] "logreg"              "lssvmLinear"         "lssvmPoly"
## [106] "lssvmRadial"         "lvq"                 "M5"
## [109] "M5Rules"             "manb"                "mda"
## [112] "Mlda"                "mlp"                 "mlpKerasDecay"
## [115] "mlpKerasDecayCost"   "mlpKerasDropout"     "mlpKerasDropoutCost"
## [118] "mlpML"               "mlpSGD"              "mlpWeightDecay"
## [121] "mlpWeightDecayML"    "monmlp"              "msaenet"
## [124] "multinom"            "mxnet"               "mxnetAdam"
## [127] "naive_bayes"         "nb"                  "nbDiscrete"
## [130] "nbSearch"            "neuralnet"           "nnet"
## [133] "nnls"                "nodeHarvest"         "null"
## [136] "OneR"                "ordinalNet"          "ordinalRF"
## [139] "ORFlog"              "ORFpls"              "ORFridge"
## [142] "ORFsvm"              "ownn"                "pam"
## [145] "parRF"               "PART"                "partDSA"
## [148] "pcaNNet"             "pcr"                 "pda"
```

```
## [151] "pda2"                "penalized"           "PenalizedLDA"
## [154] "plr"                 "pls"                 "plsRglm"
## [157] "polr"                "ppr"                 "PRIM"
## [160] "protoclass"          "qda"                 "QdaCov"
## [163] "qrf"                 "qrnn"                "randomGLM"
## [166] "ranger"              "rbf"                 "rbfDDA"
## [169] "Rborist"             "rda"                 "regLogistic"
## [172] "relaxo"              "rf"                  "rFerns"
## [175] "RFlda"               "rfRules"             "ridge"
## [178] "rlda"                "rlm"                 "rmda"
## [181] "rocc"                "rotationForest"      "rotationForestCp"
## [184] "rpart"               "rpart1SE"            "rpart2"
## [187] "rpartCost"           "rpartScore"          "rqlasso"
## [190] "rqnc"                "RRF"                 "RRFglobal"
## [193] "rrlda"               "RSimca"              "rvmLinear"
## [196] "rvmPoly"             "rvmRadial"           "SBC"
## [199] "sda"                 "sdwd"                "simpls"
## [202] "SLAVE"               "slda"                "smda"
## [205] "snn"                 "sparseLDA"           "spikeslab"
## [208] "spls"                "stepLDA"             "stepQDA"
## [211] "superpc"             "svmBoundrangeString" "svmExpoString"
## [214] "svmLinear"           "svmLinear2"          "svmLinear3"
## [217] "svmLinearWeights"    "svmLinearWeights2"   "svmPoly"
## [220] "svmRadial"           "svmRadialCost"       "svmRadialSigma"
## [223] "svmRadialWeights"    "svmSpectrumString"   "tan"
## [226] "tanSearch"           "treebag"             "vbmpRadial"
## [229] "vglmAdjCat"          "vglmContRatio"       "vglmCumulative"
## [232] "widekernelpls"       "WM"                  "wsrf"
## [235] "xgbDART"             "xgbLinear"           "xgbTree"
## [238] "xyf"
```

Random Forest

```
model_rf<-train(trainSet[,predictors],trainSet[,outcomeName],method='rf')
print(model_rf)
```

```
## Random Forest
##
## 576 samples
##   5 predictor
##   2 classes: '0', '1'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 576, 576, 576, 576, 576, 576, ...
## Resampling results across tuning parameters:
##
##   mtry  Accuracy   Kappa
##   2     0.8855207  0.7024821
##   3     0.8818996  0.6946472
##   5     0.8712058  0.6670896
##
```

```
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was mtry = 2.
```

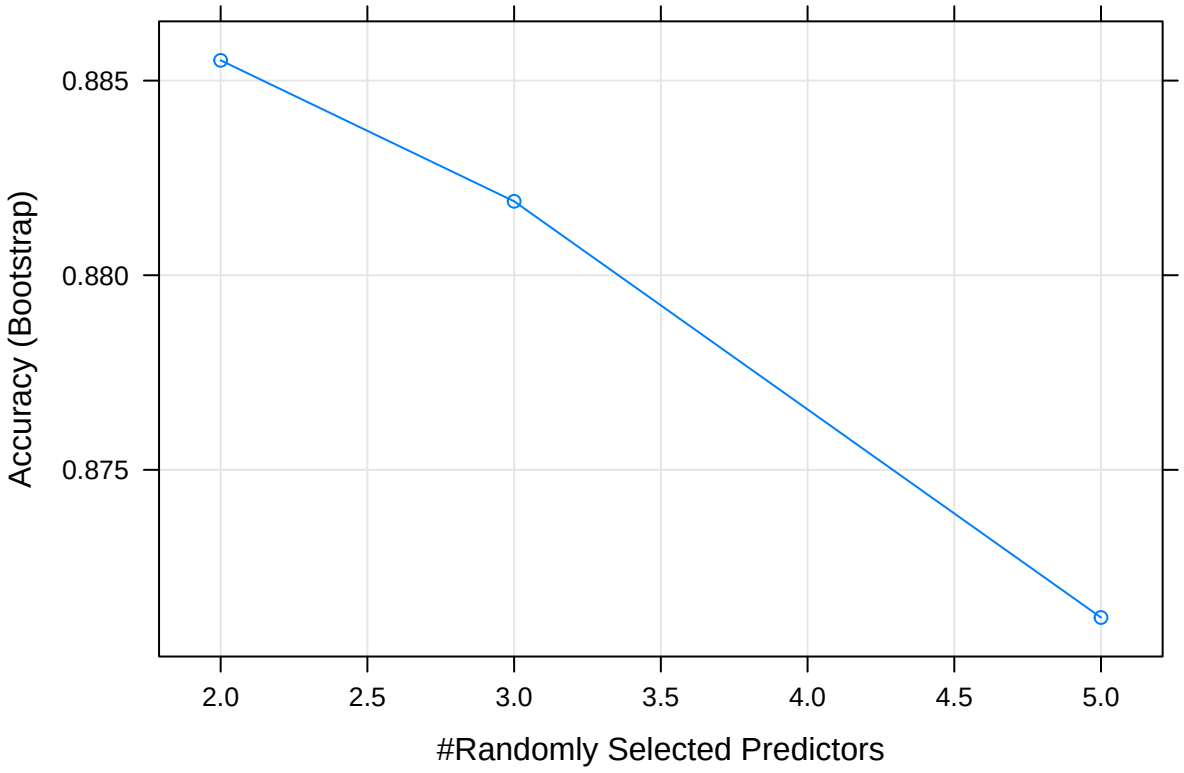
```
confusionMatrix(model_rf)
```

```
## Bootstrapped (25 reps) Confusion Matrix
##
## (entries are percentual average cell counts across resamples)
##
##           Reference
## Prediction    0    1
##          0 68.1  7.0
##          1  4.5 20.4
##
##  Accuracy (average) : 0.8852
```

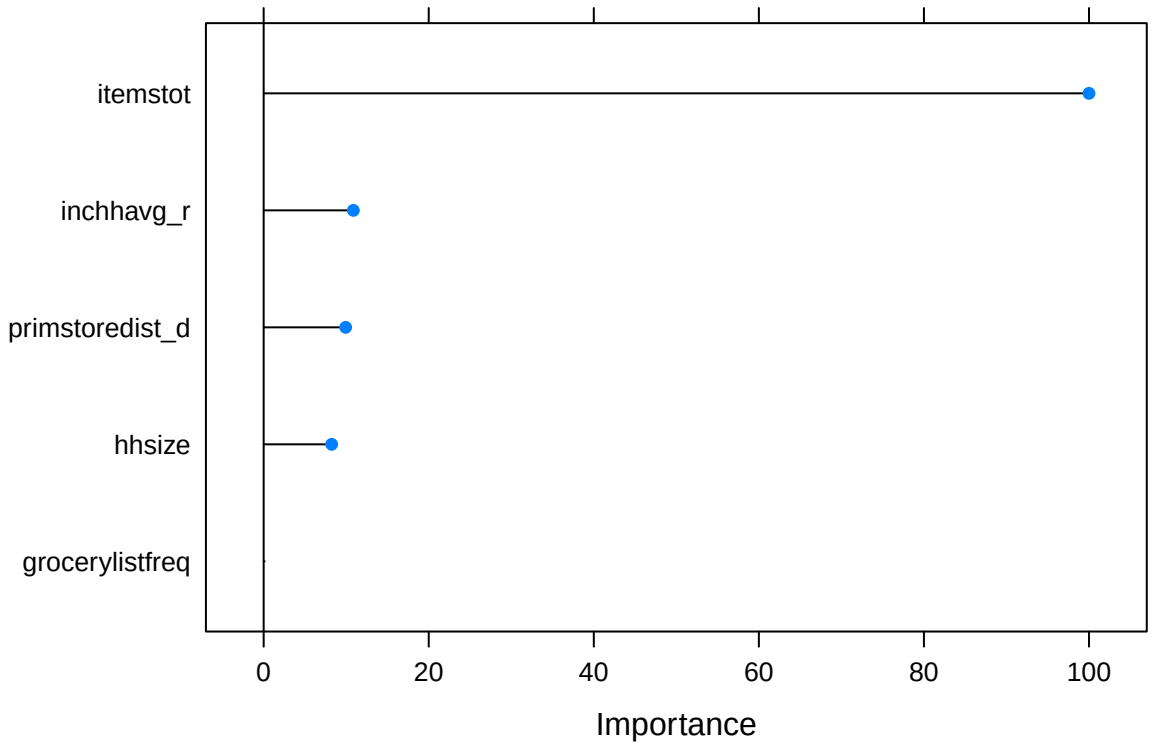
```
#Creating grid

#Checking variable importance for GLM
varImp(object=model_rf)
```

```
## rf variable importance
##
##                 Overall
## itemstot        100.000
## inchhavg_r       10.868
## primstoredist_d   9.934
## hhsize            8.243
## grocerylistfreq   0.000
```

```
#rf variable importance
plot(model_rf)
```




```
plot(varImp(object=model_rf),main="Random forest - Variable Importance")
```




```
#Predictions
predictions_rf<-predict.train(object=model_rf,testSet[,predictors],type="raw")
table(predictions_rf)
```

```
## predictions_rf
##   0   1
## 146  44
```

```
# Confusion matrix
confusionMatrix(predictions_rf,testSet[,outcomeName])
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   0   1
##          0 132  14
##          1   7  37
##
##                Accuracy : 0.8895
##                  95% CI : (0.836, 0.9303)
##     No Information Rate : 0.7316
##     P-Value [Acc > NIR] : 7.679e-08
##
##                   Kappa : 0.7058
##  Mcnemar's Test P-Value : 0.1904
##
##             Sensitivity : 0.9496
```

```
##             Specificity : 0.7255
##          Pos Pred Value : 0.9041
##          Neg Pred Value : 0.8409
##              Prevalence : 0.7316
##          Detection Rate : 0.6947
##    Detection Prevalence : 0.7684
##       Balanced Accuracy : 0.8376
##
##        'Positive' Class : 0
##
```

Stochastic Gradient Boosting

```
model_gbm<-train(trainSet[,predictors],trainSet[,outcomeName],method='gbm')
```

```
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0470             nan     0.1000    0.0592
##      2        0.9612             nan     0.1000    0.0458
##      3        0.8928             nan     0.1000    0.0380
##      4        0.8408             nan     0.1000    0.0228
##      5        0.7846             nan     0.1000    0.0243
##      6        0.7473             nan     0.1000    0.0189
##      7        0.7105             nan     0.1000    0.0175
##      8        0.6761             nan     0.1000    0.0164
##      9        0.6489             nan     0.1000    0.0127
##     10        0.6256             nan     0.1000    0.0112
##     20        0.4970             nan     0.1000    0.0020
##     40        0.4228             nan     0.1000    0.0009
##     60        0.4005             nan     0.1000   -0.0000
##     80        0.3833             nan     0.1000   -0.0011
##    100        0.3735             nan     0.1000   -0.0004
##    120        0.3652             nan     0.1000   -0.0006
##    140        0.3600             nan     0.1000   -0.0012
##    150        0.3569             nan     0.1000   -0.0017
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0433             nan     0.1000    0.0620
##      2        0.9523             nan     0.1000    0.0441
##      3        0.8725             nan     0.1000    0.0367
##      4        0.8082             nan     0.1000    0.0318
##      5        0.7555             nan     0.1000    0.0248
##      6        0.7145             nan     0.1000    0.0206
##      7        0.6785             nan     0.1000    0.0161
##      8        0.6444             nan     0.1000    0.0161
##      9        0.6191             nan     0.1000    0.0121
##     10        0.5925             nan     0.1000    0.0121
##     20        0.4593             nan     0.1000    0.0030
##     40        0.3803             nan     0.1000   -0.0000
##     60        0.3371             nan     0.1000   -0.0007
##     80        0.3037             nan     0.1000   -0.0004
##    100        0.2743             nan     0.1000   -0.0011
##    120        0.2522             nan     0.1000   -0.0006
```

```
##    140        0.2387             nan     0.1000   -0.0006
##    150        0.2290             nan     0.1000   -0.0013
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0303             nan     0.1000    0.0599
##      2        0.9378             nan     0.1000    0.0402
##      3        0.8636             nan     0.1000    0.0348
##      4        0.8023             nan     0.1000    0.0304
##      5        0.7507             nan     0.1000    0.0228
##      6        0.7061             nan     0.1000    0.0221
##      7        0.6601             nan     0.1000    0.0201
##      8        0.6253             nan     0.1000    0.0152
##      9        0.5924             nan     0.1000    0.0139
##     10        0.5671             nan     0.1000    0.0104
##     20        0.4243             nan     0.1000    0.0020
##     40        0.3238             nan     0.1000   -0.0008
##     60        0.2768             nan     0.1000   -0.0022
##     80        0.2391             nan     0.1000   -0.0003
##    100        0.2148             nan     0.1000   -0.0010
##    120        0.1871             nan     0.1000   -0.0020
##    140        0.1652             nan     0.1000   -0.0009
##    150        0.1543             nan     0.1000    0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0485             nan     0.1000    0.0556
##      2        0.9590             nan     0.1000    0.0448
##      3        0.8805             nan     0.1000    0.0368
##      4        0.8227             nan     0.1000    0.0275
##      5        0.7723             nan     0.1000    0.0222
##      6        0.7363             nan     0.1000    0.0189
##      7        0.7017             nan     0.1000    0.0169
##      8        0.6735             nan     0.1000    0.0135
##      9        0.6469             nan     0.1000    0.0130
##     10        0.6261             nan     0.1000    0.0112
##     20        0.4934             nan     0.1000    0.0046
##     40        0.4181             nan     0.1000    0.0002
##     60        0.3845             nan     0.1000   -0.0003
##     80        0.3652             nan     0.1000    0.0001
##    100        0.3558             nan     0.1000   -0.0030
##    120        0.3444             nan     0.1000   -0.0005
##    140        0.3384             nan     0.1000   -0.0010
##    150        0.3344             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0403             nan     0.1000    0.0599
##      2        0.9426             nan     0.1000    0.0469
##      3        0.8695             nan     0.1000    0.0385
##      4        0.8090             nan     0.1000    0.0288
##      5        0.7604             nan     0.1000    0.0228
##      6        0.7174             nan     0.1000    0.0218
##      7        0.6777             nan     0.1000    0.0157
##      8        0.6458             nan     0.1000    0.0170
##      9        0.6193             nan     0.1000    0.0100
##     10        0.5985             nan     0.1000    0.0088
```

```
##     20        0.4582             nan     0.1000    0.0027
##     40        0.3740             nan     0.1000   -0.0003
##     60        0.3431             nan     0.1000   -0.0015
##     80        0.3076             nan     0.1000   -0.0017
##    100        0.2825             nan     0.1000   -0.0012
##    120        0.2613             nan     0.1000   -0.0013
##    140        0.2416             nan     0.1000   -0.0011
##    150        0.2333             nan     0.1000   -0.0011
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0299             nan     0.1000    0.0642
##      2        0.9357             nan     0.1000    0.0453
##      3        0.8576             nan     0.1000    0.0360
##      4        0.7920             nan     0.1000    0.0320
##      5        0.7398             nan     0.1000    0.0241
##      6        0.6920             nan     0.1000    0.0223
##      7        0.6546             nan     0.1000    0.0176
##      8        0.6200             nan     0.1000    0.0155
##      9        0.5890             nan     0.1000    0.0143
##     10        0.5638             nan     0.1000    0.0107
##     20        0.4272             nan     0.1000    0.0028
##     40        0.3361             nan     0.1000    0.0007
##     60        0.2882             nan     0.1000    0.0000
##     80        0.2547             nan     0.1000   -0.0015
##    100        0.2207             nan     0.1000   -0.0009
##    120        0.1868             nan     0.1000   -0.0007
##    140        0.1680             nan     0.1000   -0.0007
##    150        0.1592             nan     0.1000   -0.0014
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0145             nan     0.1000    0.0649
##      2        0.9163             nan     0.1000    0.0484
##      3        0.8400             nan     0.1000    0.0361
##      4        0.7824             nan     0.1000    0.0291
##      5        0.7298             nan     0.1000    0.0245
##      6        0.6841             nan     0.1000    0.0219
##      7        0.6506             nan     0.1000    0.0152
##      8        0.6174             nan     0.1000    0.0152
##      9        0.5901             nan     0.1000    0.0118
##     10        0.5672             nan     0.1000    0.0112
##     20        0.4445             nan     0.1000    0.0001
##     40        0.3673             nan     0.1000   -0.0010
##     60        0.3278             nan     0.1000   -0.0001
##     80        0.3085             nan     0.1000    0.0002
##    100        0.2942             nan     0.1000   -0.0013
##    120        0.2847             nan     0.1000   -0.0013
##    140        0.2747             nan     0.1000   -0.0006
##    150        0.2708             nan     0.1000   -0.0013
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0034             nan     0.1000    0.0592
##      2        0.9036             nan     0.1000    0.0505
##      3        0.8236             nan     0.1000    0.0406
##      4        0.7585             nan     0.1000    0.0281
```

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##      5        0.7071             nan     0.1000    0.0228
##      6        0.6634             nan     0.1000    0.0209
##      7        0.6274             nan     0.1000    0.0175
##      8        0.5970             nan     0.1000    0.0148
##      9        0.5696             nan     0.1000    0.0140
##     10        0.5487             nan     0.1000    0.0092
##     20        0.4115             nan     0.1000    0.0031
##     40        0.3116             nan     0.1000    0.0009
##     60        0.2679             nan     0.1000   -0.0007
##     80        0.2427             nan     0.1000   -0.0011
##    100        0.2235             nan     0.1000   -0.0018
##    120        0.1975             nan     0.1000   -0.0004
##    140        0.1803             nan     0.1000   -0.0009
##    150        0.1734             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0070             nan     0.1000    0.0662
##      2        0.9079             nan     0.1000    0.0478
##      3        0.8258             nan     0.1000    0.0351
##      4        0.7605             nan     0.1000    0.0338
##      5        0.7033             nan     0.1000    0.0242
##      6        0.6549             nan     0.1000    0.0216
##      7        0.6149             nan     0.1000    0.0185
##      8        0.5795             nan     0.1000    0.0161
##      9        0.5514             nan     0.1000    0.0108
##     10        0.5249             nan     0.1000    0.0102
##     20        0.3825             nan     0.1000    0.0015
##     40        0.2756             nan     0.1000   -0.0008
##     60        0.2197             nan     0.1000    0.0000
##     80        0.1795             nan     0.1000   -0.0009
##    100        0.1510             nan     0.1000   -0.0009
##    120        0.1322             nan     0.1000   -0.0004
##    140        0.1133             nan     0.1000   -0.0007
##    150        0.1049             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0434             nan     0.1000    0.0541
##      2        0.9537             nan     0.1000    0.0434
##      3        0.8791             nan     0.1000    0.0345
##      4        0.8239             nan     0.1000    0.0286
##      5        0.7793             nan     0.1000    0.0222
##      6        0.7347             nan     0.1000    0.0233
##      7        0.6984             nan     0.1000    0.0186
##      8        0.6716             nan     0.1000    0.0136
##      9        0.6405             nan     0.1000    0.0152
##     10        0.6119             nan     0.1000    0.0124
##     20        0.4780             nan     0.1000    0.0027
##     40        0.4109             nan     0.1000   -0.0002
##     60        0.3846             nan     0.1000   -0.0007
##     80        0.3682             nan     0.1000   -0.0017
##    100        0.3539             nan     0.1000   -0.0007
##    120        0.3457             nan     0.1000   -0.0018
##    140        0.3376             nan     0.1000   -0.0007
##    150        0.3361             nan     0.1000   -0.0007
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0318             nan     0.1000    0.0654
##      2        0.9329             nan     0.1000    0.0497
##      3        0.8564             nan     0.1000    0.0370
##      4        0.7976             nan     0.1000    0.0269
##      5        0.7412             nan     0.1000    0.0241
##      6        0.7005             nan     0.1000    0.0203
##      7        0.6634             nan     0.1000    0.0173
##      8        0.6294             nan     0.1000    0.0161
##      9        0.6032             nan     0.1000    0.0108
##     10        0.5767             nan     0.1000    0.0105
##     20        0.4504             nan     0.1000    0.0020
##     40        0.3694             nan     0.1000   -0.0004
##     60        0.3364             nan     0.1000   -0.0004
##     80        0.3034             nan     0.1000   -0.0018
##    100        0.2833             nan     0.1000   -0.0010
##    120        0.2632             nan     0.1000   -0.0012
##    140        0.2443             nan     0.1000   -0.0033
##    150        0.2363             nan     0.1000   -0.0012
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0244             nan     0.1000    0.0628
##      2        0.9310             nan     0.1000    0.0491
##      3        0.8528             nan     0.1000    0.0366
##      4        0.7917             nan     0.1000    0.0324
##      5        0.7356             nan     0.1000    0.0239
##      6        0.6939             nan     0.1000    0.0206
##      7        0.6501             nan     0.1000    0.0172
##      8        0.6167             nan     0.1000    0.0154
##      9        0.5895             nan     0.1000    0.0121
##     10        0.5611             nan     0.1000    0.0133
##     20        0.4213             nan     0.1000    0.0009
##     40        0.3246             nan     0.1000    0.0011
##     60        0.2828             nan     0.1000   -0.0006
##     80        0.2449             nan     0.1000   -0.0008
##    100        0.2118             nan     0.1000   -0.0000
##    120        0.1895             nan     0.1000   -0.0009
##    140        0.1718             nan     0.1000   -0.0011
##    150        0.1632             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0413             nan     0.1000    0.0485
##      2        0.9655             nan     0.1000    0.0407
##      3        0.9032             nan     0.1000    0.0282
##      4        0.8508             nan     0.1000    0.0269
##      5        0.8107             nan     0.1000    0.0193
##      6        0.7770             nan     0.1000    0.0165
##      7        0.7398             nan     0.1000    0.0181
##      8        0.7140             nan     0.1000    0.0126
##      9        0.6877             nan     0.1000    0.0131
##     10        0.6677             nan     0.1000    0.0085
##     20        0.5497             nan     0.1000    0.0035
##     40        0.4844             nan     0.1000    0.0006
```

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##     60        0.4472             nan     0.1000   -0.0006
##     80        0.4246             nan     0.1000   -0.0013
##    100        0.4089             nan     0.1000   -0.0007
##    120        0.3982             nan     0.1000   -0.0021
##    140        0.3877             nan     0.1000   -0.0001
##    150        0.3829             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0272             nan     0.1000    0.0609
##      2        0.9432             nan     0.1000    0.0372
##      3        0.8752             nan     0.1000    0.0360
##      4        0.8223             nan     0.1000    0.0236
##      5        0.7742             nan     0.1000    0.0232
##      6        0.7350             nan     0.1000    0.0192
##      7        0.7063             nan     0.1000    0.0129
##      8        0.6801             nan     0.1000    0.0115
##      9        0.6546             nan     0.1000    0.0102
##     10        0.6358             nan     0.1000    0.0085
##     20        0.5127             nan     0.1000    0.0032
##     40        0.4315             nan     0.1000   -0.0007
##     60        0.3798             nan     0.1000   -0.0007
##     80        0.3421             nan     0.1000   -0.0007
##    100        0.3067             nan     0.1000   -0.0005
##    120        0.2812             nan     0.1000   -0.0010
##    140        0.2612             nan     0.1000   -0.0017
##    150        0.2495             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0345             nan     0.1000    0.0580
##      2        0.9387             nan     0.1000    0.0481
##      3        0.8702             nan     0.1000    0.0328
##      4        0.8150             nan     0.1000    0.0265
##      5        0.7624             nan     0.1000    0.0231
##      6        0.7244             nan     0.1000    0.0176
##      7        0.6881             nan     0.1000    0.0148
##      8        0.6564             nan     0.1000    0.0154
##      9        0.6357             nan     0.1000    0.0078
##     10        0.6132             nan     0.1000    0.0068
##     20        0.4753             nan     0.1000    0.0026
##     40        0.3750             nan     0.1000    0.0005
##     60        0.3160             nan     0.1000    0.0011
##     80        0.2748             nan     0.1000   -0.0008
##    100        0.2435             nan     0.1000   -0.0005
##    120        0.2152             nan     0.1000    0.0003
##    140        0.1918             nan     0.1000   -0.0005
##    150        0.1796             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0241             nan     0.1000    0.0575
##      2        0.9354             nan     0.1000    0.0414
##      3        0.8751             nan     0.1000    0.0332
##      4        0.8252             nan     0.1000    0.0279
##      5        0.7764             nan     0.1000    0.0218
##      6        0.7330             nan     0.1000    0.0202
```

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##      7        0.7012             nan     0.1000    0.0143
##      8        0.6755             nan     0.1000    0.0127
##      9        0.6523             nan     0.1000    0.0115
##     10        0.6231             nan     0.1000    0.0121
##     20        0.5028             nan     0.1000    0.0022
##     40        0.4162             nan     0.1000    0.0020
##     60        0.3749             nan     0.1000   -0.0011
##     80        0.3537             nan     0.1000   -0.0019
##    100        0.3373             nan     0.1000   -0.0003
##    120        0.3258             nan     0.1000   -0.0013
##    140        0.3139             nan     0.1000   -0.0003
##    150        0.3075             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0154             nan     0.1000    0.0626
##      2        0.9259             nan     0.1000    0.0441
##      3        0.8553             nan     0.1000    0.0331
##      4        0.7989             nan     0.1000    0.0293
##      5        0.7525             nan     0.1000    0.0212
##      6        0.7074             nan     0.1000    0.0217
##      7        0.6712             nan     0.1000    0.0176
##      8        0.6398             nan     0.1000    0.0140
##      9        0.6127             nan     0.1000    0.0129
##     10        0.5880             nan     0.1000    0.0096
##     20        0.4508             nan     0.1000    0.0025
##     40        0.3517             nan     0.1000   -0.0007
##     60        0.3071             nan     0.1000    0.0000
##     80        0.2684             nan     0.1000   -0.0002
##    100        0.2338             nan     0.1000   -0.0010
##    120        0.2096             nan     0.1000   -0.0002
##    140        0.1893             nan     0.1000   -0.0011
##    150        0.1802             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0057             nan     0.1000    0.0630
##      2        0.9160             nan     0.1000    0.0438
##      3        0.8394             nan     0.1000    0.0389
##      4        0.7791             nan     0.1000    0.0288
##      5        0.7278             nan     0.1000    0.0228
##      6        0.6883             nan     0.1000    0.0181
##      7        0.6486             nan     0.1000    0.0177
##      8        0.6135             nan     0.1000    0.0157
##      9        0.5842             nan     0.1000    0.0122
##     10        0.5616             nan     0.1000    0.0104
##     20        0.4062             nan     0.1000    0.0029
##     40        0.2999             nan     0.1000   -0.0002
##     60        0.2428             nan     0.1000   -0.0009
##     80        0.2004             nan     0.1000   -0.0005
##    100        0.1671             nan     0.1000   -0.0004
##    120        0.1416             nan     0.1000   -0.0016
##    140        0.1211             nan     0.1000   -0.0008
##    150        0.1121             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

```
##      1        1.0726             nan     0.1000    0.0557
##      2        0.9869             nan     0.1000    0.0433
##      3        0.9174             nan     0.1000    0.0351
##      4        0.8611             nan     0.1000    0.0245
##      5        0.8086             nan     0.1000    0.0241
##      6        0.7667             nan     0.1000    0.0196
##      7        0.7292             nan     0.1000    0.0174
##      8        0.6941             nan     0.1000    0.0165
##      9        0.6667             nan     0.1000    0.0119
##     10        0.6459             nan     0.1000    0.0096
##     20        0.5132             nan     0.1000   -0.0004
##     40        0.4362             nan     0.1000    0.0005
##     60        0.4068             nan     0.1000   -0.0006
##     80        0.3930             nan     0.1000   -0.0006
##    100        0.3833             nan     0.1000   -0.0002
##    120        0.3731             nan     0.1000   -0.0004
##    140        0.3684             nan     0.1000   -0.0013
##    150        0.3649             nan     0.1000   -0.0018
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0744             nan     0.1000    0.0560
##      2        0.9769             nan     0.1000    0.0497
##      3        0.9011             nan     0.1000    0.0352
##      4        0.8385             nan     0.1000    0.0323
##      5        0.7835             nan     0.1000    0.0250
##      6        0.7378             nan     0.1000    0.0205
##      7        0.6970             nan     0.1000    0.0194
##      8        0.6648             nan     0.1000    0.0147
##      9        0.6377             nan     0.1000    0.0123
##     10        0.6106             nan     0.1000    0.0128
##     20        0.4726             nan     0.1000    0.0044
##     40        0.3797             nan     0.1000   -0.0006
##     60        0.3404             nan     0.1000   -0.0008
##     80        0.3113             nan     0.1000   -0.0012
##    100        0.2894             nan     0.1000   -0.0012
##    120        0.2673             nan     0.1000   -0.0008
##    140        0.2422             nan     0.1000   -0.0006
##    150        0.2324             nan     0.1000   -0.0011
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0659             nan     0.1000    0.0609
##      2        0.9692             nan     0.1000    0.0441
##      3        0.8895             nan     0.1000    0.0399
##      4        0.8225             nan     0.1000    0.0323
##      5        0.7674             nan     0.1000    0.0253
##      6        0.7137             nan     0.1000    0.0233
##      7        0.6777             nan     0.1000    0.0178
##      8        0.6438             nan     0.1000    0.0145
##      9        0.6102             nan     0.1000    0.0114
##     10        0.5820             nan     0.1000    0.0128
##     20        0.4287             nan     0.1000    0.0031
##     40        0.3355             nan     0.1000   -0.0008
##     60        0.2802             nan     0.1000   -0.0010
##     80        0.2373             nan     0.1000   -0.0010
```

```
##    100        0.2127             nan     0.1000   -0.0030
##    120        0.1868             nan     0.1000   -0.0007
##    140        0.1647             nan     0.1000   -0.0010
##    150        0.1548             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0073             nan     0.1000    0.0541
##      2        0.9178             nan     0.1000    0.0422
##      3        0.8519             nan     0.1000    0.0319
##      4        0.7899             nan     0.1000    0.0284
##      5        0.7438             nan     0.1000    0.0210
##      6        0.6983             nan     0.1000    0.0200
##      7        0.6645             nan     0.1000    0.0172
##      8        0.6362             nan     0.1000    0.0128
##      9        0.6050             nan     0.1000    0.0119
##     10        0.5861             nan     0.1000    0.0083
##     20        0.4753             nan     0.1000   -0.0005
##     40        0.4080             nan     0.1000    0.0007
##     60        0.3751             nan     0.1000   -0.0011
##     80        0.3533             nan     0.1000   -0.0004
##    100        0.3401             nan     0.1000    0.0001
##    120        0.3219             nan     0.1000   -0.0004
##    140        0.3109             nan     0.1000   -0.0009
##    150        0.3058             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9896             nan     0.1000    0.0613
##      2        0.8996             nan     0.1000    0.0445
##      3        0.8250             nan     0.1000    0.0388
##      4        0.7694             nan     0.1000    0.0296
##      5        0.7295             nan     0.1000    0.0174
##      6        0.6848             nan     0.1000    0.0190
##      7        0.6474             nan     0.1000    0.0176
##      8        0.6152             nan     0.1000    0.0155
##      9        0.5855             nan     0.1000    0.0117
##     10        0.5655             nan     0.1000    0.0091
##     20        0.4445             nan     0.1000    0.0023
##     40        0.3497             nan     0.1000   -0.0007
##     60        0.3074             nan     0.1000   -0.0016
##     80        0.2728             nan     0.1000   -0.0006
##    100        0.2430             nan     0.1000   -0.0005
##    120        0.2248             nan     0.1000   -0.0014
##    140        0.2102             nan     0.1000   -0.0007
##    150        0.2010             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9899             nan     0.1000    0.0643
##      2        0.8949             nan     0.1000    0.0404
##      3        0.8123             nan     0.1000    0.0375
##      4        0.7506             nan     0.1000    0.0262
##      5        0.6990             nan     0.1000    0.0242
##      6        0.6565             nan     0.1000    0.0214
##      7        0.6196             nan     0.1000    0.0171
##      8        0.5883             nan     0.1000    0.0129
```

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##      9        0.5616             nan     0.1000    0.0127
##     10        0.5406             nan     0.1000    0.0088
##     20        0.3972             nan     0.1000    0.0023
##     40        0.2993             nan     0.1000   -0.0002
##     60        0.2451             nan     0.1000   -0.0006
##     80        0.2038             nan     0.1000   -0.0000
##    100        0.1756             nan     0.1000   -0.0009
##    120        0.1524             nan     0.1000   -0.0000
##    140        0.1291             nan     0.1000   -0.0008
##    150        0.1217             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0902             nan     0.1000    0.0550
##      2        1.0131             nan     0.1000    0.0387
##      3        0.9455             nan     0.1000    0.0349
##      4        0.8844             nan     0.1000    0.0288
##      5        0.8358             nan     0.1000    0.0242
##      6        0.7956             nan     0.1000    0.0184
##      7        0.7562             nan     0.1000    0.0183
##      8        0.7271             nan     0.1000    0.0149
##      9        0.6988             nan     0.1000    0.0134
##     10        0.6738             nan     0.1000    0.0102
##     20        0.5488             nan     0.1000    0.0026
##     40        0.4550             nan     0.1000   -0.0001
##     60        0.4054             nan     0.1000   -0.0002
##     80        0.3856             nan     0.1000   -0.0010
##    100        0.3711             nan     0.1000   -0.0008
##    120        0.3587             nan     0.1000   -0.0015
##    140        0.3530             nan     0.1000   -0.0011
##    150        0.3482             nan     0.1000   -0.0012
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0849             nan     0.1000    0.0568
##      2        0.9940             nan     0.1000    0.0470
##      3        0.9218             nan     0.1000    0.0367
##      4        0.8616             nan     0.1000    0.0303
##      5        0.8108             nan     0.1000    0.0266
##      6        0.7710             nan     0.1000    0.0174
##      7        0.7298             nan     0.1000    0.0179
##      8        0.6944             nan     0.1000    0.0146
##      9        0.6665             nan     0.1000    0.0123
##     10        0.6414             nan     0.1000    0.0103
##     20        0.4868             nan     0.1000    0.0016
##     40        0.3837             nan     0.1000    0.0022
##     60        0.3353             nan     0.1000   -0.0011
##     80        0.2954             nan     0.1000   -0.0005
##    100        0.2682             nan     0.1000   -0.0012
##    120        0.2459             nan     0.1000   -0.0009
##    140        0.2293             nan     0.1000   -0.0013
##    150        0.2232             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0737             nan     0.1000    0.0623
##      2        0.9753             nan     0.1000    0.0450
```

```
##      3        0.8936             nan     0.1000    0.0397
##      4        0.8255             nan     0.1000    0.0297
##      5        0.7714             nan     0.1000    0.0244
##      6        0.7281             nan     0.1000    0.0196
##      7        0.6936             nan     0.1000    0.0161
##      8        0.6658             nan     0.1000    0.0123
##      9        0.6339             nan     0.1000    0.0136
##     10        0.6088             nan     0.1000    0.0123
##     20        0.4475             nan     0.1000    0.0023
##     40        0.3329             nan     0.1000   -0.0020
##     60        0.2783             nan     0.1000   -0.0002
##     80        0.2392             nan     0.1000   -0.0015
##    100        0.2113             nan     0.1000   -0.0008
##    120        0.1914             nan     0.1000   -0.0011
##    140        0.1665             nan     0.1000   -0.0009
##    150        0.1564             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0877             nan     0.1000    0.0548
##      2        1.0003             nan     0.1000    0.0419
##      3        0.9406             nan     0.1000    0.0317
##      4        0.8867             nan     0.1000    0.0279
##      5        0.8440             nan     0.1000    0.0245
##      6        0.8029             nan     0.1000    0.0199
##      7        0.7677             nan     0.1000    0.0174
##      8        0.7412             nan     0.1000    0.0121
##      9        0.7189             nan     0.1000    0.0108
##     10        0.6952             nan     0.1000    0.0115
##     20        0.5655             nan     0.1000    0.0036
##     40        0.4854             nan     0.1000   -0.0017
##     60        0.4510             nan     0.1000   -0.0003
##     80        0.4311             nan     0.1000   -0.0006
##    100        0.4177             nan     0.1000   -0.0013
##    120        0.4063             nan     0.1000   -0.0010
##    140        0.3975             nan     0.1000   -0.0010
##    150        0.3955             nan     0.1000   -0.0015
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0862             nan     0.1000    0.0555
##      2        1.0025             nan     0.1000    0.0369
##      3        0.9276             nan     0.1000    0.0368
##      4        0.8625             nan     0.1000    0.0317
##      5        0.8101             nan     0.1000    0.0241
##      6        0.7752             nan     0.1000    0.0164
##      7        0.7379             nan     0.1000    0.0176
##      8        0.7043             nan     0.1000    0.0153
##      9        0.6782             nan     0.1000    0.0118
##     10        0.6557             nan     0.1000    0.0089
##     20        0.5131             nan     0.1000    0.0025
##     40        0.4261             nan     0.1000   -0.0012
##     60        0.3754             nan     0.1000   -0.0006
##     80        0.3401             nan     0.1000   -0.0010
##    100        0.3135             nan     0.1000   -0.0010
##    120        0.2865             nan     0.1000   -0.0008
```

```
##    140        0.2706             nan     0.1000   -0.0010
##    150        0.2608             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0789             nan     0.1000    0.0626
##      2        0.9869             nan     0.1000    0.0472
##      3        0.9139             nan     0.1000    0.0379
##      4        0.8485             nan     0.1000    0.0299
##      5        0.8006             nan     0.1000    0.0213
##      6        0.7589             nan     0.1000    0.0156
##      7        0.7158             nan     0.1000    0.0191
##      8        0.6811             nan     0.1000    0.0123
##      9        0.6524             nan     0.1000    0.0131
##     10        0.6256             nan     0.1000    0.0102
##     20        0.4782             nan     0.1000    0.0030
##     40        0.3689             nan     0.1000   -0.0007
##     60        0.3169             nan     0.1000   -0.0011
##     80        0.2789             nan     0.1000   -0.0003
##    100        0.2443             nan     0.1000   -0.0009
##    120        0.2168             nan     0.1000   -0.0013
##    140        0.1913             nan     0.1000   -0.0002
##    150        0.1766             nan     0.1000    0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0985             nan     0.1000    0.0574
##      2        1.0058             nan     0.1000    0.0472
##      3        0.9323             nan     0.1000    0.0383
##      4        0.8694             nan     0.1000    0.0310
##      5        0.8114             nan     0.1000    0.0253
##      6        0.7650             nan     0.1000    0.0219
##      7        0.7263             nan     0.1000    0.0191
##      8        0.6938             nan     0.1000    0.0163
##      9        0.6652             nan     0.1000    0.0139
##     10        0.6352             nan     0.1000    0.0124
##     20        0.4939             nan     0.1000    0.0046
##     40        0.4153             nan     0.1000    0.0006
##     60        0.3756             nan     0.1000   -0.0024
##     80        0.3516             nan     0.1000   -0.0006
##    100        0.3373             nan     0.1000   -0.0017
##    120        0.3257             nan     0.1000   -0.0004
##    140        0.3143             nan     0.1000   -0.0012
##    150        0.3090             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0847             nan     0.1000    0.0662
##      2        0.9852             nan     0.1000    0.0490
##      3        0.9034             nan     0.1000    0.0409
##      4        0.8392             nan     0.1000    0.0333
##      5        0.7843             nan     0.1000    0.0241
##      6        0.7368             nan     0.1000    0.0231
##      7        0.6919             nan     0.1000    0.0195
##      8        0.6593             nan     0.1000    0.0152
##      9        0.6271             nan     0.1000    0.0152
##     10        0.6032             nan     0.1000    0.0086
```

```
##     20        0.4536             nan     0.1000    0.0034
##     40        0.3621             nan     0.1000   -0.0001
##     60        0.3095             nan     0.1000   -0.0005
##     80        0.2705             nan     0.1000   -0.0015
##    100        0.2469             nan     0.1000   -0.0009
##    120        0.2215             nan     0.1000   -0.0021
##    140        0.2055             nan     0.1000   -0.0001
##    150        0.1960             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0842             nan     0.1000    0.0635
##      2        0.9830             nan     0.1000    0.0514
##      3        0.9019             nan     0.1000    0.0388
##      4        0.8324             nan     0.1000    0.0347
##      5        0.7743             nan     0.1000    0.0279
##      6        0.7227             nan     0.1000    0.0241
##      7        0.6825             nan     0.1000    0.0199
##      8        0.6437             nan     0.1000    0.0172
##      9        0.6076             nan     0.1000    0.0165
##     10        0.5806             nan     0.1000    0.0128
##     20        0.4121             nan     0.1000    0.0042
##     40        0.2980             nan     0.1000   -0.0026
##     60        0.2383             nan     0.1000    0.0001
##     80        0.1982             nan     0.1000   -0.0016
##    100        0.1696             nan     0.1000   -0.0004
##    120        0.1429             nan     0.1000   -0.0005
##    140        0.1225             nan     0.1000   -0.0008
##    150        0.1127             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0270             nan     0.1000    0.0455
##      2        0.9567             nan     0.1000    0.0319
##      3        0.8948             nan     0.1000    0.0258
##      4        0.8521             nan     0.1000    0.0226
##      5        0.8179             nan     0.1000    0.0180
##      6        0.7884             nan     0.1000    0.0161
##      7        0.7573             nan     0.1000    0.0151
##      8        0.7347             nan     0.1000    0.0089
##      9        0.7121             nan     0.1000    0.0111
##     10        0.6959             nan     0.1000    0.0070
##     20        0.5855             nan     0.1000    0.0025
##     40        0.5012             nan     0.1000   -0.0000
##     60        0.4657             nan     0.1000   -0.0003
##     80        0.4489             nan     0.1000   -0.0005
##    100        0.4364             nan     0.1000   -0.0011
##    120        0.4206             nan     0.1000   -0.0008
##    140        0.4131             nan     0.1000   -0.0009
##    150        0.4074             nan     0.1000   -0.0016
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0176             nan     0.1000    0.0569
##      2        0.9384             nan     0.1000    0.0374
##      3        0.8764             nan     0.1000    0.0322
##      4        0.8335             nan     0.1000    0.0222
```

```
##      5        0.7927             nan     0.1000    0.0189
##      6        0.7578             nan     0.1000    0.0137
##      7        0.7248             nan     0.1000    0.0140
##      8        0.6983             nan     0.1000    0.0116
##      9        0.6775             nan     0.1000    0.0103
##     10        0.6574             nan     0.1000    0.0075
##     20        0.5447             nan     0.1000    0.0033
##     40        0.4478             nan     0.1000   -0.0001
##     60        0.3951             nan     0.1000   -0.0009
##     80        0.3610             nan     0.1000   -0.0010
##    100        0.3299             nan     0.1000   -0.0006
##    120        0.3011             nan     0.1000   -0.0004
##    140        0.2774             nan     0.1000   -0.0005
##    150        0.2648             nan     0.1000    0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0180             nan     0.1000    0.0515
##      2        0.9367             nan     0.1000    0.0419
##      3        0.8735             nan     0.1000    0.0283
##      4        0.8171             nan     0.1000    0.0220
##      5        0.7712             nan     0.1000    0.0211
##      6        0.7331             nan     0.1000    0.0184
##      7        0.7032             nan     0.1000    0.0105
##      8        0.6749             nan     0.1000    0.0100
##      9        0.6488             nan     0.1000    0.0113
##     10        0.6305             nan     0.1000    0.0067
##     20        0.5017             nan     0.1000    0.0021
##     40        0.3872             nan     0.1000    0.0017
##     60        0.3214             nan     0.1000   -0.0001
##     80        0.2756             nan     0.1000   -0.0013
##    100        0.2444             nan     0.1000   -0.0007
##    120        0.2159             nan     0.1000   -0.0012
##    140        0.1908             nan     0.1000   -0.0001
##    150        0.1792             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0866             nan     0.1000    0.0508
##      2        1.0033             nan     0.1000    0.0368
##      3        0.9408             nan     0.1000    0.0280
##      4        0.8922             nan     0.1000    0.0224
##      5        0.8511             nan     0.1000    0.0210
##      6        0.8172             nan     0.1000    0.0171
##      7        0.7809             nan     0.1000    0.0158
##      8        0.7508             nan     0.1000    0.0134
##      9        0.7287             nan     0.1000    0.0103
##     10        0.7081             nan     0.1000    0.0083
##     20        0.5978             nan     0.1000    0.0009
##     40        0.5191             nan     0.1000    0.0003
##     60        0.4905             nan     0.1000    0.0007
##     80        0.4688             nan     0.1000   -0.0008
##    100        0.4590             nan     0.1000   -0.0007
##    120        0.4485             nan     0.1000   -0.0016
##    140        0.4383             nan     0.1000   -0.0005
##    150        0.4322             nan     0.1000   -0.0014
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0806             nan     0.1000    0.0608
##      2        0.9980             nan     0.1000    0.0454
##      3        0.9288             nan     0.1000    0.0339
##      4        0.8692             nan     0.1000    0.0283
##      5        0.8209             nan     0.1000    0.0224
##      6        0.7812             nan     0.1000    0.0178
##      7        0.7486             nan     0.1000    0.0165
##      8        0.7191             nan     0.1000    0.0125
##      9        0.6939             nan     0.1000    0.0111
##     10        0.6744             nan     0.1000    0.0077
##     20        0.5436             nan     0.1000    0.0025
##     40        0.4644             nan     0.1000   -0.0005
##     60        0.4061             nan     0.1000   -0.0007
##     80        0.3678             nan     0.1000   -0.0008
##    100        0.3384             nan     0.1000   -0.0008
##    120        0.3145             nan     0.1000   -0.0021
##    140        0.2866             nan     0.1000   -0.0003
##    150        0.2736             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0733             nan     0.1000    0.0571
##      2        0.9828             nan     0.1000    0.0468
##      3        0.9075             nan     0.1000    0.0354
##      4        0.8485             nan     0.1000    0.0302
##      5        0.8022             nan     0.1000    0.0236
##      6        0.7623             nan     0.1000    0.0196
##      7        0.7188             nan     0.1000    0.0216
##      8        0.6828             nan     0.1000    0.0152
##      9        0.6547             nan     0.1000    0.0112
##     10        0.6291             nan     0.1000    0.0092
##     20        0.5017             nan     0.1000    0.0020
##     40        0.4073             nan     0.1000   -0.0033
##     60        0.3390             nan     0.1000    0.0004
##     80        0.2926             nan     0.1000   -0.0013
##    100        0.2413             nan     0.1000   -0.0006
##    120        0.2101             nan     0.1000   -0.0008
##    140        0.1867             nan     0.1000   -0.0012
##    150        0.1787             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0171             nan     0.1000    0.0562
##      2        0.9373             nan     0.1000    0.0417
##      3        0.8722             nan     0.1000    0.0308
##      4        0.8179             nan     0.1000    0.0272
##      5        0.7663             nan     0.1000    0.0250
##      6        0.7262             nan     0.1000    0.0177
##      7        0.6972             nan     0.1000    0.0139
##      8        0.6710             nan     0.1000    0.0139
##      9        0.6434             nan     0.1000    0.0118
##     10        0.6234             nan     0.1000    0.0094
##     20        0.5234             nan     0.1000    0.0020
##     40        0.4640             nan     0.1000    0.0000
```

```
##     60        0.4362             nan     0.1000   -0.0003
##     80        0.4165             nan     0.1000   -0.0010
##    100        0.3978             nan     0.1000   -0.0003
##    120        0.3887             nan     0.1000   -0.0005
##    140        0.3783             nan     0.1000   -0.0008
##    150        0.3756             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9962             nan     0.1000    0.0593
##      2        0.9125             nan     0.1000    0.0437
##      3        0.8460             nan     0.1000    0.0332
##      4        0.7891             nan     0.1000    0.0275
##      5        0.7457             nan     0.1000    0.0216
##      6        0.7092             nan     0.1000    0.0181
##      7        0.6790             nan     0.1000    0.0148
##      8        0.6530             nan     0.1000    0.0117
##      9        0.6289             nan     0.1000    0.0105
##     10        0.6112             nan     0.1000    0.0078
##     20        0.4895             nan     0.1000    0.0019
##     40        0.4040             nan     0.1000    0.0005
##     60        0.3620             nan     0.1000   -0.0004
##     80        0.3268             nan     0.1000    0.0005
##    100        0.2947             nan     0.1000   -0.0009
##    120        0.2689             nan     0.1000   -0.0009
##    140        0.2507             nan     0.1000   -0.0002
##    150        0.2392             nan     0.1000   -0.0013
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9946             nan     0.1000    0.0588
##      2        0.9043             nan     0.1000    0.0400
##      3        0.8354             nan     0.1000    0.0336
##      4        0.7782             nan     0.1000    0.0258
##      5        0.7329             nan     0.1000    0.0202
##      6        0.6967             nan     0.1000    0.0170
##      7        0.6595             nan     0.1000    0.0162
##      8        0.6306             nan     0.1000    0.0124
##      9        0.6022             nan     0.1000    0.0101
##     10        0.5800             nan     0.1000    0.0105
##     20        0.4614             nan     0.1000    0.0005
##     40        0.3674             nan     0.1000   -0.0013
##     60        0.3021             nan     0.1000   -0.0008
##     80        0.2592             nan     0.1000   -0.0010
##    100        0.2285             nan     0.1000   -0.0007
##    120        0.2005             nan     0.1000   -0.0008
##    140        0.1774             nan     0.1000   -0.0007
##    150        0.1675             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0136             nan     0.1000    0.0534
##      2        0.9299             nan     0.1000    0.0413
##      3        0.8657             nan     0.1000    0.0311
##      4        0.8131             nan     0.1000    0.0213
##      5        0.7739             nan     0.1000    0.0203
##      6        0.7381             nan     0.1000    0.0159
```

```
##      7        0.7090             nan     0.1000    0.0125
##      8        0.6759             nan     0.1000    0.0164
##      9        0.6536             nan     0.1000    0.0097
##     10        0.6252             nan     0.1000    0.0119
##     20        0.5106             nan     0.1000    0.0018
##     40        0.4428             nan     0.1000   -0.0006
##     60        0.4158             nan     0.1000   -0.0007
##     80        0.3992             nan     0.1000    0.0003
##    100        0.3838             nan     0.1000   -0.0002
##    120        0.3757             nan     0.1000   -0.0006
##    140        0.3665             nan     0.1000   -0.0003
##    150        0.3585             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9981             nan     0.1000    0.0654
##      2        0.9117             nan     0.1000    0.0485
##      3        0.8409             nan     0.1000    0.0361
##      4        0.7842             nan     0.1000    0.0249
##      5        0.7399             nan     0.1000    0.0225
##      6        0.6994             nan     0.1000    0.0180
##      7        0.6661             nan     0.1000    0.0157
##      8        0.6331             nan     0.1000    0.0140
##      9        0.6115             nan     0.1000    0.0096
##     10        0.5903             nan     0.1000    0.0083
##     20        0.4694             nan     0.1000    0.0034
##     40        0.3865             nan     0.1000   -0.0009
##     60        0.3409             nan     0.1000   -0.0004
##     80        0.3077             nan     0.1000   -0.0004
##    100        0.2768             nan     0.1000   -0.0009
##    120        0.2503             nan     0.1000   -0.0018
##    140        0.2294             nan     0.1000   -0.0007
##    150        0.2209             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9980             nan     0.1000    0.0594
##      2        0.9078             nan     0.1000    0.0449
##      3        0.8342             nan     0.1000    0.0371
##      4        0.7700             nan     0.1000    0.0281
##      5        0.7229             nan     0.1000    0.0237
##      6        0.6805             nan     0.1000    0.0209
##      7        0.6462             nan     0.1000    0.0120
##      8        0.6180             nan     0.1000    0.0118
##      9        0.5849             nan     0.1000    0.0127
##     10        0.5627             nan     0.1000    0.0093
##     20        0.4379             nan     0.1000    0.0016
##     40        0.3399             nan     0.1000   -0.0006
##     60        0.2800             nan     0.1000    0.0001
##     80        0.2410             nan     0.1000   -0.0003
##    100        0.2072             nan     0.1000   -0.0014
##    120        0.1764             nan     0.1000    0.0002
##    140        0.1509             nan     0.1000   -0.0009
##    150        0.1440             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

```
##      1        1.0385             nan     0.1000    0.0546
##      2        0.9506             nan     0.1000    0.0422
##      3        0.8869             nan     0.1000    0.0294
##      4        0.8344             nan     0.1000    0.0249
##      5        0.7900             nan     0.1000    0.0209
##      6        0.7543             nan     0.1000    0.0168
##      7        0.7187             nan     0.1000    0.0157
##      8        0.6910             nan     0.1000    0.0131
##      9        0.6671             nan     0.1000    0.0112
##     10        0.6446             nan     0.1000    0.0106
##     20        0.5279             nan     0.1000    0.0030
##     40        0.4557             nan     0.1000   -0.0001
##     60        0.4243             nan     0.1000   -0.0015
##     80        0.4058             nan     0.1000    0.0000
##    100        0.3974             nan     0.1000   -0.0007
##    120        0.3860             nan     0.1000   -0.0009
##    140        0.3800             nan     0.1000   -0.0003
##    150        0.3754             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0299             nan     0.1000    0.0602
##      2        0.9345             nan     0.1000    0.0416
##      3        0.8617             nan     0.1000    0.0297
##      4        0.8049             nan     0.1000    0.0269
##      5        0.7637             nan     0.1000    0.0190
##      6        0.7232             nan     0.1000    0.0184
##      7        0.6908             nan     0.1000    0.0146
##      8        0.6640             nan     0.1000    0.0134
##      9        0.6403             nan     0.1000    0.0100
##     10        0.6145             nan     0.1000    0.0109
##     20        0.4850             nan     0.1000    0.0028
##     40        0.3991             nan     0.1000   -0.0008
##     60        0.3546             nan     0.1000   -0.0018
##     80        0.3196             nan     0.1000   -0.0004
##    100        0.2905             nan     0.1000   -0.0001
##    120        0.2708             nan     0.1000   -0.0018
##    140        0.2513             nan     0.1000   -0.0008
##    150        0.2386             nan     0.1000   -0.0011
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0344             nan     0.1000    0.0563
##      2        0.9441             nan     0.1000    0.0406
##      3        0.8678             nan     0.1000    0.0336
##      4        0.8083             nan     0.1000    0.0301
##      5        0.7532             nan     0.1000    0.0240
##      6        0.7062             nan     0.1000    0.0197
##      7        0.6670             nan     0.1000    0.0193
##      8        0.6389             nan     0.1000    0.0124
##      9        0.6124             nan     0.1000    0.0131
##     10        0.5864             nan     0.1000    0.0114
##     20        0.4437             nan     0.1000    0.0013
##     40        0.3496             nan     0.1000   -0.0013
##     60        0.2994             nan     0.1000   -0.0005
##     80        0.2592             nan     0.1000   -0.0002
```

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##    100        0.2226             nan     0.1000   -0.0004
##    120        0.1901             nan     0.1000   -0.0010
##    140        0.1653             nan     0.1000   -0.0009
##    150        0.1556             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0743             nan     0.1000    0.0567
##      2        0.9895             nan     0.1000    0.0461
##      3        0.9195             nan     0.1000    0.0366
##      4        0.8560             nan     0.1000    0.0319
##      5        0.8034             nan     0.1000    0.0251
##      6        0.7589             nan     0.1000    0.0197
##      7        0.7230             nan     0.1000    0.0186
##      8        0.6946             nan     0.1000    0.0143
##      9        0.6695             nan     0.1000    0.0115
##     10        0.6487             nan     0.1000    0.0100
##     20        0.4975             nan     0.1000    0.0051
##     40        0.4083             nan     0.1000    0.0006
##     60        0.3666             nan     0.1000   -0.0019
##     80        0.3428             nan     0.1000   -0.0014
##    100        0.3254             nan     0.1000   -0.0019
##    120        0.3120             nan     0.1000   -0.0005
##    140        0.3027             nan     0.1000   -0.0011
##    150        0.2972             nan     0.1000   -0.0014
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0686             nan     0.1000    0.0605
##      2        0.9677             nan     0.1000    0.0468
##      3        0.8992             nan     0.1000    0.0353
##      4        0.8373             nan     0.1000    0.0311
##      5        0.7800             nan     0.1000    0.0268
##      6        0.7327             nan     0.1000    0.0214
##      7        0.6894             nan     0.1000    0.0210
##      8        0.6541             nan     0.1000    0.0171
##      9        0.6269             nan     0.1000    0.0101
##     10        0.6015             nan     0.1000    0.0092
##     20        0.4472             nan     0.1000    0.0026
##     40        0.3448             nan     0.1000    0.0002
##     60        0.3019             nan     0.1000   -0.0028
##     80        0.2698             nan     0.1000   -0.0000
##    100        0.2450             nan     0.1000   -0.0007
##    120        0.2238             nan     0.1000   -0.0007
##    140        0.2073             nan     0.1000   -0.0011
##    150        0.1978             nan     0.1000    0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0591             nan     0.1000    0.0617
##      2        0.9534             nan     0.1000    0.0526
##      3        0.8681             nan     0.1000    0.0392
##      4        0.8042             nan     0.1000    0.0338
##      5        0.7498             nan     0.1000    0.0276
##      6        0.7021             nan     0.1000    0.0232
##      7        0.6581             nan     0.1000    0.0197
##      8        0.6213             nan     0.1000    0.0191
```

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##      9        0.5903             nan     0.1000    0.0149
##     10        0.5647             nan     0.1000    0.0105
##     20        0.4119             nan     0.1000    0.0030
##     40        0.2998             nan     0.1000   -0.0010
##     60        0.2478             nan     0.1000   -0.0015
##     80        0.2174             nan     0.1000   -0.0007
##    100        0.1909             nan     0.1000   -0.0005
##    120        0.1660             nan     0.1000   -0.0010
##    140        0.1497             nan     0.1000   -0.0004
##    150        0.1410             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0496             nan     0.1000    0.0611
##      2        0.9645             nan     0.1000    0.0426
##      3        0.8978             nan     0.1000    0.0329
##      4        0.8451             nan     0.1000    0.0272
##      5        0.7945             nan     0.1000    0.0247
##      6        0.7545             nan     0.1000    0.0184
##      7        0.7207             nan     0.1000    0.0145
##      8        0.6860             nan     0.1000    0.0149
##      9        0.6552             nan     0.1000    0.0126
##     10        0.6366             nan     0.1000    0.0090
##     20        0.5139             nan     0.1000    0.0020
##     40        0.4434             nan     0.1000   -0.0004
##     60        0.4134             nan     0.1000   -0.0004
##     80        0.3968             nan     0.1000   -0.0004
##    100        0.3848             nan     0.1000   -0.0001
##    120        0.3730             nan     0.1000   -0.0031
##    140        0.3648             nan     0.1000   -0.0005
##    150        0.3608             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0363             nan     0.1000    0.0661
##      2        0.9425             nan     0.1000    0.0468
##      3        0.8746             nan     0.1000    0.0345
##      4        0.8158             nan     0.1000    0.0282
##      5        0.7677             nan     0.1000    0.0250
##      6        0.7313             nan     0.1000    0.0170
##      7        0.6941             nan     0.1000    0.0186
##      8        0.6646             nan     0.1000    0.0122
##      9        0.6399             nan     0.1000    0.0090
##     10        0.6137             nan     0.1000    0.0107
##     20        0.4687             nan     0.1000    0.0002
##     40        0.3775             nan     0.1000   -0.0003
##     60        0.3338             nan     0.1000   -0.0003
##     80        0.3052             nan     0.1000    0.0003
##    100        0.2812             nan     0.1000   -0.0012
##    120        0.2550             nan     0.1000   -0.0006
##    140        0.2327             nan     0.1000   -0.0004
##    150        0.2257             nan     0.1000   -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0282             nan     0.1000    0.0659
##      2        0.9309             nan     0.1000    0.0457
```

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##      3        0.8540             nan     0.1000    0.0378
##      4        0.7915             nan     0.1000    0.0313
##      5        0.7397             nan     0.1000    0.0267
##      6        0.6942             nan     0.1000    0.0226
##      7        0.6565             nan     0.1000    0.0174
##      8        0.6252             nan     0.1000    0.0143
##      9        0.5978             nan     0.1000    0.0136
##     10        0.5702             nan     0.1000    0.0112
##     20        0.4286             nan     0.1000    0.0026
##     40        0.3304             nan     0.1000    0.0014
##     60        0.2760             nan     0.1000    0.0001
##     80        0.2356             nan     0.1000   -0.0012
##    100        0.2073             nan     0.1000   -0.0006
##    120        0.1821             nan     0.1000   -0.0010
##    140        0.1610             nan     0.1000   -0.0000
##    150        0.1529             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0771             nan     0.1000    0.0464
##      2        1.0025             nan     0.1000    0.0366
##      3        0.9364             nan     0.1000    0.0334
##      4        0.8823             nan     0.1000    0.0237
##      5        0.8447             nan     0.1000    0.0183
##      6        0.8061             nan     0.1000    0.0184
##      7        0.7757             nan     0.1000    0.0135
##      8        0.7489             nan     0.1000    0.0136
##      9        0.7279             nan     0.1000    0.0081
##     10        0.7090             nan     0.1000    0.0081
##     20        0.5913             nan     0.1000    0.0024
##     40        0.5091             nan     0.1000    0.0007
##     60        0.4707             nan     0.1000   -0.0009
##     80        0.4514             nan     0.1000   -0.0009
##    100        0.4366             nan     0.1000   -0.0008
##    120        0.4288             nan     0.1000   -0.0009
##    140        0.4212             nan     0.1000    0.0000
##    150        0.4176             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0759             nan     0.1000    0.0514
##      2        0.9884             nan     0.1000    0.0417
##      3        0.9179             nan     0.1000    0.0332
##      4        0.8617             nan     0.1000    0.0263
##      5        0.8156             nan     0.1000    0.0192
##      6        0.7751             nan     0.1000    0.0191
##      7        0.7403             nan     0.1000    0.0156
##      8        0.7093             nan     0.1000    0.0148
##      9        0.6888             nan     0.1000    0.0113
##     10        0.6669             nan     0.1000    0.0109
##     20        0.5300             nan     0.1000    0.0009
##     40        0.4395             nan     0.1000   -0.0002
##     60        0.3964             nan     0.1000   -0.0015
##     80        0.3624             nan     0.1000   -0.0008
##    100        0.3333             nan     0.1000   -0.0018
##    120        0.3090             nan     0.1000   -0.0022
```

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##    140        0.2908             nan     0.1000   -0.0008
##    150        0.2780             nan     0.1000   -0.0015
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0612             nan     0.1000    0.0501
##      2        0.9705             nan     0.1000    0.0400
##      3        0.8994             nan     0.1000    0.0351
##      4        0.8385             nan     0.1000    0.0268
##      5        0.7870             nan     0.1000    0.0250
##      6        0.7432             nan     0.1000    0.0198
##      7        0.7074             nan     0.1000    0.0175
##      8        0.6745             nan     0.1000    0.0150
##      9        0.6474             nan     0.1000    0.0122
##     10        0.6271             nan     0.1000    0.0076
##     20        0.4828             nan     0.1000    0.0028
##     40        0.3847             nan     0.1000    0.0000
##     60        0.3256             nan     0.1000    0.0001
##     80        0.2880             nan     0.1000   -0.0007
##    100        0.2540             nan     0.1000   -0.0004
##    120        0.2299             nan     0.1000   -0.0011
##    140        0.2079             nan     0.1000   -0.0001
##    150        0.1965             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0313             nan     0.1000    0.0624
##      2        0.9356             nan     0.1000    0.0432
##      3        0.8602             nan     0.1000    0.0372
##      4        0.7941             nan     0.1000    0.0282
##      5        0.7439             nan     0.1000    0.0256
##      6        0.7039             nan     0.1000    0.0194
##      7        0.6667             nan     0.1000    0.0172
##      8        0.6317             nan     0.1000    0.0141
##      9        0.6057             nan     0.1000    0.0131
##     10        0.5808             nan     0.1000    0.0115
##     20        0.4496             nan     0.1000    0.0028
##     40        0.3741             nan     0.1000    0.0002
##     60        0.3431             nan     0.1000   -0.0004
##     80        0.3310             nan     0.1000   -0.0009
##    100        0.3192             nan     0.1000   -0.0008
##    120        0.3095             nan     0.1000    0.0004
##    140        0.3025             nan     0.1000   -0.0007
##    150        0.3010             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0195             nan     0.1000    0.0655
##      2        0.9224             nan     0.1000    0.0487
##      3        0.8436             nan     0.1000    0.0364
##      4        0.7857             nan     0.1000    0.0310
##      5        0.7310             nan     0.1000    0.0264
##      6        0.6864             nan     0.1000    0.0196
##      7        0.6474             nan     0.1000    0.0194
##      8        0.6137             nan     0.1000    0.0156
##      9        0.5831             nan     0.1000    0.0138
##     10        0.5556             nan     0.1000    0.0117
```

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##     20        0.4168             nan     0.1000    0.0030
##     40        0.3301             nan     0.1000    0.0006
##     60        0.2850             nan     0.1000   -0.0006
##     80        0.2575             nan     0.1000   -0.0008
##    100        0.2338             nan     0.1000   -0.0013
##    120        0.2127             nan     0.1000   -0.0007
##    140        0.1913             nan     0.1000   -0.0010
##    150        0.1843             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0222             nan     0.1000    0.0678
##      2        0.9201             nan     0.1000    0.0485
##      3        0.8352             nan     0.1000    0.0407
##      4        0.7664             nan     0.1000    0.0279
##      5        0.7111             nan     0.1000    0.0272
##      6        0.6633             nan     0.1000    0.0250
##      7        0.6186             nan     0.1000    0.0168
##      8        0.5821             nan     0.1000    0.0159
##      9        0.5553             nan     0.1000    0.0128
##     10        0.5235             nan     0.1000    0.0134
##     20        0.3803             nan     0.1000    0.0032
##     40        0.2808             nan     0.1000   -0.0024
##     60        0.2341             nan     0.1000   -0.0019
##     80        0.2002             nan     0.1000   -0.0006
##    100        0.1700             nan     0.1000   -0.0008
##    120        0.1452             nan     0.1000   -0.0006
##    140        0.1285             nan     0.1000   -0.0013
##    150        0.1208             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0305             nan     0.1000    0.0535
##      2        0.9490             nan     0.1000    0.0406
##      3        0.8777             nan     0.1000    0.0326
##      4        0.8131             nan     0.1000    0.0274
##      5        0.7702             nan     0.1000    0.0213
##      6        0.7378             nan     0.1000    0.0170
##      7        0.7023             nan     0.1000    0.0157
##      8        0.6732             nan     0.1000    0.0140
##      9        0.6494             nan     0.1000    0.0105
##     10        0.6265             nan     0.1000    0.0096
##     20        0.5183             nan     0.1000    0.0035
##     40        0.4504             nan     0.1000   -0.0025
##     60        0.4242             nan     0.1000   -0.0001
##     80        0.4020             nan     0.1000   -0.0002
##    100        0.3896             nan     0.1000   -0.0012
##    120        0.3795             nan     0.1000   -0.0002
##    140        0.3704             nan     0.1000   -0.0008
##    150        0.3663             nan     0.1000   -0.0014
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0227             nan     0.1000    0.0508
##      2        0.9354             nan     0.1000    0.0394
##      3        0.8634             nan     0.1000    0.0361
##      4        0.8117             nan     0.1000    0.0268
```

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##      5        0.7647             nan     0.1000    0.0225
##      6        0.7213             nan     0.1000    0.0198
##      7        0.6837             nan     0.1000    0.0178
##      8        0.6504             nan     0.1000    0.0146
##      9        0.6232             nan     0.1000    0.0113
##     10        0.6005             nan     0.1000    0.0093
##     20        0.4858             nan     0.1000    0.0005
##     40        0.4032             nan     0.1000   -0.0004
##     60        0.3647             nan     0.1000   -0.0009
##     80        0.3386             nan     0.1000   -0.0020
##    100        0.3093             nan     0.1000   -0.0016
##    120        0.2879             nan     0.1000   -0.0005
##    140        0.2646             nan     0.1000   -0.0013
##    150        0.2562             nan     0.1000   -0.0021
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0136             nan     0.1000    0.0609
##      2        0.9170             nan     0.1000    0.0461
##      3        0.8460             nan     0.1000    0.0315
##      4        0.7807             nan     0.1000    0.0331
##      5        0.7321             nan     0.1000    0.0210
##      6        0.6908             nan     0.1000    0.0172
##      7        0.6594             nan     0.1000    0.0142
##      8        0.6271             nan     0.1000    0.0145
##      9        0.6044             nan     0.1000    0.0108
##     10        0.5779             nan     0.1000    0.0105
##     20        0.4518             nan     0.1000    0.0032
##     40        0.3542             nan     0.1000    0.0000
##     60        0.3043             nan     0.1000   -0.0009
##     80        0.2602             nan     0.1000   -0.0016
##    100        0.2291             nan     0.1000   -0.0003
##    120        0.2005             nan     0.1000   -0.0010
##    140        0.1797             nan     0.1000   -0.0014
##    150        0.1696             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0078             nan     0.1000    0.0690
##      2        0.9168             nan     0.1000    0.0451
##      3        0.8481             nan     0.1000    0.0366
##      4        0.7831             nan     0.1000    0.0353
##      5        0.7334             nan     0.1000    0.0224
##      6        0.6921             nan     0.1000    0.0171
##      7        0.6528             nan     0.1000    0.0198
##      8        0.6185             nan     0.1000    0.0164
##      9        0.5874             nan     0.1000    0.0138
##     10        0.5650             nan     0.1000    0.0105
##     20        0.4369             nan     0.1000    0.0024
##     40        0.3612             nan     0.1000    0.0001
##     60        0.3316             nan     0.1000   -0.0013
##     80        0.3168             nan     0.1000   -0.0015
##    100        0.3014             nan     0.1000   -0.0003
##    120        0.2916             nan     0.1000   -0.0015
##    140        0.2803             nan     0.1000   -0.0011
##    150        0.2775             nan     0.1000   -0.0009
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0008             nan     0.1000    0.0709
##      2        0.9010             nan     0.1000    0.0549
##      3        0.8243             nan     0.1000    0.0366
##      4        0.7594             nan     0.1000    0.0316
##      5        0.7039             nan     0.1000    0.0255
##      6        0.6633             nan     0.1000    0.0200
##      7        0.6263             nan     0.1000    0.0183
##      8        0.5929             nan     0.1000    0.0164
##      9        0.5658             nan     0.1000    0.0117
##     10        0.5437             nan     0.1000    0.0098
##     20        0.4079             nan     0.1000    0.0034
##     40        0.3123             nan     0.1000    0.0013
##     60        0.2734             nan     0.1000   -0.0006
##     80        0.2436             nan     0.1000   -0.0010
##    100        0.2187             nan     0.1000   -0.0003
##    120        0.1976             nan     0.1000   -0.0002
##    140        0.1849             nan     0.1000   -0.0012
##    150        0.1782             nan     0.1000   -0.0011
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0043             nan     0.1000    0.0699
##      2        0.8992             nan     0.1000    0.0509
##      3        0.8195             nan     0.1000    0.0413
##      4        0.7512             nan     0.1000    0.0338
##      5        0.6947             nan     0.1000    0.0240
##      6        0.6462             nan     0.1000    0.0225
##      7        0.6068             nan     0.1000    0.0176
##      8        0.5738             nan     0.1000    0.0157
##      9        0.5427             nan     0.1000    0.0154
##     10        0.5168             nan     0.1000    0.0107
##     20        0.3767             nan     0.1000    0.0017
##     40        0.2739             nan     0.1000   -0.0015
##     60        0.2298             nan     0.1000   -0.0006
##     80        0.1991             nan     0.1000   -0.0008
##    100        0.1757             nan     0.1000   -0.0003
##    120        0.1550             nan     0.1000   -0.0005
##    140        0.1374             nan     0.1000   -0.0008
##    150        0.1270             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0276             nan     0.1000    0.0447
##      2        0.9561             nan     0.1000    0.0366
##      3        0.8994             nan     0.1000    0.0270
##      4        0.8541             nan     0.1000    0.0206
##      5        0.8162             nan     0.1000    0.0200
##      6        0.7812             nan     0.1000    0.0169
##      7        0.7498             nan     0.1000    0.0169
##      8        0.7186             nan     0.1000    0.0147
##      9        0.6938             nan     0.1000    0.0123
##     10        0.6737             nan     0.1000    0.0092
##     20        0.5670             nan     0.1000    0.0022
##     40        0.4822             nan     0.1000    0.0012
```

```
##     60        0.4459             nan     0.1000    0.0005
##     80        0.4254             nan     0.1000   -0.0012
##    100        0.4059             nan     0.1000   -0.0006
##    120        0.3899             nan     0.1000   -0.0003
##    140        0.3784             nan     0.1000   -0.0006
##    150        0.3721             nan     0.1000    0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0160             nan     0.1000    0.0570
##      2        0.9348             nan     0.1000    0.0436
##      3        0.8688             nan     0.1000    0.0282
##      4        0.8117             nan     0.1000    0.0249
##      5        0.7669             nan     0.1000    0.0213
##      6        0.7302             nan     0.1000    0.0195
##      7        0.6994             nan     0.1000    0.0151
##      8        0.6722             nan     0.1000    0.0120
##      9        0.6495             nan     0.1000    0.0103
##     10        0.6319             nan     0.1000    0.0066
##     20        0.4974             nan     0.1000    0.0037
##     40        0.4054             nan     0.1000    0.0000
##     60        0.3531             nan     0.1000   -0.0008
##     80        0.3104             nan     0.1000   -0.0018
##    100        0.2777             nan     0.1000   -0.0001
##    120        0.2556             nan     0.1000   -0.0009
##    140        0.2347             nan     0.1000   -0.0015
##    150        0.2264             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0045             nan     0.1000    0.0553
##      2        0.9165             nan     0.1000    0.0445
##      3        0.8411             nan     0.1000    0.0354
##      4        0.7758             nan     0.1000    0.0276
##      5        0.7319             nan     0.1000    0.0198
##      6        0.6916             nan     0.1000    0.0200
##      7        0.6567             nan     0.1000    0.0150
##      8        0.6301             nan     0.1000    0.0121
##      9        0.6062             nan     0.1000    0.0103
##     10        0.5839             nan     0.1000    0.0093
##     20        0.4617             nan     0.1000    0.0035
##     40        0.3462             nan     0.1000   -0.0000
##     60        0.2788             nan     0.1000    0.0000
##     80        0.2328             nan     0.1000   -0.0002
##    100        0.1945             nan     0.1000   -0.0006
##    120        0.1669             nan     0.1000   -0.0005
##    140        0.1459             nan     0.1000   -0.0017
##    150        0.1354             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0955             nan     0.1000    0.0477
##      2        1.0162             nan     0.1000    0.0367
##      3        0.9593             nan     0.1000    0.0270
##      4        0.9160             nan     0.1000    0.0231
##      5        0.8646             nan     0.1000    0.0252
##      6        0.8233             nan     0.1000    0.0198
```

```
##      7        0.7881             nan     0.1000    0.0152
##      8        0.7648             nan     0.1000    0.0114
##      9        0.7361             nan     0.1000    0.0128
##     10        0.7155             nan     0.1000    0.0103
##     20        0.6028             nan     0.1000    0.0017
##     40        0.5215             nan     0.1000    0.0012
##     60        0.4899             nan     0.1000   -0.0007
##     80        0.4655             nan     0.1000    0.0002
##    100        0.4512             nan     0.1000    0.0001
##    120        0.4388             nan     0.1000   -0.0006
##    140        0.4243             nan     0.1000   -0.0003
##    150        0.4192             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0847             nan     0.1000    0.0453
##      2        0.9986             nan     0.1000    0.0380
##      3        0.9320             nan     0.1000    0.0331
##      4        0.8817             nan     0.1000    0.0235
##      5        0.8407             nan     0.1000    0.0183
##      6        0.8012             nan     0.1000    0.0202
##      7        0.7688             nan     0.1000    0.0179
##      8        0.7379             nan     0.1000    0.0126
##      9        0.7158             nan     0.1000    0.0109
##     10        0.6931             nan     0.1000    0.0117
##     20        0.5541             nan     0.1000    0.0018
##     40        0.4643             nan     0.1000   -0.0013
##     60        0.4127             nan     0.1000   -0.0010
##     80        0.3754             nan     0.1000   -0.0018
##    100        0.3414             nan     0.1000   -0.0009
##    120        0.3145             nan     0.1000   -0.0001
##    140        0.2870             nan     0.1000   -0.0021
##    150        0.2753             nan     0.1000   -0.0012
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0824             nan     0.1000    0.0586
##      2        0.9939             nan     0.1000    0.0452
##      3        0.9226             nan     0.1000    0.0368
##      4        0.8611             nan     0.1000    0.0291
##      5        0.8096             nan     0.1000    0.0232
##      6        0.7645             nan     0.1000    0.0204
##      7        0.7318             nan     0.1000    0.0153
##      8        0.7008             nan     0.1000    0.0131
##      9        0.6754             nan     0.1000    0.0108
##     10        0.6526             nan     0.1000    0.0093
##     20        0.5135             nan     0.1000    0.0010
##     40        0.3983             nan     0.1000    0.0012
##     60        0.3259             nan     0.1000   -0.0011
##     80        0.2763             nan     0.1000   -0.0007
##    100        0.2415             nan     0.1000   -0.0003
##    120        0.2140             nan     0.1000    0.0002
##    140        0.1888             nan     0.1000   -0.0001
##    150        0.1769             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

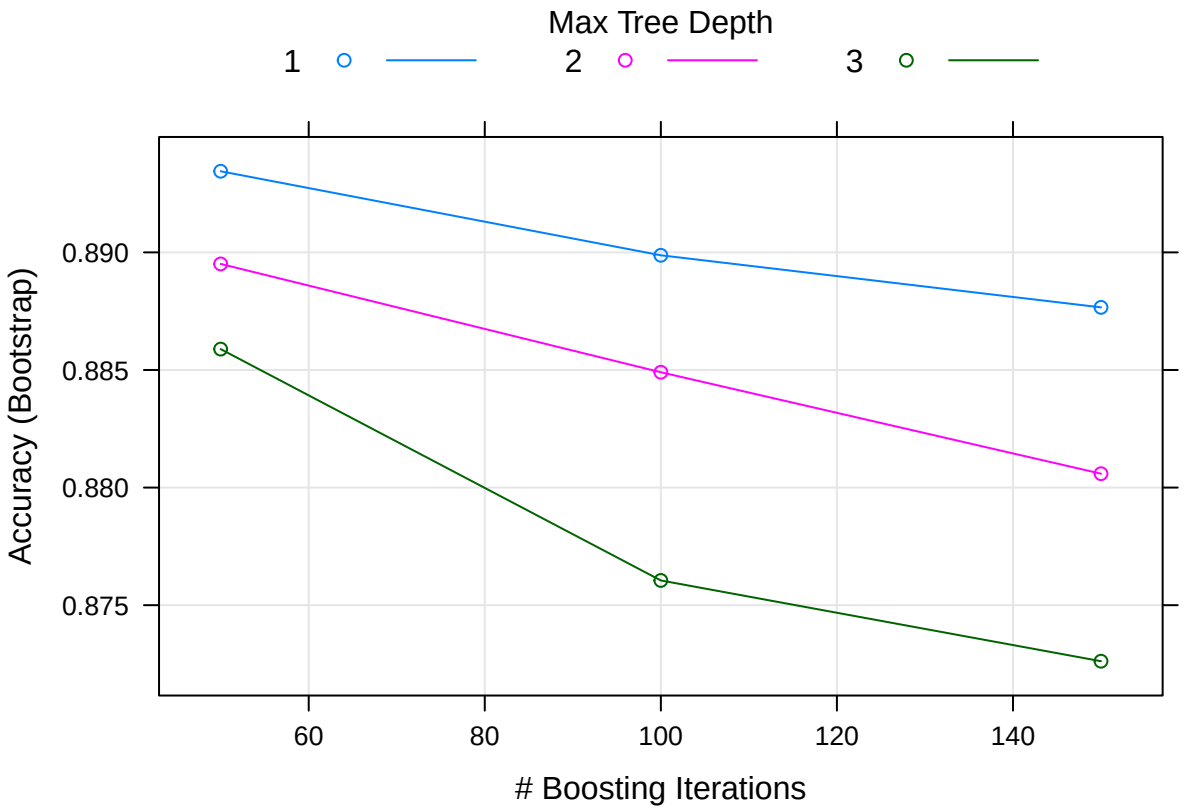
```
##      1        0.9910             nan     0.1000    0.0630
##      2        0.9032             nan     0.1000    0.0467
##      3        0.8341             nan     0.1000    0.0306
##      4        0.7790             nan     0.1000    0.0266
##      5        0.7319             nan     0.1000    0.0209
##      6        0.6914             nan     0.1000    0.0205
##      7        0.6599             nan     0.1000    0.0163
##      8        0.6256             nan     0.1000    0.0166
##      9        0.5959             nan     0.1000    0.0138
##     10        0.5734             nan     0.1000    0.0095
##     20        0.4429             nan     0.1000    0.0038
##     40        0.3506             nan     0.1000    0.0003
##     60        0.3099             nan     0.1000   -0.0002
##     80        0.2876             nan     0.1000   -0.0003
##    100        0.2720             nan     0.1000   -0.0014
##    120        0.2591             nan     0.1000   -0.0003
##    140        0.2486             nan     0.1000   -0.0011
##    150        0.2439             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9802             nan     0.1000    0.0666
##      2        0.8834             nan     0.1000    0.0472
##      3        0.8085             nan     0.1000    0.0361
##      4        0.7458             nan     0.1000    0.0275
##      5        0.6942             nan     0.1000    0.0250
##      6        0.6540             nan     0.1000    0.0207
##      7        0.6176             nan     0.1000    0.0176
##      8        0.5844             nan     0.1000    0.0151
##      9        0.5536             nan     0.1000    0.0126
##     10        0.5284             nan     0.1000    0.0118
##     20        0.3856             nan     0.1000    0.0035
##     40        0.2881             nan     0.1000   -0.0002
##     60        0.2414             nan     0.1000   -0.0016
##     80        0.2112             nan     0.1000    0.0004
##    100        0.1865             nan     0.1000   -0.0011
##    120        0.1612             nan     0.1000   -0.0004
##    140        0.1448             nan     0.1000   -0.0003
##    150        0.1382             nan     0.1000    0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9738             nan     0.1000    0.0754
##      2        0.8654             nan     0.1000    0.0512
##      3        0.7836             nan     0.1000    0.0386
##      4        0.7161             nan     0.1000    0.0332
##      5        0.6632             nan     0.1000    0.0253
##      6        0.6210             nan     0.1000    0.0226
##      7        0.5811             nan     0.1000    0.0176
##      8        0.5475             nan     0.1000    0.0152
##      9        0.5223             nan     0.1000    0.0111
##     10        0.4974             nan     0.1000    0.0115
##     20        0.3466             nan     0.1000    0.0029
##     40        0.2423             nan     0.1000    0.0000
##     60        0.1976             nan     0.1000   -0.0006
##     80        0.1644             nan     0.1000   -0.0002
```

```
##    100        0.1351             nan     0.1000   -0.0004
##    120        0.1131             nan     0.1000   -0.0003
##    140        0.0940             nan     0.1000   -0.0007
##    150        0.0878             nan     0.1000    0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0610             nan     0.1000    0.0576
##      2        0.9775             nan     0.1000    0.0423
##      3        0.9117             nan     0.1000    0.0332
##      4        0.8597             nan     0.1000    0.0259
##      5        0.8143             nan     0.1000    0.0208
##      6        0.7722             nan     0.1000    0.0189
##      7        0.7387             nan     0.1000    0.0160
##      8        0.7090             nan     0.1000    0.0140
##      9        0.6831             nan     0.1000    0.0126
##     10        0.6599             nan     0.1000    0.0100
##     20        0.5433             nan     0.1000    0.0012
##     40        0.4830             nan     0.1000    0.0000
##     50        0.4695             nan     0.1000   -0.0004
```

```
print(model_gbm)
```

```
## Stochastic Gradient Boosting
##
## 576 samples
##   5 predictor
##   2 classes: '0', '1'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 576, 576, 576, 576, 576, 576, ...
## Resampling results across tuning parameters:
##
##   interaction.depth  n.trees  Accuracy   Kappa
##   1                   50      0.8934490  0.7243933
##   1                  100      0.8898759  0.7160867
##   1                  150      0.8876620  0.7108699
##   2                   50      0.8895093  0.7141743
##   2                  100      0.8849033  0.7038224
##   2                  150      0.8805909  0.6926282
##   3                   50      0.8858876  0.7062951
##   3                  100      0.8760507  0.6825678
##   3                  150      0.8726175  0.6740539
##
## Tuning parameter 'shrinkage' was held constant at a value of 0.1
##
## Tuning parameter 'n.minobsinnode' was held constant at a value of 10
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were n.trees = 50, interaction.depth
##  = 1, shrinkage = 0.1 and n.minobsinnode = 10.
```

```
plot(model_gbm)
```




```
#Prediction with GBM
predictions_gbm<-predict.train(object=model_gbm,testSet[,predictors],type="raw")
table(predictions_gbm)
```

```
## predictions_gbm
##   0   1
## 144  46
```

```
confusionMatrix(predictions_gbm,testSet[,outcomeName])
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   0   1
##          0 131  13
##          1   8  38
##
##                Accuracy : 0.8895
##                  95% CI : (0.836, 0.9303)
##     No Information Rate : 0.7316
##     P-Value [Acc > NIR] : 7.679e-08
##
##                   Kappa : 0.7096
##  Mcnemar's Test P-Value : 0.3827
##
##             Sensitivity : 0.9424
##             Specificity : 0.7451
```

```
##          Pos Pred Value : 0.9097
##          Neg Pred Value : 0.8261
##              Prevalence : 0.7316
##          Detection Rate : 0.6895
##    Detection Prevalence : 0.7579
##       Balanced Accuracy : 0.8438
##
##        'Positive' Class : 0
##
```

Neural Network (nnet) method

```
model_nnet<-train(trainSet[,predictors],trainSet[,outcomeName],method='nnet')
```

```
## # weights:  22
## initial  value 355.003299
## iter  10 value 327.609893
## iter  20 value 284.139022
## iter  30 value 225.514498
## iter  40 value 170.657867
## iter  50 value 131.923068
## iter  60 value 124.929547
## iter  70 value 119.577670
## iter  80 value 119.418854
## final  value 119.417378
## converged
## # weights:  64
## initial  value 333.421147
## iter  10 value 327.618837
## iter  20 value 297.975246
## iter  30 value 182.523246
## iter  40 value 156.613281
## iter  50 value 150.049571
## iter  60 value 147.592928
## iter  70 value 141.305311
## iter  80 value 139.846989
## iter  90 value 139.804972
## iter 100 value 139.793664
## final  value 139.793664
## stopped after 100 iterations
## # weights:  106
## initial  value 563.831021
## iter  10 value 327.706030
## iter  20 value 326.989521
## iter  30 value 320.645616
## iter  40 value 309.798514
## iter  50 value 263.100281
## iter  60 value 218.225853
## iter  70 value 160.877637
## iter  80 value 123.924422
## iter  90 value 121.683786
## iter 100 value 116.655054
```

```
## final  value 116.655054
## stopped after 100 iterations
## # weights:  22
## initial  value 380.314004
## iter  10 value 329.429294
## iter  20 value 327.879467
## iter  30 value 317.788398
## iter  40 value 204.679541
## iter  50 value 154.175149
## iter  60 value 149.867004
## iter  70 value 145.005766
## iter  80 value 136.540289
## iter  90 value 134.453969
## iter 100 value 134.084093
## final  value 134.084093
## stopped after 100 iterations
## # weights:  64
## initial  value 390.124100
## iter  10 value 319.683601
## iter  20 value 311.795447
## iter  30 value 272.280769
## iter  40 value 237.493240
## iter  50 value 160.456855
## iter  60 value 133.686480
## iter  70 value 131.953129
## iter  80 value 131.762319
## iter  90 value 130.991264
## iter 100 value 127.964149
## final  value 127.964149
## stopped after 100 iterations
## # weights:  106
## initial  value 345.332244
## iter  10 value 329.416576
## iter  20 value 327.231602
## iter  30 value 245.053773
## iter  40 value 142.622519
## iter  50 value 137.798020
## iter  60 value 135.823545
## iter  70 value 133.573813
## iter  80 value 133.458967
## iter  80 value 133.458967
## iter  80 value 133.458967
## final  value 133.458967
## converged
## # weights:  22
## initial  value 399.261018
## iter  10 value 331.373106
## final  value 331.371913
## converged
## # weights:  64
## initial  value 389.843746
## iter  10 value 326.291280
## iter  20 value 288.626067
## iter  30 value 197.334204
```

```
## iter  40 value 178.891633
## iter  50 value 163.535247
## iter  60 value 160.280195
## iter  70 value 156.104842
## iter  80 value 155.237050
## iter  90 value 154.776872
## iter 100 value 153.396891
## final  value 153.396891
## stopped after 100 iterations
## # weights:  106
## initial  value 454.937170
## iter  10 value 266.230891
## iter  20 value 258.488807
## iter  30 value 254.068804
## iter  40 value 236.472966
## iter  50 value 177.332166
## iter  60 value 155.779613
## iter  70 value 144.162978
## iter  80 value 139.655930
## iter  90 value 138.665973
## iter 100 value 138.600443
## final  value 138.600443
## stopped after 100 iterations
## # weights:  22
## initial  value 333.610413
## iter  10 value 328.113570
## iter  20 value 328.101643
## final  value 328.101634
## converged
## # weights:  64
## initial  value 419.540419
## iter  10 value 328.114779
## iter  20 value 328.082783
## iter  30 value 328.017457
## iter  40 value 327.696077
## iter  50 value 254.901924
## iter  60 value 171.292686
## iter  70 value 143.744209
## iter  80 value 139.784847
## iter  90 value 134.821413
## iter 100 value 121.678042
## final  value 121.678042
## stopped after 100 iterations
## # weights:  106
## initial  value 735.558209
## iter  10 value 327.586539
## iter  20 value 325.273147
## iter  30 value 312.579389
## iter  40 value 312.459731
## iter  50 value 312.446044
## iter  60 value 312.445339
## iter  70 value 312.445183
## iter  70 value 312.445182
## iter  70 value 312.445182
```

```
## final  value 312.445182
## converged
## # weights:  22
## initial  value 492.894842
## iter  10 value 329.262464
## iter  20 value 328.380165
## final  value 328.375524
## converged
## # weights:  64
## initial  value 397.894169
## iter  10 value 330.777746
## iter  20 value 328.964342
## iter  30 value 327.242294
## iter  40 value 295.409801
## iter  50 value 201.101164
## iter  60 value 159.059746
## iter  70 value 132.647885
## iter  80 value 126.924776
## iter  90 value 126.529625
## iter 100 value 124.955356
## final  value 124.955356
## stopped after 100 iterations
## # weights:  106
## initial  value 465.663233
## iter  10 value 329.117443
## iter  20 value 277.637528
## iter  30 value 246.431410
## iter  40 value 226.381265
## iter  50 value 167.040766
## iter  60 value 138.332015
## iter  70 value 122.753467
## iter  80 value 118.850516
## iter  90 value 118.342991
## iter 100 value 117.113020
## final  value 117.113020
## stopped after 100 iterations
## # weights:  22
## initial  value 344.011234
## iter  10 value 323.780993
## iter  20 value 323.613052
## iter  30 value 323.585334
## iter  40 value 240.164365
## iter  50 value 134.325928
## iter  60 value 124.124548
## iter  70 value 121.411361
## iter  80 value 119.566737
## iter  90 value 118.042886
## iter 100 value 117.134234
## final  value 117.134234
## stopped after 100 iterations
## # weights:  64
## initial  value 578.352387
## iter  10 value 328.109472
## iter  20 value 328.095171
```

```
## iter  30 value 327.793304
## iter  40 value 283.548561
## iter  50 value 264.955790
## iter  60 value 232.057188
## iter  70 value 161.217442
## iter  80 value 141.334662
## iter  90 value 133.489305
## iter 100 value 131.913864
## final  value 131.913864
## stopped after 100 iterations
## # weights:  106
## initial  value 523.268924
## iter  10 value 323.267772
## iter  20 value 251.448694
## iter  30 value 224.727456
## iter  40 value 152.478300
## iter  50 value 132.612731
## iter  60 value 128.259744
## iter  70 value 119.835327
## iter  80 value 119.474284
## iter  90 value 119.357435
## iter 100 value 119.260927
## final  value 119.260927
## stopped after 100 iterations
## # weights:  22
## initial  value 395.706746
## iter  10 value 335.438782
## final  value 335.438699
## converged
## # weights:  64
## initial  value 359.821596
## iter  10 value 334.379644
## iter  20 value 333.595400
## iter  30 value 291.351216
## iter  40 value 230.931580
## iter  50 value 147.790103
## iter  60 value 122.211248
## iter  70 value 115.869667
## iter  80 value 109.954922
## iter  90 value 107.316940
## iter 100 value 106.335153
## final  value 106.335153
## stopped after 100 iterations
## # weights:  106
## initial  value 350.432788
## iter  10 value 334.438770
## iter  20 value 326.236789
## iter  30 value 296.763973
## iter  40 value 182.772471
## iter  50 value 139.624753
## iter  60 value 130.027332
## iter  70 value 126.997330
## iter  80 value 120.514319
## iter  90 value 120.369874
```

```
## final  value 120.369663
## converged
## # weights:  22
## initial  value 499.747296
## iter  10 value 334.635265
## iter  20 value 334.380507
## iter  30 value 333.916051
## iter  40 value 323.935174
## iter  50 value 307.674791
## iter  60 value 259.391851
## iter  70 value 152.556861
## iter  80 value 132.351351
## iter  90 value 129.516081
## iter 100 value 129.327521
## final  value 129.327521
## stopped after 100 iterations
## # weights:  64
## initial  value 344.861402
## iter  10 value 332.452457
## iter  20 value 276.991536
## iter  30 value 228.359831
## iter  40 value 143.890331
## iter  50 value 138.363179
## iter  60 value 124.627494
## iter  70 value 120.622271
## iter  80 value 116.470719
## iter  90 value 116.276751
## iter 100 value 116.069914
## final  value 116.069914
## stopped after 100 iterations
## # weights:  106
## initial  value 401.929028
## iter  10 value 305.073176
## iter  20 value 296.585930
## iter  30 value 282.881781
## iter  40 value 232.962529
## iter  50 value 178.471096
## iter  60 value 133.898767
## iter  70 value 122.652002
## iter  80 value 121.300593
## iter  90 value 119.744003
## iter 100 value 110.193248
## final  value 110.193248
## stopped after 100 iterations
## # weights:  22
## initial  value 382.511845
## iter  10 value 331.975871
## iter  20 value 239.964392
## iter  30 value 185.497475
## iter  40 value 154.949966
## iter  50 value 127.399892
## iter  60 value 119.146785
## iter  70 value 116.029982
## iter  80 value 114.918323
```

```
## iter  90 value 114.873598
## iter 100 value 114.561198
## final  value 114.561198
## stopped after 100 iterations
## # weights:  64
## initial  value 367.545443
## iter  10 value 338.984075
## iter  20 value 327.920597
## iter  30 value 214.584272
## iter  40 value 135.119400
## iter  50 value 112.064960
## iter  60 value 102.261154
## iter  70 value 96.686024
## iter  80 value 93.410169
## iter  90 value 92.141682
## iter 100 value 88.708885
## final  value 88.708885
## stopped after 100 iterations
## # weights:  106
## initial  value 378.916325
## iter  10 value 298.163046
## iter  20 value 272.248757
## iter  30 value 203.951231
## iter  40 value 169.328348
## iter  50 value 126.805122
## iter  60 value 122.115040
## iter  70 value 118.800241
## iter  80 value 111.120425
## iter  90 value 107.102214
## iter 100 value 106.171720
## final  value 106.171720
## stopped after 100 iterations
## # weights:  22
## initial  value 354.233679
## iter  10 value 335.420667
## iter  20 value 330.476047
## iter  30 value 317.124151
## iter  40 value 218.915225
## iter  50 value 142.102142
## iter  60 value 129.782683
## iter  70 value 125.520046
## iter  80 value 121.755151
## iter  90 value 120.505094
## iter 100 value 120.106769
## final  value 120.106769
## stopped after 100 iterations
## # weights:  64
## initial  value 431.917964
## iter  10 value 334.188155
## iter  20 value 330.384554
## iter  30 value 254.522939
## iter  40 value 186.061236
## iter  50 value 130.657140
## iter  60 value 121.829080
```

```
## iter  70 value 120.240373
## iter  80 value 120.100468
## iter  90 value 120.098486
## iter 100 value 120.097210
## final  value 120.097210
## stopped after 100 iterations
## # weights:  106
## initial  value 347.117431
## iter  10 value 280.498364
## iter  20 value 150.309392
## iter  30 value 146.086379
## iter  40 value 145.342979
## iter  50 value 140.918944
## iter  60 value 137.283709
## iter  70 value 135.191816
## iter  80 value 132.793804
## iter  90 value 132.694703
## iter 100 value 132.508963
## final  value 132.508963
## stopped after 100 iterations
## # weights:  22
## initial  value 489.875389
## iter  10 value 291.895828
## iter  20 value 247.019757
## iter  30 value 191.239141
## iter  40 value 144.373769
## iter  50 value 131.292617
## iter  60 value 130.261213
## final  value 130.252858
## converged
## # weights:  64
## initial  value 357.647503
## iter  10 value 283.460957
## iter  20 value 261.636627
## iter  30 value 256.565605
## iter  40 value 247.950797
## iter  50 value 240.221049
## iter  60 value 144.289262
## iter  70 value 132.760710
## iter  80 value 129.143769
## iter  90 value 120.232287
## iter 100 value 114.826381
## final  value 114.826381
## stopped after 100 iterations
## # weights:  106
## initial  value 373.352984
## iter  10 value 333.923814
## iter  20 value 319.658750
## iter  30 value 254.693699
## iter  40 value 249.970382
## iter  50 value 237.414361
## iter  60 value 222.289056
## iter  70 value 182.027920
## iter  80 value 114.304745
```

```
## iter  90 value 105.687617
## iter 100 value 101.946055
## final  value 101.946055
## stopped after 100 iterations
## # weights:  22
## initial  value 394.136199
## iter  10 value 335.440154
## final  value 335.439434
## converged
## # weights:  64
## initial  value 357.584527
## iter  10 value 331.484202
## iter  20 value 330.445381
## iter  30 value 329.657140
## iter  40 value 328.661755
## iter  50 value 328.655378
## iter  60 value 328.653205
## final  value 328.650652
## converged
## # weights:  106
## initial  value 411.644787
## iter  10 value 331.513242
## iter  20 value 331.052263
## iter  30 value 327.404532
## iter  40 value 324.838775
## iter  50 value 274.281649
## iter  60 value 240.186910
## iter  70 value 207.298935
## iter  80 value 167.008773
## iter  90 value 155.559287
## iter 100 value 153.745072
## final  value 153.745072
## stopped after 100 iterations
## # weights:  22
## initial  value 534.002031
## iter  10 value 339.840263
## iter  20 value 339.453247
## final  value 339.453093
## converged
## # weights:  64
## initial  value 473.347627
## iter  10 value 339.460389
## iter  20 value 338.617550
## iter  30 value 338.266047
## iter  40 value 335.484205
## iter  50 value 335.376851
## iter  60 value 333.364108
## iter  70 value 333.347348
## iter  80 value 333.339978
## iter  90 value 333.339717
## final  value 333.339670
## converged
## # weights:  106
## initial  value 375.216996
```

```
## iter  10 value 339.807847
## iter  20 value 328.784757
## iter  30 value 315.528370
## iter  40 value 315.319950
## final  value 315.319718
## converged
## # weights:  22
## initial  value 352.540230
## iter  10 value 340.484402
## iter  20 value 340.176504
## final  value 340.176026
## converged
## # weights:  64
## initial  value 395.874508
## iter  10 value 296.670480
## iter  20 value 211.240159
## iter  30 value 134.249959
## iter  40 value 129.655585
## iter  50 value 127.621684
## iter  60 value 127.398347
## iter  70 value 127.384221
## final  value 127.384165
## converged
## # weights:  106
## initial  value 360.928204
## iter  10 value 340.100199
## iter  20 value 298.949850
## iter  30 value 267.076797
## iter  40 value 240.481860
## iter  50 value 158.644780
## iter  60 value 131.148256
## iter  70 value 130.681291
## final  value 130.681205
## converged
## # weights:  22
## initial  value 348.634657
## iter  10 value 336.074087
## iter  20 value 335.831839
## final  value 335.830875
## converged
## # weights:  64
## initial  value 398.326472
## iter  10 value 339.467679
## iter  20 value 339.453741
## iter  30 value 336.927112
## iter  40 value 335.532291
## iter  50 value 292.313583
## iter  60 value 152.861636
## iter  70 value 127.546562
## iter  80 value 124.162017
## iter  90 value 123.672788
## final  value 123.659895
## converged
## # weights:  106
```

```
## initial  value 375.854733
## iter  10 value 339.638205
## iter  20 value 334.677635
## iter  30 value 315.483875
## iter  40 value 309.753193
## iter  50 value 305.660386
## iter  60 value 305.649403
## iter  70 value 305.643145
## iter  80 value 305.639535
## final  value 305.638772
## converged
## # weights:  22
## initial  value 321.297070
## iter  10 value 319.436114
## final  value 319.435945
## converged
## # weights:  64
## initial  value 405.463922
## iter  10 value 310.507942
## iter  20 value 248.202200
## iter  30 value 205.204355
## iter  40 value 151.902304
## iter  50 value 140.370587
## iter  60 value 131.785834
## iter  70 value 102.175692
## iter  80 value 92.466497
## iter  90 value 91.990526
## iter 100 value 89.400803
## final  value 89.400803
## stopped after 100 iterations
## # weights:  106
## initial  value 498.807424
## iter  10 value 316.983522
## iter  20 value 254.771440
## iter  30 value 230.692472
## iter  40 value 219.330025
## iter  50 value 198.026367
## iter  60 value 136.514240
## iter  70 value 115.987753
## iter  80 value 112.473795
## iter  90 value 110.809252
## iter 100 value 110.229697
## final  value 110.229697
## stopped after 100 iterations
## # weights:  22
## initial  value 333.199678
## iter  10 value 317.739844
## iter  20 value 317.607997
## iter  30 value 312.333196
## iter  40 value 218.387097
## iter  50 value 148.522168
## iter  60 value 126.241540
## iter  70 value 124.260873
## final  value 124.227849
```

```
## converged
## # weights:  64
## initial  value 498.258900
## iter  10 value 318.642332
## iter  20 value 314.277079
## iter  30 value 235.184738
## iter  40 value 214.118472
## iter  50 value 168.341912
## iter  60 value 143.345515
## iter  70 value 115.504079
## iter  80 value 114.383109
## iter  90 value 114.353134
## final  value 114.353121
## converged
## # weights:  106
## initial  value 326.753541
## iter  10 value 319.953228
## iter  20 value 294.913274
## iter  30 value 249.296009
## iter  40 value 224.067941
## iter  50 value 192.555963
## iter  60 value 121.093454
## iter  70 value 116.213536
## iter  80 value 110.374935
## iter  90 value 109.891351
## iter 100 value 109.378547
## final  value 109.378547
## stopped after 100 iterations
## # weights:  22
## initial  value 337.944387
## iter  10 value 319.437149
## final  value 319.437029
## converged
## # weights:  64
## initial  value 375.633669
## iter  10 value 317.194410
## iter  20 value 316.385554
## iter  30 value 264.183896
## iter  40 value 238.757654
## iter  50 value 175.061833
## iter  60 value 150.821490
## iter  70 value 138.976082
## iter  80 value 129.705900
## iter  90 value 129.683054
## iter 100 value 129.428521
## final  value 129.428521
## stopped after 100 iterations
## # weights:  106
## initial  value 323.649656
## iter  10 value 317.395154
## iter  20 value 316.910153
## iter  30 value 315.449415
## final  value 315.446531
## converged
```

```
## # weights:  22
## initial  value 479.129249
## iter  10 value 340.841344
## iter  20 value 337.495926
## iter  30 value 272.102516
## iter  40 value 246.294504
## iter  50 value 224.585578
## iter  60 value 209.823286
## iter  70 value 201.578230
## iter  80 value 200.937250
## iter  90 value 199.893405
## iter 100 value 199.426584
## final  value 199.426584
## stopped after 100 iterations
## # weights:  64
## initial  value 342.687276
## iter  10 value 337.950105
## iter  20 value 330.204996
## iter  30 value 329.984650
## final  value 329.983816
## converged
## # weights:  106
## initial  value 568.340739
## iter  10 value 337.073457
## iter  20 value 335.737092
## iter  30 value 335.269742
## iter  40 value 331.559541
## iter  50 value 326.146872
## iter  60 value 322.464108
## iter  70 value 321.501595
## iter  80 value 319.709268
## iter  90 value 317.163941
## iter 100 value 312.732087
## final  value 312.732087
## stopped after 100 iterations
## # weights:  22
## initial  value 427.330694
## iter  10 value 294.925217
## iter  20 value 270.811810
## iter  30 value 236.455279
## iter  40 value 155.488219
## iter  50 value 152.913149
## final  value 152.873529
## converged
## # weights:  64
## initial  value 403.322959
## iter  10 value 339.912266
## iter  20 value 316.031296
## iter  30 value 283.856105
## iter  40 value 209.194379
## iter  50 value 169.842861
## iter  60 value 156.180202
## iter  70 value 144.186965
## iter  80 value 138.204726
```

```
## iter  90 value 137.034024
## iter 100 value 136.827529
## final  value 136.827529
## stopped after 100 iterations
## # weights:  106
## initial  value 410.785014
## iter  10 value 316.822543
## iter  20 value 270.414793
## iter  30 value 265.677487
## iter  40 value 239.485054
## iter  50 value 164.484070
## iter  60 value 159.649108
## iter  70 value 151.671743
## iter  80 value 148.351296
## iter  90 value 147.244346
## iter 100 value 141.779156
## final  value 141.779156
## stopped after 100 iterations
## # weights:  22
## initial  value 348.206988
## iter  10 value 341.139519
## iter  20 value 337.369996
## iter  30 value 337.251737
## iter  40 value 337.250434
## iter  40 value 337.250431
## final  value 337.250416
## converged
## # weights:  64
## initial  value 404.852993
## iter  10 value 340.855723
## iter  20 value 337.084381
## iter  30 value 310.360172
## iter  40 value 253.516480
## iter  50 value 211.120294
## iter  60 value 177.702516
## iter  70 value 153.297225
## iter  80 value 151.680200
## iter  90 value 151.487430
## iter 100 value 149.914544
## final  value 149.914544
## stopped after 100 iterations
## # weights:  106
## initial  value 587.666638
## final  value 341.269667
## converged
## # weights:  22
## initial  value 424.696231
## iter  10 value 347.231747
## iter  20 value 347.217490
## final  value 347.217411
## converged
## # weights:  64
## initial  value 441.421013
## iter  10 value 347.227555
```

```
## iter  20 value 345.469992
## iter  30 value 338.191127
## iter  40 value 337.702062
## iter  50 value 336.935143
## iter  60 value 329.269649
## iter  70 value 329.093604
## iter  80 value 328.204976
## iter  90 value 326.919578
## iter 100 value 307.847089
## final  value 307.847089
## stopped after 100 iterations
## # weights:  106
## initial  value 457.177114
## iter  10 value 346.969935
## iter  20 value 269.185348
## iter  30 value 233.982063
## iter  40 value 197.181958
## iter  50 value 176.080305
## iter  60 value 171.778358
## iter  70 value 171.659448
## final  value 171.658560
## converged
## # weights:  22
## initial  value 363.668183
## iter  10 value 348.091028
## iter  20 value 338.714584
## iter  30 value 155.040781
## iter  40 value 137.179934
## iter  50 value 136.431336
## final  value 136.424610
## converged
## # weights:  64
## initial  value 362.223169
## iter  10 value 348.738897
## iter  20 value 292.425170
## iter  30 value 202.897287
## iter  40 value 170.519215
## iter  50 value 129.230259
## iter  60 value 127.415905
## iter  70 value 127.330467
## final  value 127.330019
## converged
## # weights:  106
## initial  value 380.416676
## iter  10 value 302.498524
## iter  20 value 270.291511
## iter  30 value 232.604308
## iter  40 value 202.628345
## iter  50 value 188.175665
## iter  60 value 141.695002
## iter  70 value 130.750342
## iter  80 value 126.556163
## iter  90 value 125.223809
## iter 100 value 123.556476
```

```
## final  value 123.556476
## stopped after 100 iterations
## # weights:  22
## initial  value 364.184461
## iter  10 value 264.760346
## iter  20 value 226.417452
## iter  30 value 206.087297
## iter  40 value 187.453595
## iter  50 value 175.680399
## iter  60 value 168.559759
## iter  70 value 166.938701
## iter  80 value 166.763995
## iter  90 value 166.731278
## iter 100 value 166.293890
## final  value 166.293890
## stopped after 100 iterations
## # weights:  64
## initial  value 467.530533
## iter  10 value 348.567700
## iter  20 value 345.743950
## iter  30 value 334.361198
## iter  40 value 254.641744
## iter  50 value 155.267406
## iter  60 value 153.163102
## iter  70 value 151.636222
## iter  80 value 146.608072
## iter  90 value 145.480626
## iter 100 value 128.340524
## final  value 128.340524
## stopped after 100 iterations
## # weights:  106
## initial  value 353.521529
## iter  10 value 347.012909
## iter  20 value 346.584399
## iter  30 value 293.485347
## iter  40 value 211.475613
## iter  50 value 161.478954
## iter  60 value 121.589174
## iter  70 value 117.361158
## iter  80 value 111.562010
## iter  90 value 109.923292
## iter 100 value 107.676312
## final  value 107.676312
## stopped after 100 iterations
## # weights:  22
## initial  value 412.544308
## iter  10 value 348.127647
## iter  20 value 347.868415
## iter  30 value 347.856744
## final  value 347.856674
## converged
## # weights:  64
## initial  value 680.578271
## iter  10 value 341.909261
```

```
## iter  20 value 333.519485
## iter  30 value 333.254485
## iter  40 value 333.252730
## final  value 333.252614
## converged
## # weights:  106
## initial  value 396.314970
## iter  10 value 347.777466
## iter  20 value 250.830702
## iter  30 value 134.856311
## iter  40 value 120.040666
## iter  50 value 119.497206
## iter  60 value 119.326953
## iter  70 value 118.933855
## final  value 118.930673
## converged
## # weights:  22
## initial  value 514.861809
## iter  10 value 348.197054
## iter  20 value 347.674141
## iter  30 value 347.472228
## iter  40 value 328.017366
## iter  50 value 249.159808
## iter  60 value 194.356194
## iter  70 value 143.152621
## iter  80 value 133.237997
## iter  90 value 132.645758
## final  value 132.644432
## converged
## # weights:  64
## initial  value 420.735508
## iter  10 value 348.080185
## iter  20 value 292.326253
## iter  30 value 273.029588
## iter  40 value 214.648605
## iter  50 value 175.558836
## iter  60 value 134.168015
## iter  70 value 130.716154
## iter  80 value 125.788605
## iter  90 value 123.311088
## iter 100 value 123.154419
## final  value 123.154419
## stopped after 100 iterations
## # weights:  106
## initial  value 739.197563
## iter  10 value 302.416610
## iter  20 value 217.302914
## iter  30 value 139.265619
## iter  40 value 136.161517
## iter  50 value 135.699142
## iter  60 value 129.529865
## iter  70 value 127.874854
## iter  80 value 124.208247
## iter  90 value 123.804123
```

```
## iter 100 value 120.204955
## final  value 120.204955
## stopped after 100 iterations
## # weights:  22
## initial  value 402.101138
## iter  10 value 347.867720
## final  value 347.858173
## converged
## # weights:  64
## initial  value 360.949916
## iter  10 value 347.690101
## iter  20 value 282.511009
## iter  30 value 270.399861
## iter  40 value 268.926078
## iter  50 value 238.095338
## iter  60 value 188.472603
## iter  70 value 144.453282
## iter  80 value 122.225942
## iter  90 value 119.549013
## iter 100 value 119.451944
## final  value 119.451944
## stopped after 100 iterations
## # weights:  106
## initial  value 376.181330
## iter  10 value 348.487243
## iter  20 value 304.846111
## iter  30 value 270.107770
## iter  40 value 179.184866
## iter  50 value 161.177597
## iter  60 value 148.590177
## iter  70 value 145.340289
## iter  80 value 131.029688
## iter  90 value 124.787237
## iter 100 value 123.837731
## final  value 123.837731
## stopped after 100 iterations
## # weights:  22
## initial  value 353.857502
## iter  10 value 346.615459
## iter  20 value 346.613700
## iter  20 value 346.613697
## iter  20 value 346.613697
## final  value 346.613697
## converged
## # weights:  64
## initial  value 402.446464
## iter  10 value 346.615176
## final  value 346.613832
## converged
## # weights:  106
## initial  value 351.577415
## iter  10 value 345.722671
## iter  20 value 344.544960
## final  value 344.542663
```

```
## converged
## # weights:  22
## initial  value 423.245453
## iter  10 value 347.763737
## iter  10 value 347.763734
## iter  10 value 347.763734
## final  value 347.763734
## converged
## # weights:  64
## initial  value 493.731891
## iter  10 value 346.351314
## iter  20 value 309.156004
## iter  30 value 243.766158
## iter  40 value 167.958623
## iter  50 value 155.078466
## iter  60 value 148.460037
## iter  70 value 147.812527
## iter  80 value 147.809735
## final  value 147.809710
## converged
## # weights:  106
## initial  value 353.113879
## iter  10 value 346.990026
## iter  20 value 346.233245
## iter  30 value 291.209936
## iter  40 value 266.285524
## iter  50 value 170.009401
## iter  60 value 160.451006
## iter  70 value 153.361748
## iter  80 value 151.339881
## iter  90 value 150.859547
## iter 100 value 149.353225
## final  value 149.353225
## stopped after 100 iterations
## # weights:  22
## initial  value 349.133896
## iter  10 value 346.614739
## iter  10 value 346.614738
## iter  10 value 346.614738
## final  value 346.614738
## converged
## # weights:  64
## initial  value 363.945947
## iter  10 value 345.982121
## iter  20 value 345.972207
## iter  30 value 345.279239
## iter  40 value 345.276165
## iter  40 value 345.276162
## iter  40 value 345.276162
## final  value 345.276162
## converged
## # weights:  106
## initial  value 348.291499
## iter  10 value 280.576555
```

```
## iter  20 value 261.153041
## iter  30 value 252.216361
## iter  40 value 251.060394
## iter  50 value 248.677701
## iter  60 value 219.967550
## iter  70 value 197.123334
## iter  80 value 157.915536
## iter  90 value 138.962961
## iter 100 value 129.501222
## final  value 129.501222
## stopped after 100 iterations
## # weights:  22
## initial  value 403.895497
## iter  10 value 327.052060
## final  value 327.052034
## converged
## # weights:  64
## initial  value 472.574553
## iter  10 value 308.960425
## iter  20 value 295.734320
## iter  30 value 292.396944
## iter  40 value 287.228637
## iter  50 value 253.593100
## iter  60 value 247.983131
## iter  70 value 204.701944
## iter  80 value 120.525351
## iter  90 value 98.708514
## iter 100 value 88.311498
## final  value 88.311498
## stopped after 100 iterations
## # weights:  106
## initial  value 618.643224
## iter  10 value 326.623589
## iter  20 value 325.760874
## iter  30 value 265.261464
## iter  40 value 233.730864
## iter  50 value 201.667953
## iter  60 value 164.506210
## iter  70 value 144.615083
## iter  80 value 141.796878
## iter  90 value 140.646549
## iter 100 value 140.302350
## final  value 140.302350
## stopped after 100 iterations
## # weights:  22
## initial  value 659.370706
## iter  10 value 327.243634
## final  value 327.241853
## converged
## # weights:  64
## initial  value 410.895402
## iter  10 value 326.901285
## iter  20 value 272.640395
## iter  30 value 256.514501
```

```
## iter  40 value 198.805392
## iter  50 value 147.601150
## iter  60 value 116.504194
## iter  70 value 113.957835
## iter  80 value 112.700563
## iter  90 value 111.519108
## iter 100 value 111.505210
## final  value 111.505210
## stopped after 100 iterations
## # weights:  106
## initial  value 333.048612
## iter  10 value 326.644462
## iter  20 value 236.270158
## iter  30 value 204.061839
## iter  40 value 170.556546
## iter  50 value 119.673139
## iter  60 value 115.626057
## iter  70 value 112.864110
## iter  80 value 112.616090
## iter  90 value 112.484546
## iter 100 value 112.467201
## final  value 112.467201
## stopped after 100 iterations
## # weights:  22
## initial  value 410.806469
## iter  10 value 327.159915
## final  value 327.159892
## converged
## # weights:  64
## initial  value 346.708877
## iter  10 value 325.849809
## iter  20 value 325.575733
## iter  30 value 325.574933
## iter  40 value 325.345579
## iter  50 value 324.802906
## iter  60 value 324.462452
## iter  70 value 324.458485
## final  value 324.458429
## converged
## # weights:  106
## initial  value 1005.262659
## iter  10 value 324.854401
## iter  20 value 317.145953
## iter  30 value 314.244480
## iter  40 value 136.901996
## iter  50 value 107.170761
## iter  60 value 99.905609
## iter  70 value 97.281748
## iter  80 value 96.379346
## iter  90 value 96.339995
## iter 100 value 96.182670
## final  value 96.182670
## stopped after 100 iterations
## # weights:  22
```

```
## initial  value 502.484075
## iter  10 value 302.591447
## iter  20 value 237.045433
## iter  30 value 165.815537
## iter  40 value 152.172898
## iter  50 value 146.760499
## iter  60 value 145.651717
## iter  70 value 145.649256
## final  value 145.649254
## converged
## # weights:  64
## initial  value 356.349864
## iter  10 value 350.909786
## iter  20 value 349.783588
## iter  30 value 341.529373
## iter  40 value 209.612854
## iter  50 value 164.945710
## iter  60 value 150.080697
## iter  70 value 147.490262
## iter  80 value 147.360000
## iter  90 value 146.534664
## iter 100 value 145.787466
## final  value 145.787466
## stopped after 100 iterations
## # weights:  106
## initial  value 357.884730
## iter  10 value 350.675904
## iter  20 value 342.361247
## iter  30 value 340.217850
## iter  40 value 330.212116
## iter  50 value 226.535882
## iter  60 value 159.302332
## iter  70 value 148.807780
## iter  80 value 142.115829
## iter  90 value 140.373889
## iter 100 value 134.199720
## final  value 134.199720
## stopped after 100 iterations
## # weights:  22
## initial  value 377.602454
## iter  10 value 350.745109
## iter  20 value 263.303608
## iter  30 value 164.117213
## iter  40 value 155.323673
## iter  50 value 155.003523
## final  value 155.001515
## converged
## # weights:  64
## initial  value 451.796769
## iter  10 value 350.332385
## iter  20 value 349.668259
## iter  30 value 339.853323
## iter  40 value 327.100184
## iter  50 value 290.491839
```

```
## iter  60 value 288.218490
## iter  70 value 281.463475
## iter  80 value 250.773620
## iter  90 value 219.759878
## iter 100 value 181.838665
## final  value 181.838665
## stopped after 100 iterations
## # weights:  106
## initial  value 398.956941
## iter  10 value 350.760848
## iter  20 value 349.506974
## iter  30 value 334.569890
## iter  40 value 266.386374
## iter  50 value 238.396970
## iter  60 value 170.574561
## iter  70 value 155.594685
## iter  80 value 151.219507
## iter  90 value 143.972869
## iter 100 value 137.760419
## final  value 137.760419
## stopped after 100 iterations
## # weights:  22
## initial  value 480.956646
## iter  10 value 350.789186
## iter  20 value 350.787473
## iter  30 value 350.740876
## iter  40 value 348.317396
## iter  50 value 314.765486
## iter  60 value 312.784843
## iter  70 value 278.649720
## iter  80 value 235.974251
## iter  90 value 228.207527
## iter 100 value 185.874144
## final  value 185.874144
## stopped after 100 iterations
## # weights:  64
## initial  value 509.508253
## iter  10 value 348.290073
## iter  20 value 281.845511
## iter  30 value 278.086130
## iter  40 value 275.835304
## iter  50 value 274.861918
## iter  60 value 269.248497
## iter  70 value 199.891883
## iter  80 value 147.252327
## iter  90 value 142.742195
## iter 100 value 138.401515
## final  value 138.401515
## stopped after 100 iterations
## # weights:  106
## initial  value 754.392241
## iter  10 value 303.904632
## iter  20 value 271.594439
## iter  30 value 199.712369
```

```
## iter  40 value 169.872684
## iter  50 value 148.057801
## iter  60 value 145.950880
## iter  70 value 145.229308
## iter  80 value 141.704269
## iter  90 value 140.811875
## iter 100 value 140.632567
## final  value 140.632567
## stopped after 100 iterations
## # weights:  22
## initial  value 405.018786
## final  value 337.414167
## converged
## # weights:  64
## initial  value 339.875946
## iter  10 value 331.377859
## iter  20 value 324.273224
## iter  30 value 324.217383
## final  value 324.217316
## converged
## # weights:  106
## initial  value 489.780531
## iter  10 value 334.982571
## iter  20 value 310.990397
## iter  30 value 298.461830
## iter  40 value 277.334645
## iter  50 value 163.233802
## iter  60 value 155.153387
## iter  70 value 153.337394
## iter  80 value 151.234135
## iter  90 value 150.004338
## iter 100 value 149.056655
## final  value 149.056655
## stopped after 100 iterations
## # weights:  22
## initial  value 363.676068
## iter  10 value 337.570802
## iter  20 value 337.523339
## final  value 337.523294
## converged
## # weights:  64
## initial  value 367.083286
## iter  10 value 336.811982
## iter  20 value 269.250675
## iter  30 value 198.888401
## iter  40 value 170.323981
## iter  50 value 155.298976
## iter  60 value 154.040419
## iter  70 value 153.981248
## iter  80 value 153.971344
## final  value 153.953016
## converged
## # weights:  106
## initial  value 438.823336
```

```
## iter  10 value 319.344183
## iter  20 value 263.072542
## iter  30 value 175.173847
## iter  40 value 157.131584
## iter  50 value 155.002793
## iter  60 value 154.535132
## iter  70 value 154.430192
## iter  80 value 154.423768
## final  value 154.423612
## converged
## # weights:  22
## initial  value 344.824902
## iter  10 value 337.416754
## iter  20 value 337.123015
## iter  30 value 334.084825
## iter  40 value 331.305464
## iter  50 value 331.299846
## iter  60 value 330.637061
## iter  70 value 249.980541
## iter  80 value 184.661084
## iter  90 value 157.743355
## iter 100 value 155.479665
## final  value 155.479665
## stopped after 100 iterations
## # weights:  64
## initial  value 394.680557
## iter  10 value 329.540677
## iter  20 value 327.158765
## iter  30 value 238.419361
## iter  40 value 156.720896
## iter  50 value 147.555294
## iter  60 value 146.395092
## iter  70 value 146.003072
## iter  80 value 145.766891
## iter  90 value 145.619864
## iter 100 value 145.592409
## final  value 145.592409
## stopped after 100 iterations
## # weights:  106
## initial  value 572.868616
## iter  10 value 334.194611
## iter  20 value 324.697405
## iter  30 value 322.749018
## iter  40 value 322.554514
## iter  50 value 322.549079
## iter  60 value 312.648944
## iter  70 value 216.040018
## iter  80 value 163.631668
## iter  90 value 149.566462
## iter 100 value 146.556387
## final  value 146.556387
## stopped after 100 iterations
## # weights:  22
## initial  value 358.680236
```

```
## iter  10 value 348.454584
## iter  20 value 309.814812
## iter  30 value 262.269555
## iter  40 value 135.618155
## iter  50 value 119.079776
## iter  60 value 111.657430
## iter  70 value 102.330278
## iter  80 value 101.565738
## iter  90 value 101.540325
## iter 100 value 101.531012
## final  value 101.531012
## stopped after 100 iterations
## # weights:  64
## initial  value 461.188900
## iter  10 value 279.129954
## iter  20 value 269.584266
## iter  30 value 259.007385
## iter  40 value 204.746033
## iter  50 value 121.728427
## iter  60 value 114.005644
## iter  70 value 107.233626
## iter  80 value 93.340458
## iter  90 value 92.422180
## iter 100 value 92.418098
## final  value 92.418098
## stopped after 100 iterations
## # weights:  106
## initial  value 371.670108
## iter  10 value 346.890496
## iter  20 value 335.686315
## iter  30 value 281.587722
## iter  40 value 143.622300
## iter  50 value 120.857207
## iter  60 value 118.677182
## iter  70 value 109.693261
## iter  80 value 101.060162
## iter  90 value 91.798629
## iter 100 value 85.528175
## final  value 85.528175
## stopped after 100 iterations
## # weights:  22
## initial  value 351.801483
## iter  10 value 279.679221
## iter  20 value 184.914740
## iter  30 value 134.216568
## iter  40 value 126.663355
## iter  50 value 126.350530
## final  value 126.350081
## converged
## # weights:  64
## initial  value 350.087168
## iter  10 value 348.567613
## iter  20 value 319.405856
## iter  30 value 275.568708
```

```
## iter  40 value 252.912976
## iter  50 value 158.578840
## iter  60 value 127.779056
## iter  70 value 124.829344
## iter  80 value 124.392090
## iter  90 value 124.382719
## final  value 124.382717
## converged
## # weights:  106
## initial  value 374.720957
## iter  10 value 322.372238
## iter  20 value 272.029194
## iter  30 value 266.275928
## iter  40 value 241.233442
## iter  50 value 132.165624
## iter  60 value 125.653662
## iter  70 value 123.331654
## iter  80 value 117.185811
## iter  90 value 115.847644
## iter 100 value 115.001897
## final  value 115.001897
## stopped after 100 iterations
## # weights:  22
## initial  value 381.024683
## iter  10 value 346.875226
## iter  20 value 342.293326
## iter  30 value 342.276532
## iter  40 value 342.271438
## iter  50 value 342.267309
## iter  60 value 342.264522
## final  value 342.263544
## converged
## # weights:  64
## initial  value 477.361846
## iter  10 value 346.666224
## iter  20 value 345.653501
## iter  30 value 162.896955
## iter  40 value 144.132258
## iter  50 value 143.807899
## iter  60 value 141.588086
## iter  70 value 131.289622
## iter  80 value 119.693446
## iter  90 value 118.399886
## iter 100 value 117.815085
## final  value 117.815085
## stopped after 100 iterations
## # weights:  106
## initial  value 415.644824
## iter  10 value 315.943211
## iter  20 value 281.246384
## iter  30 value 279.078635
## iter  40 value 263.096679
## iter  50 value 167.935267
## iter  60 value 154.623523
```

```
## iter  70 value 143.079852
## iter  80 value 138.221495
## iter  90 value 137.733521
## iter 100 value 133.094237
## final  value 133.094237
## stopped after 100 iterations
## # weights:  22
## initial  value 406.556941
## iter  10 value 322.481198
## iter  20 value 322.396462
## final  value 322.391585
## converged
## # weights:  64
## initial  value 476.396451
## iter  10 value 318.709089
## iter  20 value 309.582778
## iter  30 value 309.544192
## final  value 309.543227
## converged
## # weights:  106
## initial  value 425.248144
## iter  10 value 270.660595
## iter  20 value 253.830653
## iter  30 value 219.073917
## iter  40 value 158.780324
## iter  50 value 115.433420
## iter  60 value 110.432551
## iter  70 value 109.946746
## iter  80 value 109.942018
## iter  90 value 109.870111
## iter 100 value 107.104120
## final  value 107.104120
## stopped after 100 iterations
## # weights:  22
## initial  value 499.676067
## iter  10 value 304.901049
## iter  20 value 159.039150
## iter  30 value 139.298640
## iter  40 value 128.034230
## iter  50 value 128.008539
## final  value 128.008509
## converged
## # weights:  64
## initial  value 576.382435
## iter  10 value 291.327746
## iter  20 value 231.905666
## iter  30 value 144.380465
## iter  40 value 129.064542
## iter  50 value 126.984305
## iter  60 value 124.384189
## iter  70 value 123.230484
## iter  80 value 123.141340
## iter  90 value 123.139470
## final  value 123.139466
```

```
## converged
## # weights:  106
## initial  value 350.878773
## iter  10 value 322.789274
## iter  20 value 321.994101
## iter  30 value 306.531515
## iter  40 value 275.478784
## iter  50 value 232.955007
## iter  60 value 188.036826
## iter  70 value 127.869504
## iter  80 value 127.622996
## iter  90 value 127.242339
## iter 100 value 124.773433
## final  value 124.773433
## stopped after 100 iterations
## # weights:  22
## initial  value 372.262814
## iter  10 value 322.482065
## final  value 322.481734
## converged
## # weights:  64
## initial  value 386.666715
## iter  10 value 321.819260
## iter  20 value 310.732800
## iter  30 value 309.706956
## iter  40 value 309.667358
## iter  50 value 309.639934
## iter  60 value 309.632570
## iter  70 value 296.690320
## iter  80 value 288.922851
## iter  90 value 240.966022
## iter 100 value 208.445465
## final  value 208.445465
## stopped after 100 iterations
## # weights:  106
## initial  value 338.424293
## iter  10 value 289.902099
## iter  20 value 233.548563
## iter  30 value 150.971832
## iter  40 value 130.097405
## iter  50 value 116.164681
## iter  60 value 111.234318
## iter  70 value 109.553587
## iter  80 value 109.133944
## iter  90 value 109.114079
## iter 100 value 109.109333
## final  value 109.109333
## stopped after 100 iterations
## # weights:  22
## initial  value 583.152891
## iter  10 value 328.108543
## iter  20 value 327.970800
## final  value 327.970651
## converged
```

```
## # weights:  64
## initial  value 361.137019
## iter  10 value 308.858449
## iter  20 value 266.227159
## iter  30 value 257.622137
## iter  40 value 219.749776
## iter  50 value 158.793813
## iter  60 value 120.191630
## iter  70 value 117.656355
## iter  80 value 117.274729
## iter  90 value 117.260013
## iter 100 value 117.253362
## final  value 117.253362
## stopped after 100 iterations
## # weights:  106
## initial  value 420.937704
## iter  10 value 326.646546
## iter  20 value 262.804164
## iter  30 value 229.841269
## iter  40 value 221.205929
## iter  50 value 181.657444
## iter  60 value 174.023629
## iter  70 value 165.942405
## iter  80 value 157.127749
## iter  90 value 137.774374
## iter 100 value 112.198118
## final  value 112.198118
## stopped after 100 iterations
## # weights:  22
## initial  value 597.589420
## iter  10 value 329.087293
## iter  20 value 327.900985
## iter  30 value 308.400964
## iter  40 value 256.726534
## iter  50 value 233.519245
## iter  60 value 156.462718
## iter  70 value 143.406351
## iter  80 value 134.500789
## iter  90 value 134.428132
## iter  90 value 134.428131
## iter  90 value 134.428130
## final  value 134.428130
## converged
## # weights:  64
## initial  value 335.098428
## iter  10 value 327.274685
## iter  20 value 270.261783
## iter  30 value 260.180251
## iter  40 value 235.125494
## iter  50 value 212.369889
## iter  60 value 138.565349
## iter  70 value 125.393082
## iter  80 value 125.005860
## iter  90 value 124.993974
```

```
## final  value 124.993820
## converged
## # weights:  106
## initial  value 745.732690
## iter  10 value 335.197181
## iter  20 value 327.263557
## iter  30 value 266.001155
## iter  40 value 222.451407
## iter  50 value 169.160345
## iter  60 value 141.362912
## iter  70 value 130.785597
## iter  80 value 123.291152
## iter  90 value 118.872816
## iter 100 value 109.906983
## final  value 109.906983
## stopped after 100 iterations
## # weights:  22
## initial  value 451.188804
## iter  10 value 328.476492
## iter  20 value 327.552522
## iter  30 value 322.377304
## iter  40 value 322.182998
## iter  50 value 230.086098
## iter  60 value 144.714728
## iter  70 value 127.787766
## iter  80 value 125.273398
## iter  90 value 123.906582
## iter 100 value 123.697850
## final  value 123.697850
## stopped after 100 iterations
## # weights:  64
## initial  value 520.799135
## iter  10 value 325.942098
## iter  20 value 323.722821
## iter  30 value 323.067014
## iter  40 value 319.990194
## iter  50 value 319.866081
## iter  60 value 319.859390
## iter  70 value 319.852303
## iter  80 value 318.684535
## iter  90 value 318.322821
## iter 100 value 317.930093
## final  value 317.930093
## stopped after 100 iterations
## # weights:  106
## initial  value 347.753519
## iter  10 value 327.521969
## iter  20 value 326.926759
## iter  30 value 318.089226
## iter  40 value 276.975551
## iter  50 value 132.572384
## iter  60 value 124.728492
## iter  70 value 118.828675
## iter  80 value 117.434542
```

```
## iter  90 value 117.301103
## iter 100 value 117.091271
## final  value 117.091271
## stopped after 100 iterations
## # weights:  22
## initial  value 506.625266
## iter  10 value 347.771309
## iter  20 value 344.193936
## iter  30 value 273.845461
## iter  40 value 238.575733
## iter  50 value 157.282179
## iter  60 value 141.503702
## iter  70 value 130.718345
## iter  80 value 124.610512
## iter  90 value 117.637241
## iter 100 value 116.642683
## final  value 116.642683
## stopped after 100 iterations
## # weights:  64
## initial  value 362.259869
## iter  10 value 350.185077
## iter  20 value 333.214292
## iter  30 value 322.556238
## iter  40 value 253.267887
## iter  50 value 171.130434
## iter  60 value 146.617313
## iter  70 value 139.975158
## iter  80 value 137.253672
## iter  90 value 130.945809
## iter 100 value 127.998637
## final  value 127.998637
## stopped after 100 iterations
## # weights:  106
## initial  value 358.011337
## iter  10 value 349.057870
## iter  20 value 324.689561
## iter  30 value 319.614983
## iter  40 value 251.371022
## iter  50 value 162.919473
## iter  60 value 139.246425
## iter  70 value 128.995597
## iter  80 value 125.766616
## iter  90 value 123.736721
## iter 100 value 122.507159
## final  value 122.507159
## stopped after 100 iterations
## # weights:  22
## initial  value 353.198207
## iter  10 value 349.974275
## final  value 349.973074
## converged
## # weights:  64
## initial  value 364.479030
## iter  10 value 327.765721
```

```
## iter  20 value 274.588651
## iter  30 value 266.572474
## iter  40 value 208.156396
## iter  50 value 155.805620
## iter  60 value 148.336222
## iter  70 value 146.081495
## iter  80 value 145.086276
## iter  90 value 144.407956
## iter 100 value 143.919697
## final  value 143.919697
## stopped after 100 iterations
## # weights:  106
## initial  value 355.889034
## iter  10 value 349.620595
## iter  20 value 346.062801
## iter  30 value 248.599462
## iter  40 value 149.822374
## iter  50 value 146.130996
## iter  60 value 145.684076
## iter  70 value 143.120822
## iter  80 value 141.951841
## iter  90 value 139.036409
## iter 100 value 137.155219
## final  value 137.155219
## stopped after 100 iterations
## # weights:  22
## initial  value 537.144214
## iter  10 value 349.315888
## iter  20 value 347.500392
## iter  30 value 347.496687
## final  value 347.496551
## converged
## # weights:  64
## initial  value 588.028691
## iter  10 value 337.163623
## iter  20 value 324.484835
## iter  30 value 323.295483
## iter  40 value 322.456276
## iter  50 value 270.725674
## iter  60 value 186.380443
## iter  70 value 168.750186
## iter  80 value 136.440947
## iter  90 value 132.953662
## iter 100 value 126.051552
## final  value 126.051552
## stopped after 100 iterations
## # weights:  106
## initial  value 347.921975
## iter  10 value 274.660027
## iter  20 value 195.144787
## iter  30 value 148.310751
## iter  40 value 134.072041
## iter  50 value 133.028080
## iter  60 value 131.864055
```

```
## iter  70 value 129.628165
## iter  80 value 128.928967
## iter  90 value 128.485212
## iter 100 value 128.291791
## final  value 128.291791
## stopped after 100 iterations
## # weights:  22
## initial  value 325.079779
## iter  10 value 324.998246
## iter  20 value 324.138785
## final  value 324.126406
## converged
## # weights:  64
## initial  value 569.564957
## iter  10 value 321.244923
## iter  20 value 283.991301
## iter  30 value 147.614260
## iter  40 value 125.850940
## iter  50 value 124.542655
## iter  60 value 119.012956
## iter  70 value 118.393748
## iter  80 value 118.390206
## final  value 118.390200
## converged
## # weights:  106
## initial  value 398.324914
## iter  10 value 278.652078
## iter  20 value 232.758766
## iter  30 value 184.867154
## iter  40 value 134.208818
## iter  50 value 126.448392
## iter  60 value 121.791798
## iter  70 value 121.391010
## iter  80 value 121.313094
## iter  90 value 119.296309
## iter 100 value 115.510767
## final  value 115.510767
## stopped after 100 iterations
## # weights:  22
## initial  value 375.616945
## iter  10 value 325.214846
## iter  20 value 324.772928
## iter  30 value 264.536123
## iter  40 value 258.532128
## iter  50 value 226.870850
## iter  60 value 167.938030
## iter  70 value 134.807869
## iter  80 value 131.926341
## iter  90 value 131.374132
## final  value 131.374049
## converged
## # weights:  64
## initial  value 510.271756
## iter  10 value 251.177199
```

```
## iter  20 value 183.560401
## iter  30 value 148.902625
## iter  40 value 130.243541
## iter  50 value 127.657422
## iter  60 value 127.595160
## iter  70 value 127.582950
## final  value 127.577115
## converged
## # weights:  106
## initial  value 408.050396
## iter  10 value 325.371640
## iter  20 value 275.437164
## iter  30 value 149.646623
## iter  40 value 135.310814
## iter  50 value 129.688052
## iter  60 value 129.475881
## final  value 129.460394
## converged
## # weights:  22
## initial  value 335.030717
## iter  10 value 322.125394
## iter  20 value 294.907983
## iter  30 value 141.426713
## iter  40 value 139.376918
## iter  50 value 136.234434
## iter  60 value 133.465931
## iter  70 value 133.225531
## iter  80 value 133.200016
## iter  90 value 133.014665
## iter 100 value 132.895292
## final  value 132.895292
## stopped after 100 iterations
## # weights:  64
## initial  value 352.838877
## iter  10 value 323.783665
## iter  20 value 321.407044
## iter  30 value 320.926880
## iter  40 value 320.312521
## iter  50 value 282.606974
## iter  60 value 175.358791
## iter  70 value 138.864972
## iter  80 value 130.678247
## iter  90 value 123.850323
## iter 100 value 117.336449
## final  value 117.336449
## stopped after 100 iterations
## # weights:  106
## initial  value 324.533870
## iter  10 value 310.721316
## iter  20 value 278.438016
## iter  30 value 274.303066
## iter  40 value 255.736712
## iter  50 value 226.976131
## iter  60 value 177.586932
```

```
## iter  70 value 126.150860
## iter  80 value 122.828694
## iter  90 value 119.059074
## iter 100 value 118.097097
## final  value 118.097097
## stopped after 100 iterations
## # weights:  22
## initial  value 384.346015
## final  value 331.626388
## converged
## # weights:  64
## initial  value 645.802118
## iter  10 value 329.470314
## iter  20 value 328.135298
## iter  30 value 243.727664
## iter  40 value 142.245738
## iter  50 value 115.045028
## iter  60 value 107.694015
## iter  70 value 104.456612
## iter  80 value 103.394604
## iter  90 value 102.712193
## iter 100 value 101.878753
## final  value 101.878753
## stopped after 100 iterations
## # weights:  106
## initial  value 391.614585
## iter  10 value 286.175970
## iter  20 value 264.063639
## iter  30 value 263.012163
## iter  40 value 213.171578
## iter  50 value 119.804569
## iter  60 value 113.464875
## iter  70 value 111.456204
## iter  80 value 106.607366
## iter  90 value 105.923468
## iter 100 value 104.558060
## final  value 104.558060
## stopped after 100 iterations
## # weights:  22
## initial  value 429.528589
## iter  10 value 332.250048
## iter  20 value 318.863280
## iter  30 value 283.391454
## iter  40 value 235.333215
## iter  50 value 172.566447
## iter  60 value 132.695705
## iter  70 value 124.005860
## iter  80 value 123.744191
## final  value 123.732551
## converged
## # weights:  64
## initial  value 343.594290
## iter  10 value 324.448383
## iter  20 value 277.706887
```

```
## iter  30 value 261.817028
## iter  40 value 243.397223
## iter  50 value 138.164612
## iter  60 value 125.665241
## iter  70 value 121.595575
## iter  80 value 120.994803
## iter  90 value 120.967961
## iter 100 value 120.729898
## final  value 120.729898
## stopped after 100 iterations
## # weights:  106
## initial  value 408.147837
## iter  10 value 331.262370
## iter  20 value 330.118894
## iter  30 value 322.634088
## iter  40 value 215.803859
## iter  50 value 150.636241
## iter  60 value 124.423942
## iter  70 value 118.056977
## iter  80 value 113.547566
## iter  90 value 112.717159
## iter 100 value 112.660632
## final  value 112.660632
## stopped after 100 iterations
## # weights:  22
## initial  value 619.754220
## final  value 332.401618
## converged
## # weights:  64
## initial  value 545.982443
## iter  10 value 331.908181
## iter  10 value 331.908178
## final  value 331.908178
## converged
## # weights:  106
## initial  value 421.412497
## iter  10 value 287.673245
## iter  20 value 270.290002
## iter  30 value 221.785693
## iter  40 value 132.446699
## iter  50 value 122.263280
## iter  60 value 121.274973
## iter  70 value 120.893621
## iter  80 value 118.829753
## iter  90 value 117.168202
## iter 100 value 117.092944
## final  value 117.092944
## stopped after 100 iterations
## # weights:  22
## initial  value 339.820592
## final  value 321.689285
## converged
## # weights:  64
## initial  value 386.426202
```

```
## iter  10 value 303.471454
## iter  20 value 205.313703
## iter  30 value 148.169198
## iter  40 value 142.057161
## iter  50 value 140.677896
## iter  60 value 137.892638
## iter  70 value 137.088046
## iter  80 value 136.265679
## iter  90 value 130.050311
## iter 100 value 112.487062
## final  value 112.487062
## stopped after 100 iterations
## # weights:  106
## initial  value 326.675321
## iter  10 value 319.290944
## iter  20 value 262.888762
## iter  30 value 170.474879
## iter  40 value 147.019640
## iter  50 value 144.078508
## iter  60 value 141.980687
## iter  70 value 140.575877
## iter  80 value 140.110731
## iter  90 value 139.465811
## iter 100 value 136.256661
## final  value 136.256661
## stopped after 100 iterations
## # weights:  22
## initial  value 423.377247
## iter  10 value 319.515794
## iter  20 value 273.288464
## iter  30 value 245.963091
## iter  40 value 153.400266
## iter  50 value 139.586200
## iter  60 value 138.335350
## final  value 138.318830
## converged
## # weights:  64
## initial  value 354.713806
## iter  10 value 321.319973
## iter  20 value 314.341364
## iter  30 value 292.293495
## iter  40 value 258.312316
## iter  50 value 191.173887
## iter  60 value 143.097778
## iter  70 value 138.084555
## iter  80 value 135.574557
## iter  90 value 135.398871
## iter 100 value 134.368112
## final  value 134.368112
## stopped after 100 iterations
## # weights:  106
## initial  value 524.750369
## iter  10 value 298.101443
## iter  20 value 291.153223
```

```
## iter  30 value 267.884832
## iter  40 value 225.829387
## iter  50 value 204.439073
## iter  60 value 146.357310
## iter  70 value 139.687018
## iter  80 value 136.532493
## iter  90 value 134.272291
## iter 100 value 133.144744
## final  value 133.144744
## stopped after 100 iterations
## # weights:  22
## initial  value 479.982105
## final  value 321.690000
## converged
## # weights:  64
## initial  value 597.077539
## iter  10 value 319.484506
## iter  20 value 319.086848
## iter  30 value 318.928567
## iter  40 value 317.501725
## iter  50 value 317.405131
## iter  60 value 317.404266
## iter  70 value 317.402990
## iter  80 value 317.402348
## final  value 317.402323
## converged
## # weights:  106
## initial  value 473.804169
## iter  10 value 319.398933
## iter  20 value 318.936104
## iter  30 value 318.683049
## iter  40 value 318.497662
## iter  50 value 318.497110
## iter  60 value 318.495342
## iter  70 value 318.486294
## iter  80 value 305.118086
## iter  90 value 172.808440
## iter 100 value 132.928546
## final  value 132.928546
## stopped after 100 iterations
## # weights:  22
## initial  value 366.197901
## iter  10 value 325.113728
## iter  20 value 325.097472
## final  value 325.097450
## converged
## # weights:  64
## initial  value 676.390554
## iter  10 value 325.420800
## iter  20 value 294.969966
## iter  30 value 233.441917
## iter  40 value 161.289728
## iter  50 value 154.777061
## iter  60 value 151.609130
```

```
## iter  70 value 142.849561
## iter  80 value 141.260316
## iter  90 value 136.134396
## iter 100 value 133.554705
## final  value 133.554705
## stopped after 100 iterations
## # weights:  106
## initial  value 384.401484
## iter  10 value 317.639423
## iter  20 value 299.223681
## iter  30 value 291.146919
## iter  40 value 284.939065
## iter  50 value 281.938368
## iter  60 value 281.906747
## final  value 281.906715
## converged
## # weights:  22
## initial  value 414.126464
## iter  10 value 328.338343
## final  value 328.335739
## converged
## # weights:  64
## initial  value 571.731898
## iter  10 value 326.025560
## iter  20 value 323.720582
## iter  30 value 290.658310
## iter  40 value 276.315888
## iter  50 value 263.893430
## iter  60 value 163.191009
## iter  70 value 149.720191
## iter  80 value 144.222478
## iter  90 value 137.890430
## iter 100 value 137.729660
## final  value 137.729660
## stopped after 100 iterations
## # weights:  106
## initial  value 697.363923
## iter  10 value 322.521960
## iter  20 value 224.099806
## iter  30 value 159.905707
## iter  40 value 151.767546
## iter  50 value 140.867773
## iter  60 value 135.440275
## iter  70 value 135.103263
## iter  80 value 133.873230
## iter  90 value 129.427836
## iter 100 value 127.022072
## final  value 127.022072
## stopped after 100 iterations
## # weights:  22
## initial  value 705.016299
## iter  10 value 330.902581
## iter  20 value 315.239893
## iter  30 value 223.702027
```

```
## iter  40 value 153.427117
## iter  50 value 142.196703
## iter  60 value 132.986392
## iter  70 value 128.876887
## iter  80 value 127.682844
## iter  90 value 127.409515
## iter 100 value 127.370630
## final  value 127.370630
## stopped after 100 iterations
## # weights:  64
## initial  value 325.228732
## iter  10 value 267.560634
## iter  20 value 252.137726
## iter  30 value 198.246136
## iter  40 value 175.454784
## iter  50 value 151.091467
## iter  60 value 147.752229
## iter  70 value 145.098582
## iter  80 value 143.768729
## iter  90 value 140.032802
## iter 100 value 139.679735
## final  value 139.679735
## stopped after 100 iterations
## # weights:  106
## initial  value 353.796470
## iter  10 value 307.292961
## iter  20 value 295.691505
## iter  30 value 285.539306
## iter  40 value 268.986874
## iter  50 value 265.517619
## iter  60 value 264.266079
## iter  70 value 259.349056
## iter  80 value 205.186146
## iter  90 value 150.801077
## iter 100 value 144.732976
## final  value 144.732976
## stopped after 100 iterations
## # weights:  22
## initial  value 412.390093
## iter  10 value 346.777349
## iter  20 value 346.555750
## final  value 346.555695
## converged
## # weights:  64
## initial  value 396.794800
## iter  10 value 346.266523
## iter  20 value 342.205723
## iter  30 value 342.085082
## final  value 341.727467
## converged
## # weights:  106
## initial  value 448.595703
## iter  10 value 345.530616
## iter  20 value 345.093997
```

```
## iter  30 value 338.760038
## iter  40 value 324.201790
## iter  50 value 320.301126
## iter  60 value 293.059616
## iter  70 value 256.161873
## iter  80 value 199.021803
## iter  90 value 157.530916
## iter 100 value 149.860635
## final  value 149.860635
## stopped after 100 iterations
## # weights:  22
## initial  value 404.701937
## iter  10 value 346.742409
## iter  20 value 346.538826
## final  value 346.522872
## converged
## # weights:  64
## initial  value 458.400297
## iter  10 value 274.743451
## iter  20 value 188.208950
## iter  30 value 166.573672
## iter  40 value 159.737574
## iter  50 value 158.131117
## iter  60 value 157.243572
## iter  70 value 152.508879
## iter  80 value 150.669690
## iter  90 value 141.821844
## iter 100 value 138.525567
## final  value 138.525567
## stopped after 100 iterations
## # weights:  106
## initial  value 371.482269
## iter  10 value 345.255876
## iter  20 value 317.221263
## iter  30 value 284.360974
## iter  40 value 248.892504
## iter  50 value 186.585847
## iter  60 value 172.479543
## iter  70 value 161.203682
## iter  80 value 154.025080
## iter  90 value 151.449653
## iter 100 value 150.554635
## final  value 150.554635
## stopped after 100 iterations
## # weights:  22
## initial  value 399.115345
## iter  10 value 345.949542
## final  value 345.948147
## converged
## # weights:  64
## initial  value 373.526859
## iter  10 value 345.557028
## iter  20 value 344.946078
## iter  30 value 343.695559
```

```
## iter  40 value 341.256463
## iter  50 value 338.814714
## iter  60 value 338.802289
## iter  70 value 338.800655
## iter  80 value 338.799811
## iter  80 value 338.799811
## iter  80 value 338.799811
## final  value 338.799811
## converged
## # weights:  106
## initial  value 603.516993
## iter  10 value 346.649431
## iter  20 value 342.909605
## iter  30 value 323.168769
## iter  40 value 294.991063
## iter  50 value 248.510165
## iter  60 value 171.971425
## iter  70 value 155.937116
## iter  80 value 154.596453
## iter  90 value 151.959002
## iter 100 value 147.819802
## final  value 147.819802
## stopped after 100 iterations
## # weights:  22
## initial  value 410.393824
## iter  10 value 342.440830
## final  value 342.440647
## converged
## # weights:  64
## initial  value 344.105884
## iter  10 value 341.913473
## iter  20 value 340.544019
## iter  30 value 335.793409
## iter  40 value 335.006251
## iter  50 value 335.004935
## iter  50 value 335.004933
## final  value 335.004930
## converged
## # weights:  106
## initial  value 493.226826
## iter  10 value 341.987247
## iter  20 value 341.625384
## iter  30 value 335.535382
## iter  40 value 335.474399
## final  value 335.474307
## converged
## # weights:  22
## initial  value 437.038235
## iter  10 value 344.141520
## final  value 344.141509
## converged
## # weights:  64
## initial  value 356.941436
## iter  10 value 342.379230
```

```
## iter  20 value 341.368536
## iter  30 value 340.637093
## iter  40 value 340.611346
## final  value 340.611285
## converged
## # weights:  106
## initial  value 512.061833
## iter  10 value 342.390380
## iter  20 value 341.733593
## iter  30 value 300.478177
## iter  40 value 290.510570
## iter  50 value 280.314226
## iter  60 value 188.708478
## iter  70 value 154.964038
## iter  80 value 148.575693
## iter  90 value 147.377974
## iter 100 value 145.474743
## final  value 145.474743
## stopped after 100 iterations
## # weights:  22
## initial  value 426.016416
## iter  10 value 342.172295
## iter  20 value 341.976734
## final  value 341.976644
## converged
## # weights:  64
## initial  value 355.602099
## iter  10 value 344.084011
## iter  20 value 344.070615
## iter  30 value 342.444664
## iter  30 value 342.444662
## iter  30 value 342.444662
## final  value 342.444662
## converged
## # weights:  106
## initial  value 348.231428
## iter  10 value 307.683514
## iter  20 value 257.068266
## iter  30 value 145.783191
## iter  40 value 139.456132
## iter  50 value 138.442786
## iter  60 value 137.537220
## iter  70 value 134.437639
## iter  80 value 133.088328
## iter  90 value 132.253864
## iter 100 value 132.064255
## final  value 132.064255
## stopped after 100 iterations
## # weights:  22
## initial  value 461.176396
## iter  10 value 349.087083
## iter  20 value 349.003931
## iter  30 value 347.342579
## iter  40 value 344.158305
```

```
## iter  50 value 272.048028
## iter  60 value 180.166308
## iter  70 value 155.315709
## iter  80 value 147.075710
## iter  90 value 140.411580
## iter 100 value 140.267474
## final  value 140.267474
## stopped after 100 iterations
## # weights:  64
## initial  value 353.998865
## iter  10 value 349.055296
## iter  20 value 343.846559
## iter  30 value 322.280166
## iter  40 value 179.244787
## iter  50 value 156.055318
## iter  60 value 154.157224
## iter  70 value 151.281777
## iter  80 value 143.411893
## iter  90 value 142.137062
## iter 100 value 138.411240
## final  value 138.411240
## stopped after 100 iterations
## # weights:  106
## initial  value 614.513367
## iter  10 value 340.592691
## iter  20 value 319.260300
## iter  30 value 299.526828
## iter  40 value 281.351539
## iter  50 value 230.107186
## iter  60 value 142.265845
## iter  70 value 135.556720
## iter  80 value 135.121755
## iter  90 value 134.578846
## iter 100 value 129.028183
## final  value 129.028183
## stopped after 100 iterations
## # weights:  22
## initial  value 429.678013
## iter  10 value 348.909533
## iter  20 value 348.859184
## final  value 348.858327
## converged
## # weights:  64
## initial  value 497.809591
## iter  10 value 330.619670
## iter  20 value 284.040189
## iter  30 value 275.942680
## iter  40 value 268.632193
## iter  50 value 260.945002
## iter  60 value 177.632901
## iter  70 value 152.986936
## iter  80 value 149.190262
## iter  90 value 149.043949
## iter 100 value 148.733163
```

```
## final  value 148.733163
## stopped after 100 iterations
## # weights:  106
## initial  value 489.727169
## iter  10 value 348.559868
## iter  20 value 347.456317
## iter  30 value 325.452959
## iter  40 value 248.144673
## iter  50 value 197.501161
## iter  60 value 158.380858
## iter  70 value 144.189740
## iter  80 value 143.190907
## iter  90 value 138.979464
## iter 100 value 137.456907
## final  value 137.456907
## stopped after 100 iterations
## # weights:  22
## initial  value 378.684007
## iter  10 value 347.781986
## iter  20 value 339.977988
## iter  30 value 249.067003
## iter  40 value 159.240983
## iter  50 value 153.943334
## iter  60 value 147.796250
## iter  70 value 147.248228
## iter  80 value 147.092273
## iter  90 value 146.200888
## iter 100 value 146.105708
## final  value 146.105708
## stopped after 100 iterations
## # weights:  64
## initial  value 412.201167
## iter  10 value 347.670748
## iter  20 value 343.416444
## iter  30 value 294.394161
## iter  40 value 168.993988
## iter  50 value 148.915760
## iter  60 value 148.164300
## iter  70 value 143.866342
## iter  80 value 143.100175
## iter  90 value 142.954671
## iter 100 value 142.816546
## final  value 142.816546
## stopped after 100 iterations
## # weights:  106
## initial  value 625.686474
## iter  10 value 343.851075
## iter  20 value 335.260917
## iter  30 value 334.904555
## iter  40 value 332.612116
## iter  50 value 281.846953
## iter  60 value 175.941824
## iter  70 value 157.036978
## iter  80 value 155.107436
```

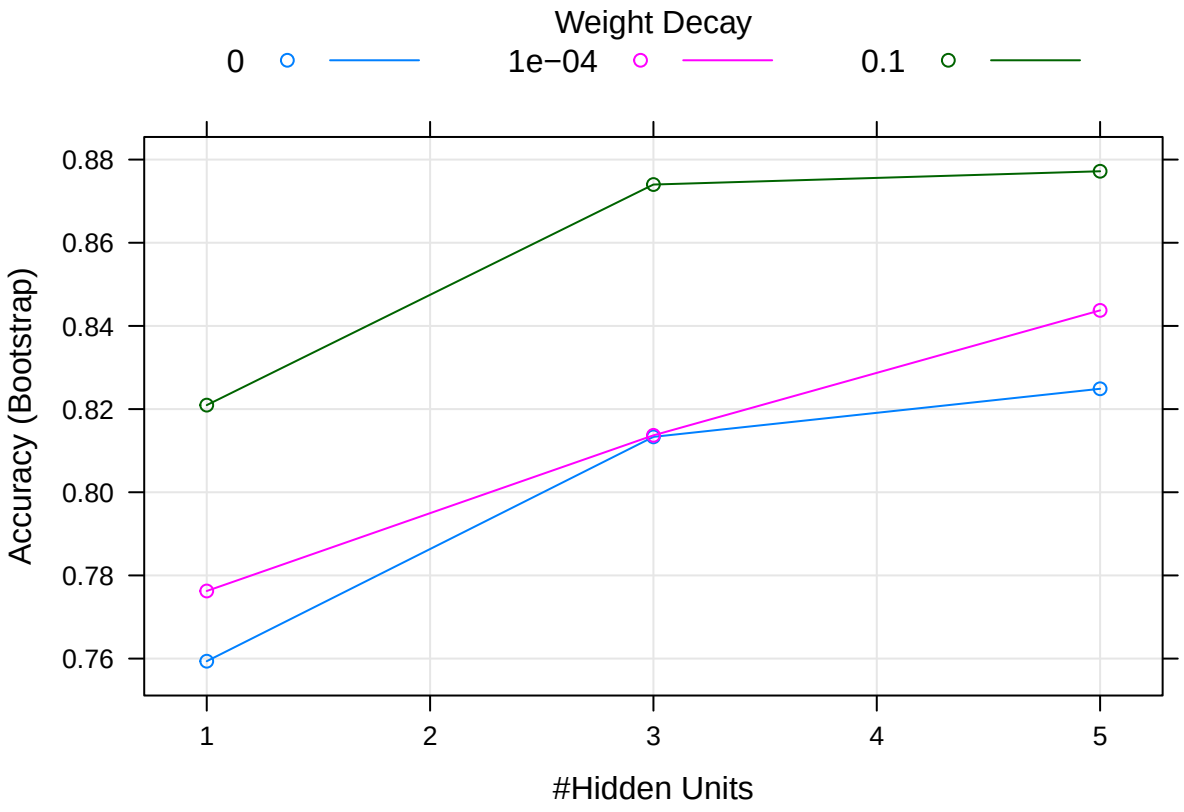
```
## iter  90 value 154.479120
## iter 100 value 152.546983
## final  value 152.546983
## stopped after 100 iterations
## # weights:  22
## initial  value 342.211968
## iter  10 value 326.819158
## final  value 326.813916
## converged
## # weights:  64
## initial  value 702.953758
## iter  10 value 326.847637
## iter  20 value 326.799763
## iter  30 value 326.251877
## iter  40 value 323.834638
## iter  50 value 322.331753
## iter  60 value 317.823365
## iter  70 value 317.037228
## iter  80 value 301.468735
## iter  90 value 283.310739
## iter 100 value 249.644262
## final  value 249.644262
## stopped after 100 iterations
## # weights:  106
## initial  value 757.711903
## iter  10 value 325.472123
## iter  20 value 323.108874
## iter  30 value 322.760908
## iter  40 value 315.388459
## iter  50 value 308.319949
## iter  60 value 308.162936
## iter  70 value 305.637587
## iter  80 value 305.513382
## iter  90 value 300.411848
## iter 100 value 291.449000
## final  value 291.449000
## stopped after 100 iterations
## # weights:  22
## initial  value 352.371897
## iter  10 value 327.126742
## final  value 327.102413
## converged
## # weights:  64
## initial  value 536.242792
## iter  10 value 327.193939
## iter  20 value 284.015988
## iter  30 value 221.709220
## iter  40 value 145.428074
## iter  50 value 132.578507
## iter  60 value 125.053391
## iter  70 value 119.528796
## iter  80 value 114.880611
## iter  90 value 112.943630
## iter 100 value 111.403846
```

```
## final  value 111.403846
## stopped after 100 iterations
## # weights:  106
## initial  value 389.103481
## iter  10 value 311.123658
## iter  20 value 252.993311
## iter  30 value 199.371191
## iter  40 value 151.669471
## iter  50 value 119.824519
## iter  60 value 114.978981
## iter  70 value 113.959868
## iter  80 value 110.769639
## iter  90 value 107.974348
## iter 100 value 105.587660
## final  value 105.587660
## stopped after 100 iterations
## # weights:  22
## initial  value 361.980864
## iter  10 value 328.226265
## iter  20 value 327.147395
## iter  30 value 324.905633
## iter  40 value 323.439233
## iter  50 value 323.438039
## iter  60 value 323.436487
## iter  70 value 323.435779
## final  value 323.435773
## converged
## # weights:  64
## initial  value 885.800443
## iter  10 value 326.484001
## iter  20 value 326.353290
## iter  30 value 326.151224
## final  value 326.147423
## converged
## # weights:  106
## initial  value 545.039767
## iter  10 value 326.838264
## iter  20 value 326.816524
## final  value 326.815080
## converged
## # weights:  106
## initial  value 502.846058
## iter  10 value 335.673490
## iter  20 value 289.729062
## iter  30 value 204.521096
## iter  40 value 149.527181
## iter  50 value 143.297707
## iter  60 value 142.179891
## iter  70 value 141.798523
## iter  80 value 141.710352
## iter  90 value 141.061513
## iter 100 value 139.859044
## final  value 139.859044
## stopped after 100 iterations
```

```r
print(model_nnet)
```

```
## Neural Network
##
## 576 samples
##   5 predictor
##   2 classes: '0', '1'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 576, 576, 576, 576, 576, 576, ...
## Resampling results across tuning parameters:
##
##   size  decay  Accuracy   Kappa
##   1     0e+00  0.7593696  0.1757480
##   1     1e-04  0.7762596  0.2406536
##   1     1e-01  0.8209556  0.3944200
##   3     0e+00  0.8133218  0.3968140
##   3     1e-04  0.8136883  0.4052193
##   3     1e-01  0.8739967  0.6615744
##   5     0e+00  0.8248843  0.4771722
##   5     1e-04  0.8437348  0.5532274
##   5     1e-01  0.8771927  0.6799754
##
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were size = 5 and decay = 0.1.
```

```r
plot(model_nnet)
```




```
# prediction with nnet
predictions_nnet<-predict.train(object=model_nnet,testSet[,predictors],type="raw")
table(predictions_nnet)
```

```
## predictions_nnet
##   0   1
## 143  47
```

```
#Confusion Matrix and Statistics

confusionMatrix(predictions_nnet,testSet[,outcomeName])
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   0   1
##          0 132  11
##          1   7  40
##
##                Accuracy : 0.9053
##                  95% CI : (0.8544, 0.9429)
##     No Information Rate : 0.7316
##     P-Value [Acc > NIR] : 2.306e-09
##
##                   Kappa : 0.7526
##  Mcnemar's Test P-Value : 0.4795
##
```

```
##             Sensitivity : 0.9496
##             Specificity : 0.7843
##          Pos Pred Value : 0.9231
##          Neg Pred Value : 0.8511
##              Prevalence : 0.7316
##          Detection Rate : 0.6947
##    Detection Prevalence : 0.7526
##       Balanced Accuracy : 0.8670
##
##        'Positive' Class : 0
##
```

```
confusionMatrix(predictions_gbm,testSet[,outcomeName])
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   0   1
##          0 131  13
##          1   8  38
##
##                Accuracy : 0.8895
##                  95% CI : (0.836, 0.9303)
##     No Information Rate : 0.7316
##     P-Value [Acc > NIR] : 7.679e-08
##
##                   Kappa : 0.7096
##  Mcnemar's Test P-Value : 0.3827
##
##             Sensitivity : 0.9424
##             Specificity : 0.7451
##          Pos Pred Value : 0.9097
##          Neg Pred Value : 0.8261
##              Prevalence : 0.7316
##          Detection Rate : 0.6895
##    Detection Prevalence : 0.7579
##       Balanced Accuracy : 0.8438
##
##        'Positive' Class : 0
##
```

```
confusionMatrix(predictions_rf,testSet[,outcomeName])
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   0   1
##          0 132  14
##          1   7  37
##
##                Accuracy : 0.8895
##                  95% CI : (0.836, 0.9303)
##     No Information Rate : 0.7316
##     P-Value [Acc > NIR] : 7.679e-08
##
```

```
##                   Kappa : 0.7058
##  Mcnemar's Test P-Value : 0.1904
##
##             Sensitivity : 0.9496
##             Specificity : 0.7255
##          Pos Pred Value : 0.9041
##          Neg Pred Value : 0.8409
##              Prevalence : 0.7316
##          Detection Rate : 0.6947
##    Detection Prevalence : 0.7684
##       Balanced Accuracy : 0.8376
##
##        'Positive' Class : 0
##
```

Using these three methods, the Stochastic Gradient Boosting (GBM) approach has highest accuracy of 0.9, thus we can cay that Stochastic Gradient Boosting algorith predict the food expenditure better.