Prediction of Cannabis Consumption from Demographics and Personality

HarvardX PH125.9x Data Science Capstone

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Contents

Executive Summary

+ Introduction

Drug use is a behavior that constitutes an important factor linked to poor health, including early mortality, and which presents significant adverse consequences for the social fabric, notably with respect to criminality and family cohesion. Early detection of an individual's predisposition to drug consumption offers the opportunity to healthcare professionals to short-circuit the onset of addiction.

The present study is based on a dataset that includes demographic and psychological information related to the consumption of 18 legal and illegal drugs by 1885 participants. For the purpose of this study, we choose to focus the data analysis and modeling on the use of cannabis.

+ Goal of project

The goal of this project is to assess whether an individual's consumption of cannabis can be predicted from a combination of demographic and personality data.

To do so, we build and assess the effectiveness of six machine learning classifiers and confront the results obtained with the insights provided by data exploration.

+ Dataset description

The original dataset is found on the UCI machine learning repository. It is based the research paper by E. Fehrman, A. K. Muhammad, E. M. Mirkes, V. Egan and A. N. Gorban, "The Five Factor Model of personality and evaluation of drug consumption risk.," arXiv, 2015. The data was collected from 1885 English-speaking participants over 18 years of age between March 2011 and March 2012.

In the original dataset, drug use is separated between 'Never used', 'Used over a decade ago', 'Used over a decade ago', 'Used in last decade', 'Used in last year', 'Used in last month', 'Used in last week' and 'Used in last day'. For the purpose of this study, we separate the data in two groups: 'Never Used' (the original predictor) and 'Used' (the combination of the others).

The original dataset includes answers to questions related to the use of alcohol, amphetamines, amyl nitrite, benzodiazepines, cannabis, chocolate, cocaine, caffeine, crack, ecstasy, heroin, ketamine, legal highs, LSD, methadone, magic mushrooms, nicotine and volatile substance abuse (VSA)) and one fictitious drug (Semeron) which was introduced to identify over-claimers. In the present study, we restrict our scope to the analysis of cannabis consumption.

The data consists of two groups of pre-normalized and centered predictors:

1. Five demographic predictors : Age, Gender, Level of education, Ethnicity, and Country of origin.
2. The results from seven scored tests administered to assess personality, specifically:

- Neuroticism (a long-term tendency to experience negative emotions such as nervousness, tension, anxiety and depression);
- Extraversion (manifested in outgoing, warm, active, assertive, talkative, cheerful, and in search of stimulation characteristics);
- Openness to experience (a general appreciation for art, unusual ideas, and imaginative, creative, unconventional, and wide interests);
- Agreeableness (a dimension of interpersonal relations, characterized by altruism, trust, modesty, kindness, compassion and cooperativeness);
- Conscientiousness (a tendency to be organized and dependable, strong-willed, persistent, reliable, and efficient);
- Impulsiveness;
- Sensation-seeking.

The working dataset in this study therefore consists of one Class (Cannabis consumption labeled 'Used') and twelve predictors (five demographic and seven personality-related).

+ Key steps

We extract a training subset (80% of data) from the dataset for the purpose of training our model, and use the remaining 20% of the data as a test set for the purpose of evaluation. This being a classification problem, we use accuracy as the metric to assess the goodness of fit.

This report consists of two main sections:

- In the first part, after performing minor data engineering, we explore, bin, and analyze the dataset.
- In the second part, we move on to the modeling phase:
- After applying a Recursive feature elimination algotirhm to seek and discard predictors that do not contribute significantly to the outcome, we build models based on the following methods:
- Generalized linear model (glm)
- Generalized linear model with penalized maximum likelihood (GLMnet)
- Decision tree (rpart)

- Random forest (rf)
- Stochastic gradient boosting (gbm)
- Neural network (nnet)

We compare the modeling approaches, both in terms of accuracy and coherence with the data analysis.

Analysis

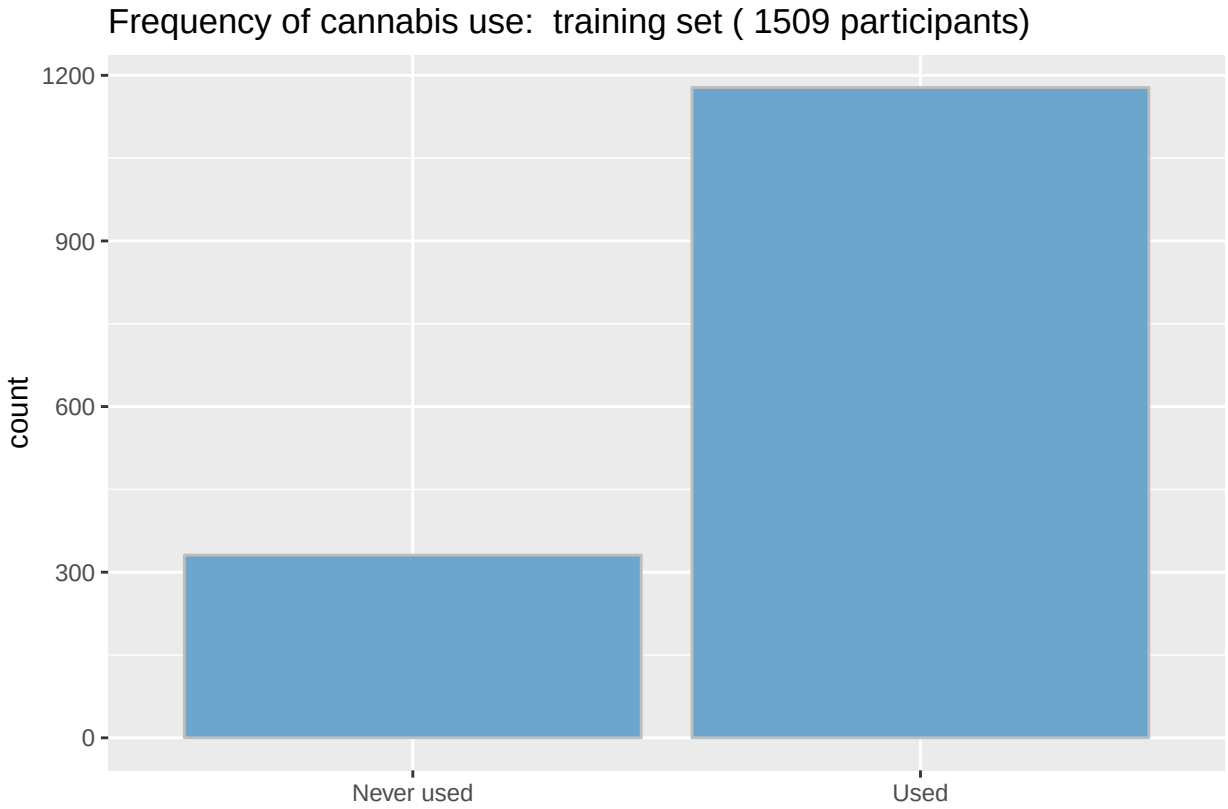
A: Data engineering

- All predictors were already normalized and centered in the original dataset.
- We construct the 'Used' class to separate 'Never used' participants (0) from the others (1).
- We then partition the data between training (80% / df.train) and test sets (20% / df.test) preserving the distribution of the Cannabis class.

B: Data exploration

- There are 0 NAs in the dataset.

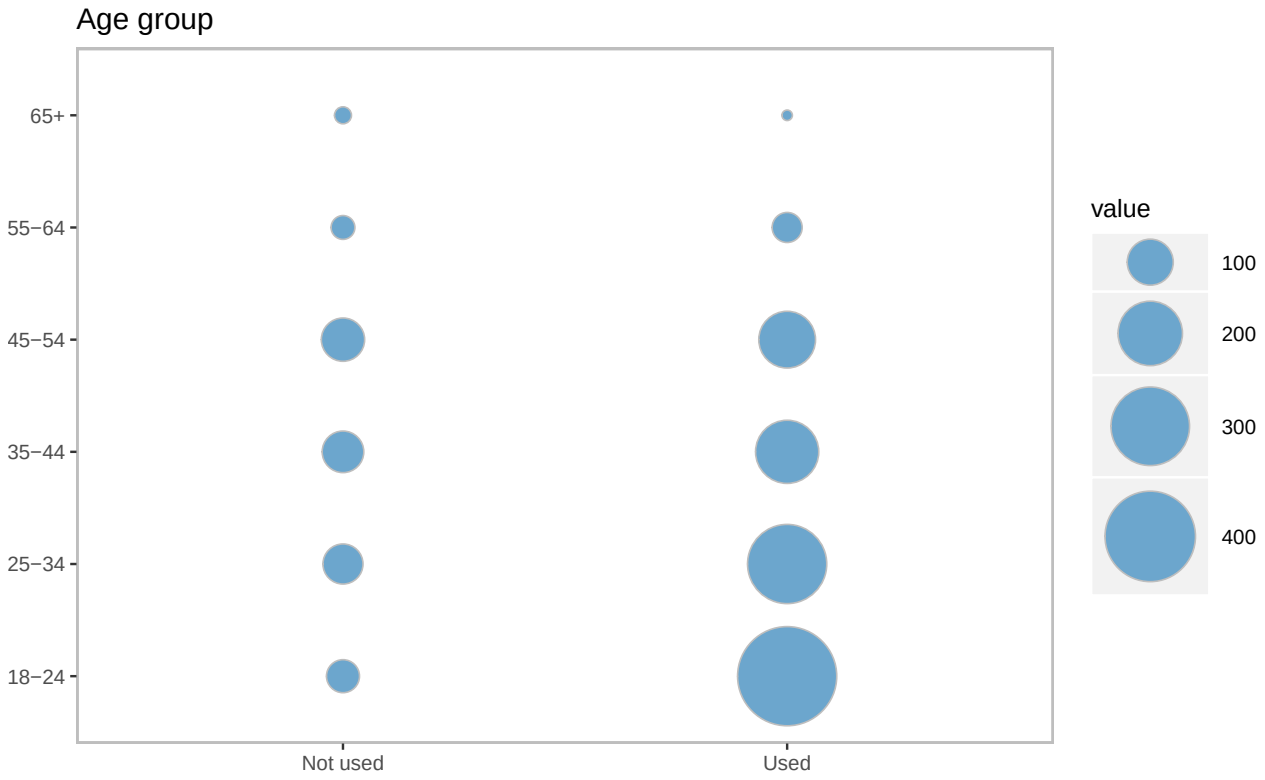
Class distribution

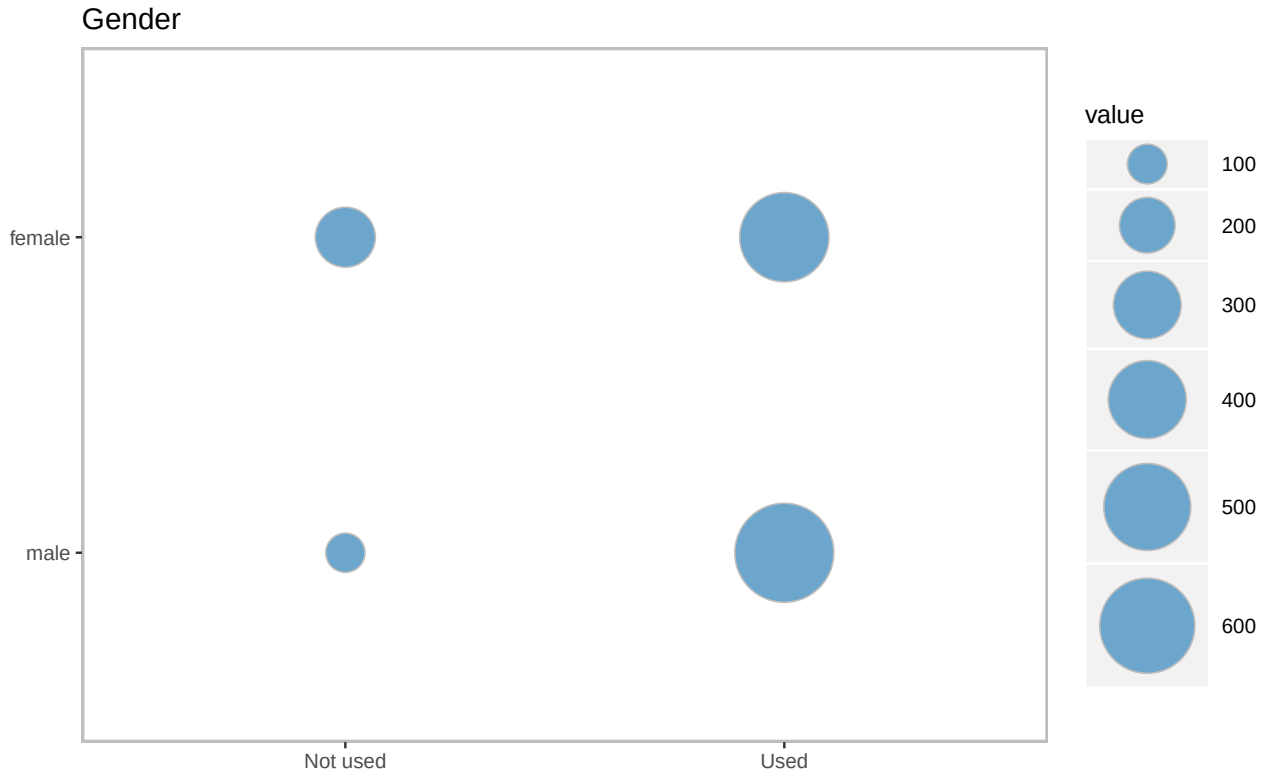


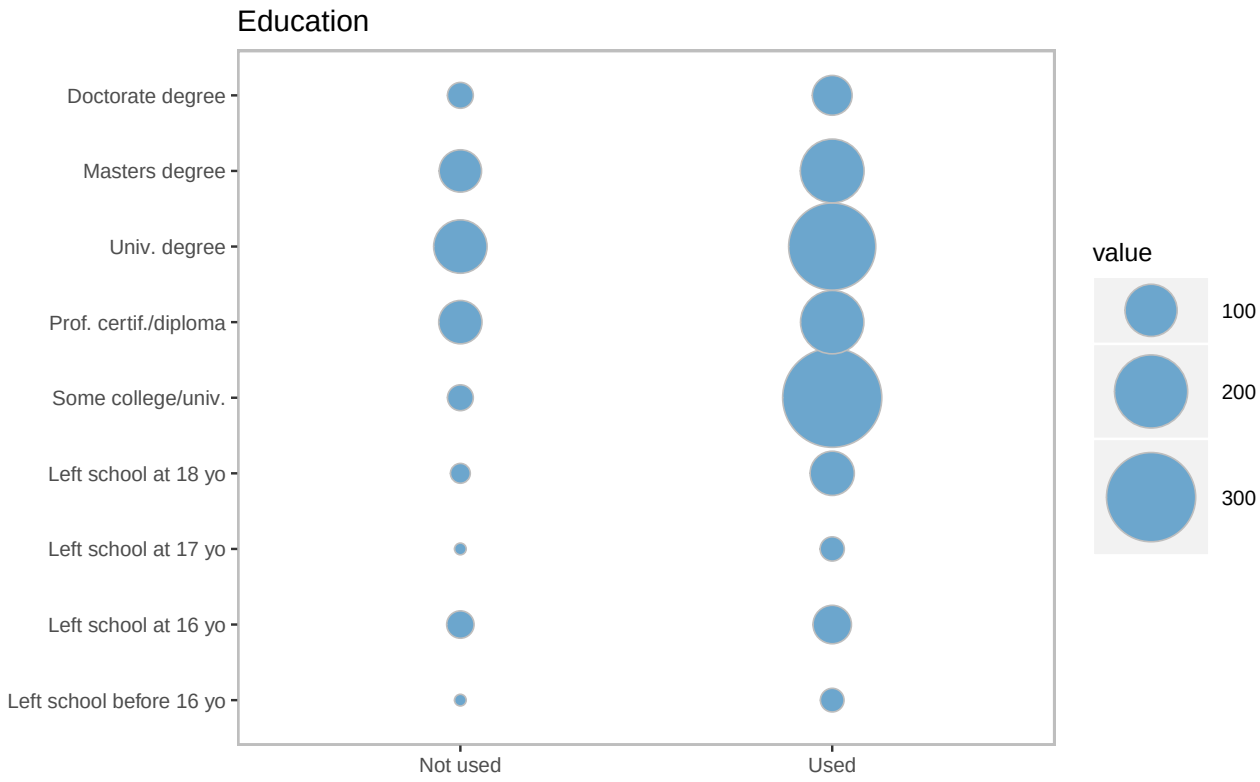
The training set consists of 1178 participants having used cannabis at some pioint in the past and 331 participants who haven't.

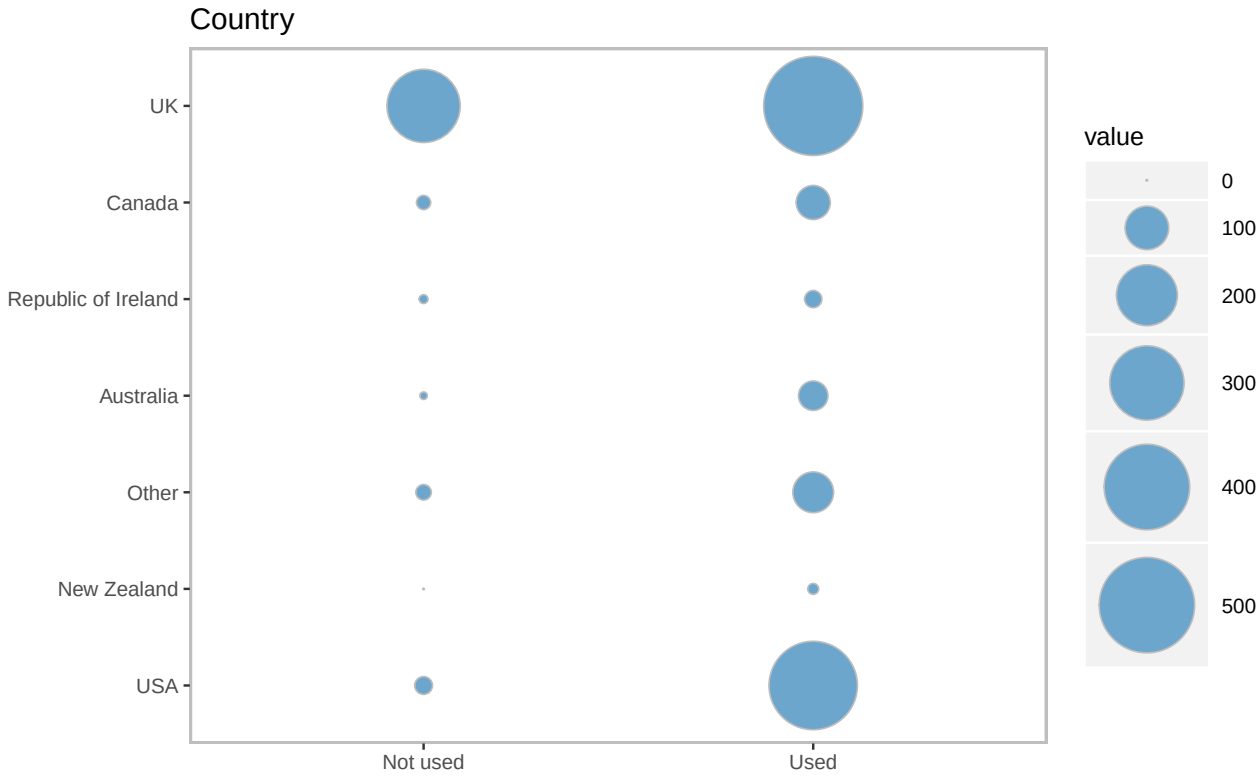
Contingency plots (prior to binning)

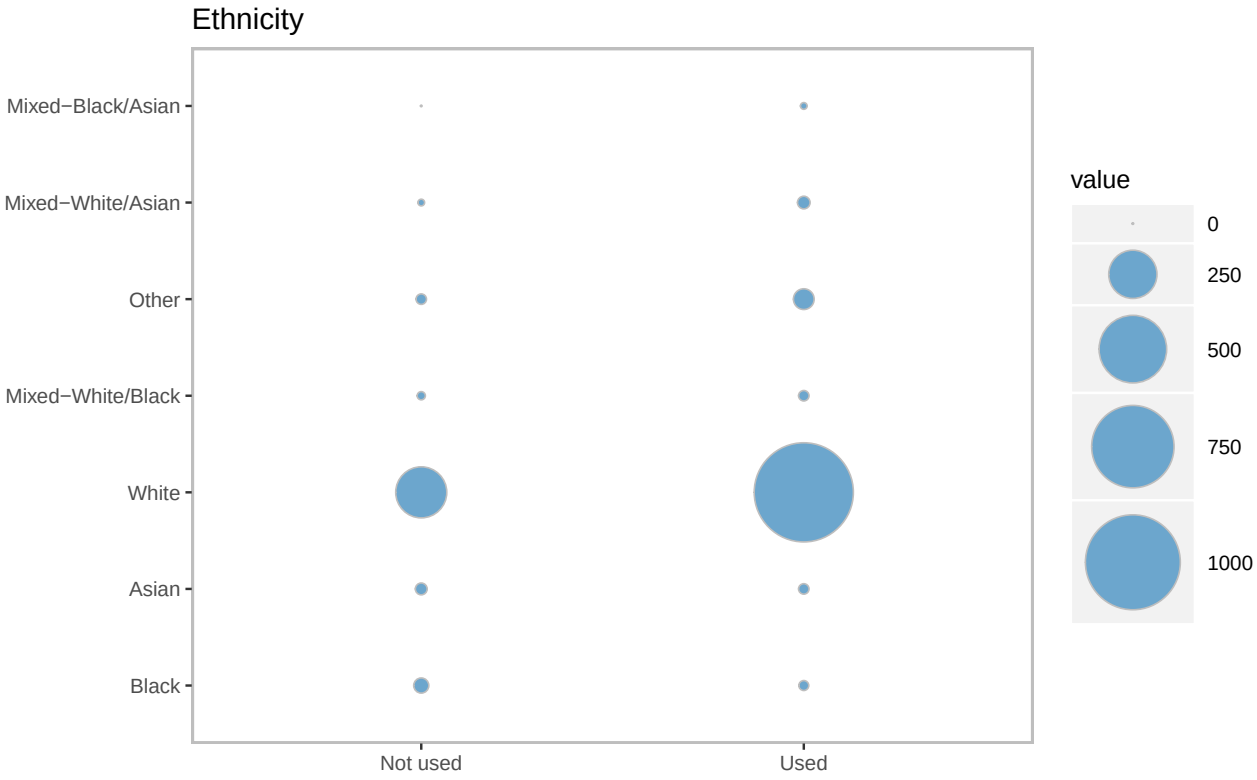
Cannabis use by demographic group


Age group
65+
55–64
45–54
35–44
25–34
18–24
Not used
Used
value
100
200
300
400


Gender
female
male
Not used
Used
value
100
200
300
400
500
600


Education
Doctorate degree
Masters degree
Univ. degree
Prof. certif./diploma
Some college/univ.
Left school at 18 yo
Left school at 17 yo
Left school at 16 yo
Left school before 16 yo
Not used
Used
value
100
200
300


Country
UK
Canada
Republic of Ireland
Australia
Other
New Zealand
USA
Not used
Used
value
0
100
200
300
400
500



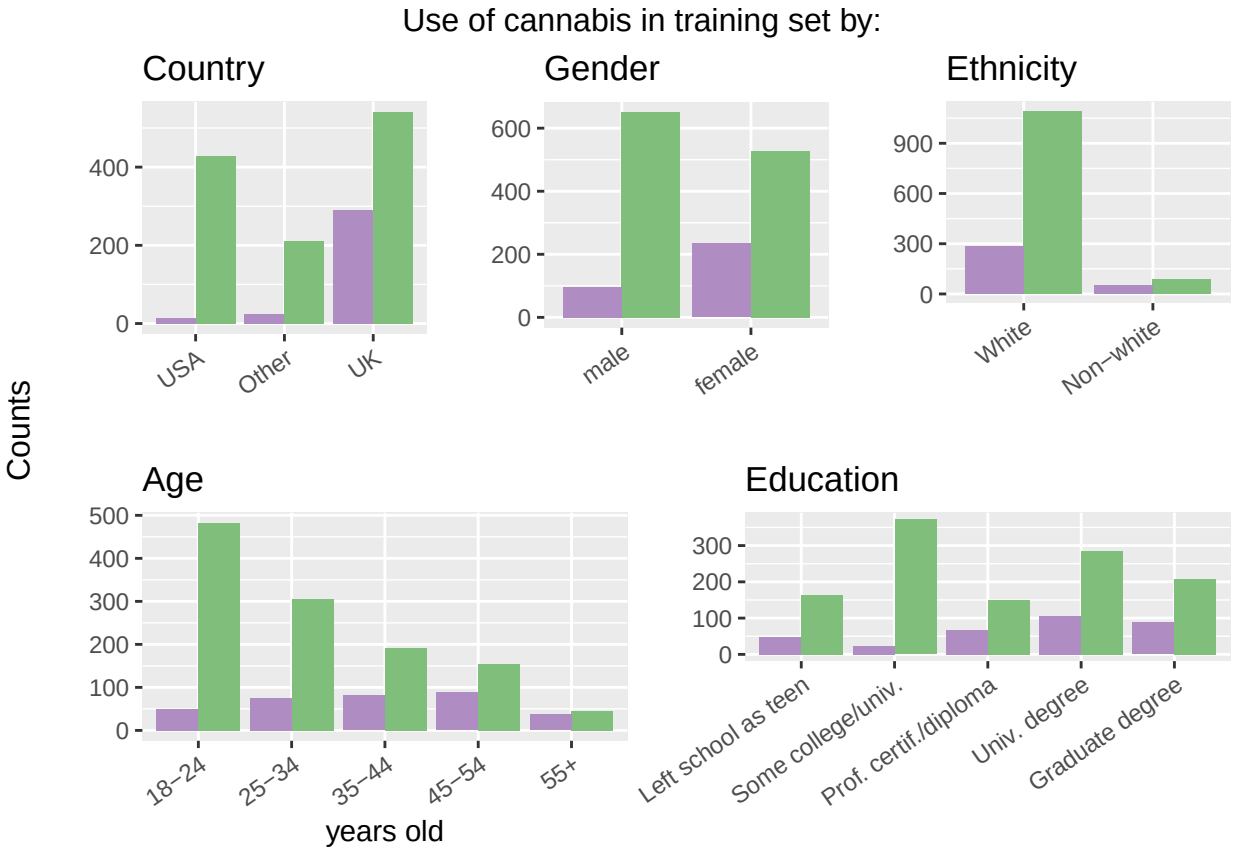
The dataset of 1509 participants is dominated by young and educated white American and British participants of both sexes.

Binning

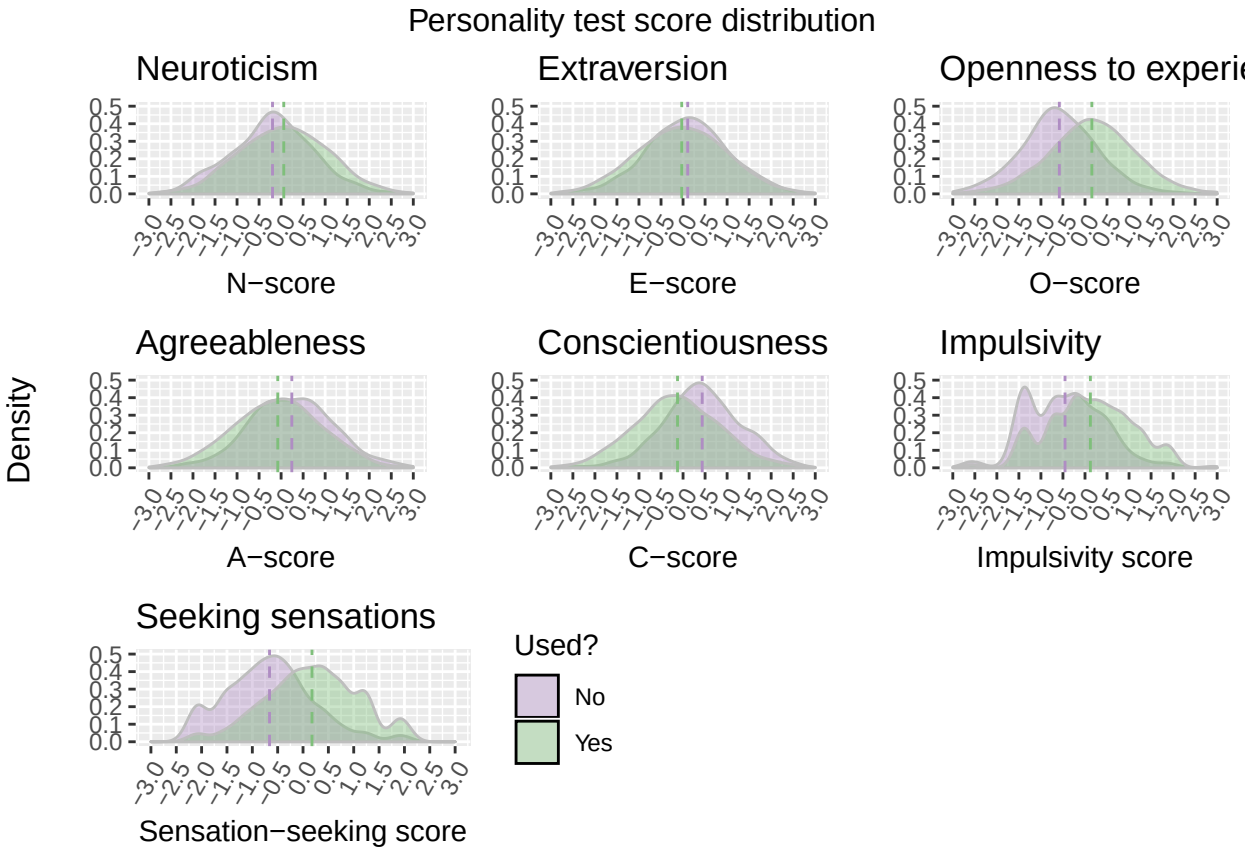
The small size of many demographic sub-groups add little valuable insight and will likely only serve to introduce variance in the analysis. At the risk of erasing behavioral differences among groups, the distribution of the dataset forces a more meaningful binning of the demographic information:

- 5 age groups: “18-24”, “25-34”, “35-44”, “45-54”, “55+”
- 5 groups for Education: “Left school as a teen”, “Some college”, “Professional certificate”, “University degree”, “Graduate degree”.
- 3 groups for Country: “USA”, “UK”, “Others”.
- 2 ethnic groups: “Whites”, “Non-whites”

Analysis of demographics



Personality analysis



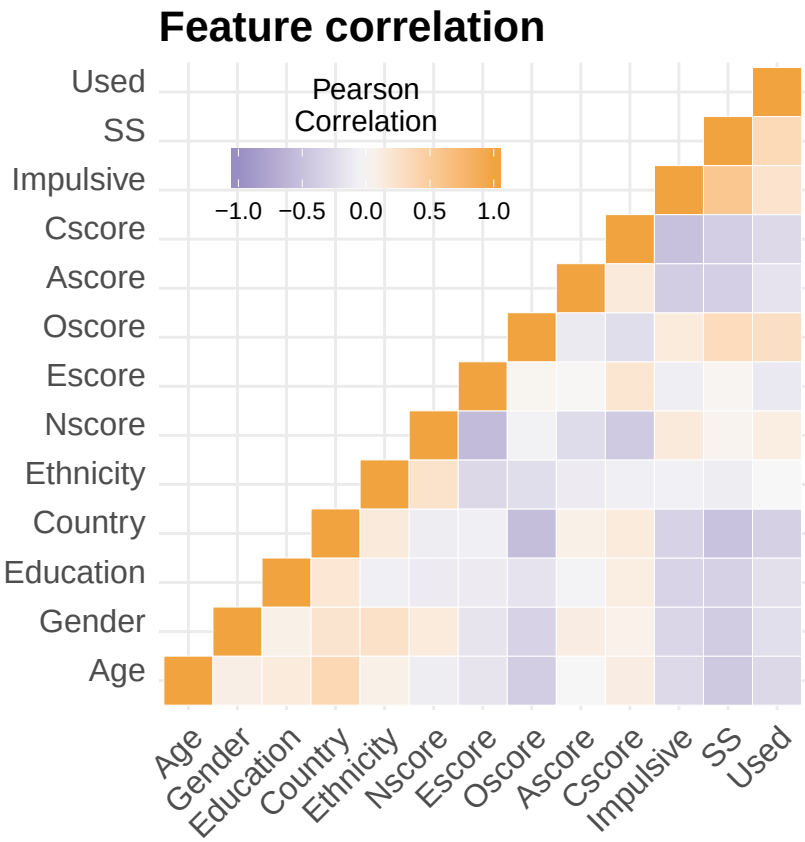
The density plots show some measure of difference between users and non-users particularly as it relates to either openness to experience, agreeableness, conscientiousness, impulsivity, and sensation-seeking. Some implications are rather entertaining, notably the notion that nice (ie: agreeable) people may be less likely to smoke weed, or conversely that exposure to pot tends to might make people less nice.

On the other hand, the distributions for users and non-users as they relate to neuroticism or extraversion are similar, suggesting that these personality traits may not impact cannabis consumption. We will examine in the modeling section below whether that is indeed the case.

Besides goodness of fit, the demographic and personality-related observations above will guide the assessment of the models we derive.

Feature correlation

We examine redundancies among the 12 predictors and with the Used class:

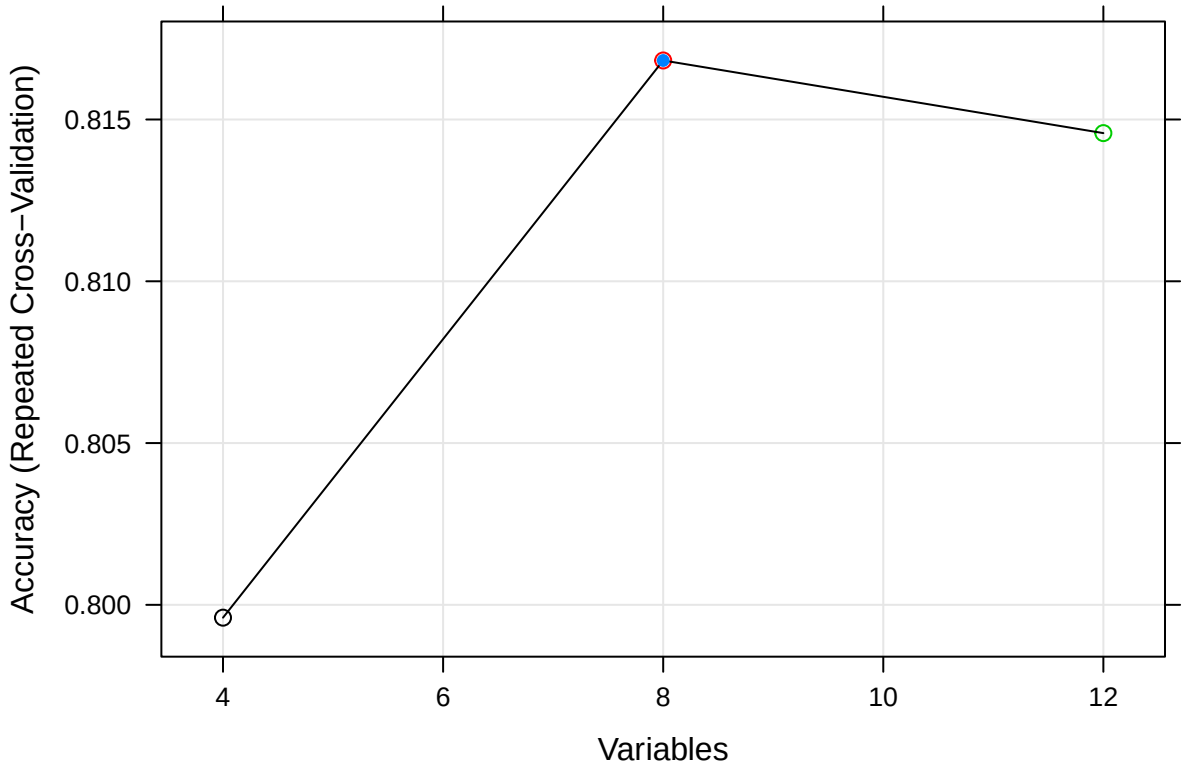

Feature correlation
Pearson Correlation
−1.0
−0.5
0.0
0.5
1.0
Used
SS
Impulsive
Cscore
Ascore
Oscore
Escore
Nscore
Ethnicity
Country
Education
Gender
Age
Age
Gender
Education
Country
Ethnicity
Nscore
Escore
Oscore
Ascore
Cscore
Impulsive
SS
Used

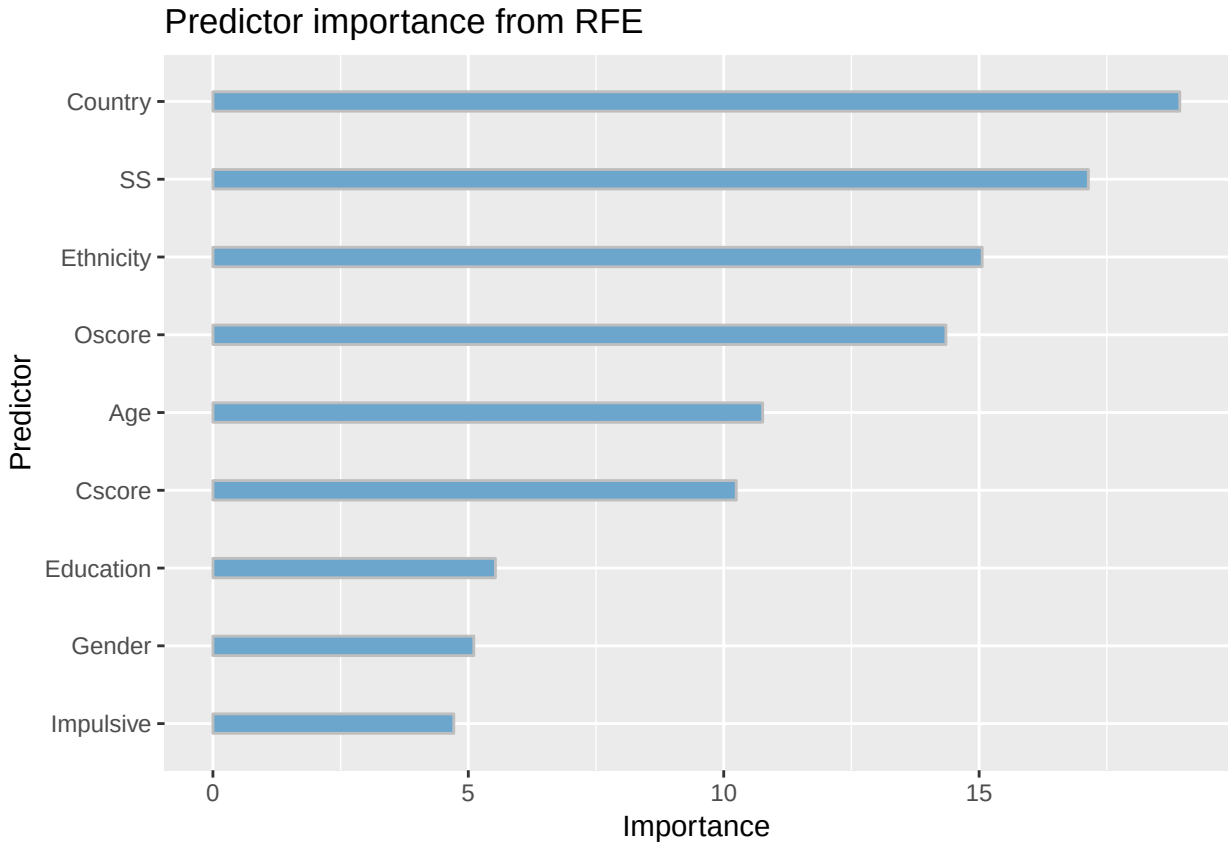
C: Modeling

We seek a model which improves on the ratio of users to the population (78.10%). This constitutes the baseline above which predictive modeling becomes interesting.

Recursive Feature elimination

For RFE as well as subsequent modeling, we use the k-fold cross validation method which involves splitting the dataset into k subsets. The algorithm holds aside one of the subsets while the model is trained on the others. This process is repeated a predetermined number of times and the overall accuracy estimate is provided.





The comparative analysis of the contribution of each factor agrees by and large with that of the density distribution plots: among the personality trait tests, N-score and E-score contribute the least while seeking sensation and O-score contribute the most. However, the impulsivity doesn't seem to be as strong a factor as one might have expected from the density plots.

Generalized linear model

Generalized linear model with penalized maximum likelihood

Decision trees

Random forest

Stochastic Gradient Boosting

```
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0225             nan     0.1000    0.0130
##      2        1.0007             nan     0.1000    0.0106
##      3        0.9825             nan     0.1000    0.0063
##      4        0.9666             nan     0.1000    0.0062
##      5        0.9505             nan     0.1000    0.0079
##      6        0.9380             nan     0.1000    0.0059
##      7        0.9249             nan     0.1000    0.0062
##      8        0.9140             nan     0.1000    0.0052
##      9        0.9052             nan     0.1000    0.0029
##     10        0.8964             nan     0.1000    0.0039
```

```
##     20        0.8346             nan     0.1000    0.0020
##     40        0.7698             nan     0.1000    0.0002
##     60        0.7378             nan     0.1000    0.0003
##     80        0.7205             nan     0.1000   -0.0003
##    100        0.7127             nan     0.1000   -0.0002
##    120        0.7070             nan     0.1000   -0.0002
##    140        0.7038             nan     0.1000   -0.0001
##    150        0.7017             nan     0.1000   -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0221             nan     0.1000    0.0123
##      2        0.9889             nan     0.1000    0.0163
##      3        0.9604             nan     0.1000    0.0124
##      4        0.9355             nan     0.1000    0.0096
##      5        0.9166             nan     0.1000    0.0089
##      6        0.8969             nan     0.1000    0.0090
##      7        0.8827             nan     0.1000    0.0046
##      8        0.8663             nan     0.1000    0.0069
##      9        0.8525             nan     0.1000    0.0063
##     10        0.8401             nan     0.1000    0.0049
##     20        0.7654             nan     0.1000    0.0031
##     40        0.7011             nan     0.1000   -0.0010
##     60        0.6730             nan     0.1000   -0.0008
##     80        0.6528             nan     0.1000   -0.0001
##    100        0.6375             nan     0.1000    0.0002
##    120        0.6233             nan     0.1000    0.0000
##    140        0.6097             nan     0.1000   -0.0002
##    150        0.6038             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0017             nan     0.1000    0.0222
##      2        0.9665             nan     0.1000    0.0172
##      3        0.9353             nan     0.1000    0.0139
##      4        0.9084             nan     0.1000    0.0124
##      5        0.8863             nan     0.1000    0.0088
##      6        0.8686             nan     0.1000    0.0062
##      7        0.8523             nan     0.1000    0.0067
##      8        0.8357             nan     0.1000    0.0060
##      9        0.8202             nan     0.1000    0.0069
##     10        0.8086             nan     0.1000    0.0045
##     20        0.7260             nan     0.1000    0.0021
##     40        0.6646             nan     0.1000    0.0006
##     60        0.6277             nan     0.1000   -0.0003
##     80        0.6012             nan     0.1000   -0.0002
##    100        0.5837             nan     0.1000   -0.0002
##    120        0.5644             nan     0.1000   -0.0005
##    140        0.5411             nan     0.1000   -0.0003
##    150        0.5337             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0217             nan     0.1000    0.0090
##      2        1.0007             nan     0.1000    0.0109
##      3        0.9829             nan     0.1000    0.0081
##      4        0.9648             nan     0.1000    0.0085
```

```
##      5        0.9500             nan     0.1000    0.0069
##      6        0.9378             nan     0.1000    0.0060
##      7        0.9273             nan     0.1000    0.0049
##      8        0.9166             nan     0.1000    0.0045
##      9        0.9067             nan     0.1000    0.0034
##     10        0.8992             nan     0.1000    0.0023
##     20        0.8394             nan     0.1000    0.0009
##     40        0.7789             nan     0.1000    0.0006
##     60        0.7508             nan     0.1000   -0.0005
##     80        0.7342             nan     0.1000   -0.0003
##    100        0.7242             nan     0.1000   -0.0000
##    120        0.7195             nan     0.1000    0.0000
##    140        0.7143             nan     0.1000   -0.0000
##    150        0.7125             nan     0.1000    0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0127             nan     0.1000    0.0164
##      2        0.9879             nan     0.1000    0.0111
##      3        0.9609             nan     0.1000    0.0126
##      4        0.9394             nan     0.1000    0.0100
##      5        0.9254             nan     0.1000    0.0064
##      6        0.9116             nan     0.1000    0.0046
##      7        0.8928             nan     0.1000    0.0079
##      8        0.8839             nan     0.1000    0.0037
##      9        0.8729             nan     0.1000    0.0043
##     10        0.8631             nan     0.1000    0.0043
##     20        0.7909             nan     0.1000    0.0028
##     40        0.7259             nan     0.1000    0.0001
##     60        0.6973             nan     0.1000   -0.0004
##     80        0.6773             nan     0.1000   -0.0002
##    100        0.6624             nan     0.1000   -0.0010
##    120        0.6496             nan     0.1000   -0.0009
##    140        0.6400             nan     0.1000   -0.0001
##    150        0.6334             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9964             nan     0.1000    0.0170
##      2        0.9618             nan     0.1000    0.0137
##      3        0.9344             nan     0.1000    0.0097
##      4        0.9108             nan     0.1000    0.0093
##      5        0.8964             nan     0.1000    0.0061
##      6        0.8826             nan     0.1000    0.0060
##      7        0.8643             nan     0.1000    0.0078
##      8        0.8476             nan     0.1000    0.0086
##      9        0.8366             nan     0.1000    0.0029
##     10        0.8242             nan     0.1000    0.0059
##     20        0.7501             nan     0.1000    0.0023
##     40        0.6875             nan     0.1000    0.0000
##     60        0.6469             nan     0.1000   -0.0002
##     80        0.6206             nan     0.1000   -0.0007
##    100        0.5989             nan     0.1000   -0.0004
##    120        0.5766             nan     0.1000   -0.0001
##    140        0.5608             nan     0.1000   -0.0008
##    150        0.5530             nan     0.1000   -0.0006
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0199             nan     0.1000    0.0114
##      2        1.0025             nan     0.1000    0.0088
##      3        0.9863             nan     0.1000    0.0068
##      4        0.9708             nan     0.1000    0.0067
##      5        0.9614             nan     0.1000    0.0052
##      6        0.9498             nan     0.1000    0.0047
##      7        0.9386             nan     0.1000    0.0048
##      8        0.9286             nan     0.1000    0.0041
##      9        0.9203             nan     0.1000    0.0028
##     10        0.9128             nan     0.1000    0.0030
##     20        0.8551             nan     0.1000    0.0011
##     40        0.7887             nan     0.1000    0.0009
##     60        0.7574             nan     0.1000    0.0001
##     80        0.7427             nan     0.1000   -0.0003
##    100        0.7336             nan     0.1000   -0.0002
##    120        0.7270             nan     0.1000   -0.0001
##    140        0.7227             nan     0.1000   -0.0002
##    150        0.7203             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0175             nan     0.1000    0.0128
##      2        0.9912             nan     0.1000    0.0119
##      3        0.9711             nan     0.1000    0.0090
##      4        0.9493             nan     0.1000    0.0079
##      5        0.9305             nan     0.1000    0.0082
##      6        0.9135             nan     0.1000    0.0074
##      7        0.9006             nan     0.1000    0.0049
##      8        0.8900             nan     0.1000    0.0047
##      9        0.8786             nan     0.1000    0.0049
##     10        0.8699             nan     0.1000    0.0038
##     20        0.7918             nan     0.1000    0.0026
##     40        0.7278             nan     0.1000    0.0004
##     60        0.6961             nan     0.1000   -0.0002
##     80        0.6785             nan     0.1000    0.0002
##    100        0.6640             nan     0.1000   -0.0004
##    120        0.6516             nan     0.1000   -0.0002
##    140        0.6394             nan     0.1000   -0.0008
##    150        0.6324             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0111             nan     0.1000    0.0126
##      2        0.9817             nan     0.1000    0.0139
##      3        0.9511             nan     0.1000    0.0127
##      4        0.9309             nan     0.1000    0.0087
##      5        0.9144             nan     0.1000    0.0074
##      6        0.8963             nan     0.1000    0.0080
##      7        0.8775             nan     0.1000    0.0073
##      8        0.8629             nan     0.1000    0.0058
##      9        0.8516             nan     0.1000    0.0034
##     10        0.8423             nan     0.1000    0.0032
##     20        0.7572             nan     0.1000    0.0016
##     40        0.6936             nan     0.1000   -0.0006
```

```
##     60        0.6587             nan     0.1000   -0.0002
##     80        0.6258             nan     0.1000    0.0007
##    100        0.6059             nan     0.1000   -0.0003
##    120        0.5857             nan     0.1000   -0.0003
##    140        0.5664             nan     0.1000   -0.0009
##    150        0.5575             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0737             nan     0.1000    0.0112
##      2        1.0513             nan     0.1000    0.0116
##      3        1.0355             nan     0.1000    0.0078
##      4        1.0162             nan     0.1000    0.0093
##      5        0.9993             nan     0.1000    0.0072
##      6        0.9883             nan     0.1000    0.0051
##      7        0.9762             nan     0.1000    0.0056
##      8        0.9642             nan     0.1000    0.0038
##      9        0.9527             nan     0.1000    0.0052
##     10        0.9447             nan     0.1000    0.0031
##     20        0.8817             nan     0.1000    0.0023
##     40        0.8103             nan     0.1000    0.0009
##     60        0.7724             nan     0.1000    0.0004
##     80        0.7562             nan     0.1000    0.0000
##    100        0.7463             nan     0.1000   -0.0002
##    120        0.7392             nan     0.1000   -0.0002
##    140        0.7332             nan     0.1000   -0.0002
##    150        0.7311             nan     0.1000    0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0578             nan     0.1000    0.0176
##      2        1.0269             nan     0.1000    0.0137
##      3        1.0027             nan     0.1000    0.0107
##      4        0.9803             nan     0.1000    0.0101
##      5        0.9613             nan     0.1000    0.0084
##      6        0.9436             nan     0.1000    0.0077
##      7        0.9305             nan     0.1000    0.0048
##      8        0.9165             nan     0.1000    0.0064
##      9        0.9057             nan     0.1000    0.0042
##     10        0.8955             nan     0.1000    0.0042
##     20        0.8137             nan     0.1000    0.0014
##     40        0.7398             nan     0.1000   -0.0011
##     60        0.7105             nan     0.1000    0.0001
##     80        0.6912             nan     0.1000   -0.0003
##    100        0.6755             nan     0.1000    0.0002
##    120        0.6626             nan     0.1000   -0.0005
##    140        0.6518             nan     0.1000   -0.0007
##    150        0.6462             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0568             nan     0.1000    0.0200
##      2        1.0223             nan     0.1000    0.0159
##      3        0.9954             nan     0.1000    0.0144
##      4        0.9677             nan     0.1000    0.0132
##      5        0.9473             nan     0.1000    0.0067
##      6        0.9306             nan     0.1000    0.0083
```

```
##      7        0.9147             nan     0.1000    0.0073
##      8        0.8996             nan     0.1000    0.0064
##      9        0.8857             nan     0.1000    0.0055
##     10        0.8680             nan     0.1000    0.0066
##     20        0.7790             nan     0.1000    0.0023
##     40        0.7105             nan     0.1000   -0.0001
##     60        0.6715             nan     0.1000    0.0004
##     80        0.6437             nan     0.1000   -0.0005
##    100        0.6226             nan     0.1000   -0.0006
##    120        0.6054             nan     0.1000   -0.0004
##    140        0.5856             nan     0.1000   -0.0006
##    150        0.5795             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0250             nan     0.1000    0.0126
##      2        1.0020             nan     0.1000    0.0103
##      3        0.9785             nan     0.1000    0.0105
##      4        0.9610             nan     0.1000    0.0070
##      5        0.9445             nan     0.1000    0.0081
##      6        0.9342             nan     0.1000    0.0042
##      7        0.9212             nan     0.1000    0.0066
##      8        0.9101             nan     0.1000    0.0055
##      9        0.9026             nan     0.1000    0.0029
##     10        0.8952             nan     0.1000    0.0029
##     20        0.8318             nan     0.1000    0.0011
##     40        0.7710             nan     0.1000    0.0009
##     60        0.7403             nan     0.1000    0.0007
##     80        0.7232             nan     0.1000   -0.0007
##    100        0.7126             nan     0.1000   -0.0002
##    120        0.7072             nan     0.1000   -0.0003
##    140        0.6994             nan     0.1000   -0.0005
##    150        0.6969             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0099             nan     0.1000    0.0195
##      2        0.9775             nan     0.1000    0.0154
##      3        0.9517             nan     0.1000    0.0106
##      4        0.9275             nan     0.1000    0.0119
##      5        0.9092             nan     0.1000    0.0077
##      6        0.8956             nan     0.1000    0.0058
##      7        0.8771             nan     0.1000    0.0084
##      8        0.8629             nan     0.1000    0.0049
##      9        0.8523             nan     0.1000    0.0046
##     10        0.8406             nan     0.1000    0.0048
##     20        0.7702             nan     0.1000    0.0017
##     40        0.7087             nan     0.1000    0.0004
##     60        0.6812             nan     0.1000   -0.0003
##     80        0.6588             nan     0.1000   -0.0004
##    100        0.6426             nan     0.1000   -0.0002
##    120        0.6279             nan     0.1000    0.0003
##    140        0.6174             nan     0.1000   -0.0001
##    150        0.6118             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

```
##      1        1.0065             nan     0.1000    0.0225
##      2        0.9661             nan     0.1000    0.0165
##      3        0.9357             nan     0.1000    0.0141
##      4        0.9133             nan     0.1000    0.0117
##      5        0.8932             nan     0.1000    0.0085
##      6        0.8786             nan     0.1000    0.0059
##      7        0.8603             nan     0.1000    0.0080
##      8        0.8441             nan     0.1000    0.0070
##      9        0.8311             nan     0.1000    0.0056
##     10        0.8196             nan     0.1000    0.0046
##     20        0.7428             nan     0.1000    0.0018
##     40        0.6748             nan     0.1000    0.0002
##     60        0.6459             nan     0.1000   -0.0000
##     80        0.6157             nan     0.1000   -0.0007
##    100        0.5939             nan     0.1000   -0.0004
##    120        0.5761             nan     0.1000   -0.0003
##    140        0.5578             nan     0.1000   -0.0002
##    150        0.5508             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0310             nan     0.1000    0.0116
##      2        1.0060             nan     0.1000    0.0104
##      3        0.9884             nan     0.1000    0.0086
##      4        0.9704             nan     0.1000    0.0082
##      5        0.9562             nan     0.1000    0.0066
##      6        0.9462             nan     0.1000    0.0039
##      7        0.9365             nan     0.1000    0.0041
##      8        0.9254             nan     0.1000    0.0043
##      9        0.9171             nan     0.1000    0.0035
##     10        0.9052             nan     0.1000    0.0054
##     20        0.8436             nan     0.1000    0.0021
##     40        0.7780             nan     0.1000    0.0008
##     60        0.7469             nan     0.1000   -0.0001
##     80        0.7318             nan     0.1000    0.0000
##    100        0.7236             nan     0.1000   -0.0002
##    120        0.7160             nan     0.1000   -0.0002
##    140        0.7094             nan     0.1000   -0.0010
##    150        0.7062             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0193             nan     0.1000    0.0163
##      2        0.9953             nan     0.1000    0.0079
##      3        0.9703             nan     0.1000    0.0125
##      4        0.9492             nan     0.1000    0.0095
##      5        0.9348             nan     0.1000    0.0060
##      6        0.9182             nan     0.1000    0.0074
##      7        0.9024             nan     0.1000    0.0068
##      8        0.8856             nan     0.1000    0.0072
##      9        0.8765             nan     0.1000    0.0039
##     10        0.8649             nan     0.1000    0.0041
##     20        0.7893             nan     0.1000    0.0016
##     40        0.7256             nan     0.1000   -0.0004
##     60        0.6978             nan     0.1000   -0.0003
##     80        0.6795             nan     0.1000    0.0000
```

```
##    100        0.6624             nan     0.1000   -0.0004
##    120        0.6510             nan     0.1000   -0.0001
##    140        0.6378             nan     0.1000   -0.0006
##    150        0.6336             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0130             nan     0.1000    0.0186
##      2        0.9776             nan     0.1000    0.0159
##      3        0.9539             nan     0.1000    0.0105
##      4        0.9329             nan     0.1000    0.0109
##      5        0.9096             nan     0.1000    0.0094
##      6        0.8929             nan     0.1000    0.0066
##      7        0.8780             nan     0.1000    0.0066
##      8        0.8659             nan     0.1000    0.0051
##      9        0.8544             nan     0.1000    0.0043
##     10        0.8413             nan     0.1000    0.0048
##     20        0.7608             nan     0.1000    0.0017
##     40        0.6952             nan     0.1000   -0.0005
##     60        0.6601             nan     0.1000    0.0001
##     80        0.6332             nan     0.1000   -0.0010
##    100        0.6100             nan     0.1000   -0.0002
##    120        0.5929             nan     0.1000   -0.0007
##    140        0.5724             nan     0.1000   -0.0004
##    150        0.5650             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0404             nan     0.1000    0.0128
##      2        1.0153             nan     0.1000    0.0115
##      3        0.9969             nan     0.1000    0.0092
##      4        0.9815             nan     0.1000    0.0071
##      5        0.9647             nan     0.1000    0.0087
##      6        0.9518             nan     0.1000    0.0058
##      7        0.9412             nan     0.1000    0.0052
##      8        0.9293             nan     0.1000    0.0052
##      9        0.9168             nan     0.1000    0.0052
##     10        0.9062             nan     0.1000    0.0055
##     20        0.8376             nan     0.1000    0.0021
##     40        0.7658             nan     0.1000    0.0003
##     60        0.7330             nan     0.1000    0.0001
##     80        0.7120             nan     0.1000   -0.0000
##    100        0.6997             nan     0.1000    0.0000
##    120        0.6928             nan     0.1000   -0.0004
##    140        0.6865             nan     0.1000   -0.0004
##    150        0.6829             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0291             nan     0.1000    0.0183
##      2        1.0018             nan     0.1000    0.0136
##      3        0.9725             nan     0.1000    0.0142
##      4        0.9501             nan     0.1000    0.0102
##      5        0.9356             nan     0.1000    0.0056
##      6        0.9183             nan     0.1000    0.0083
##      7        0.9020             nan     0.1000    0.0070
##      8        0.8865             nan     0.1000    0.0074
```

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##      9        0.8689             nan     0.1000    0.0077
##     10        0.8565             nan     0.1000    0.0052
##     20        0.7775             nan     0.1000    0.0020
##     40        0.7063             nan     0.1000    0.0001
##     60        0.6694             nan     0.1000    0.0001
##     80        0.6471             nan     0.1000   -0.0005
##    100        0.6307             nan     0.1000   -0.0003
##    120        0.6167             nan     0.1000   -0.0003
##    140        0.6056             nan     0.1000   -0.0008
##    150        0.6004             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0195             nan     0.1000    0.0214
##      2        0.9862             nan     0.1000    0.0165
##      3        0.9574             nan     0.1000    0.0121
##      4        0.9305             nan     0.1000    0.0120
##      5        0.9087             nan     0.1000    0.0108
##      6        0.8867             nan     0.1000    0.0102
##      7        0.8685             nan     0.1000    0.0073
##      8        0.8551             nan     0.1000    0.0046
##      9        0.8404             nan     0.1000    0.0058
##     10        0.8286             nan     0.1000    0.0035
##     20        0.7350             nan     0.1000    0.0032
##     40        0.6656             nan     0.1000    0.0001
##     60        0.6242             nan     0.1000    0.0003
##     80        0.5959             nan     0.1000   -0.0006
##    100        0.5734             nan     0.1000   -0.0006
##    120        0.5559             nan     0.1000    0.0002
##    140        0.5359             nan     0.1000   -0.0005
##    150        0.5288             nan     0.1000   -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0443             nan     0.1000    0.0128
##      2        1.0250             nan     0.1000    0.0104
##      3        1.0067             nan     0.1000    0.0091
##      4        0.9895             nan     0.1000    0.0085
##      5        0.9711             nan     0.1000    0.0082
##      6        0.9586             nan     0.1000    0.0051
##      7        0.9461             nan     0.1000    0.0054
##      8        0.9350             nan     0.1000    0.0058
##      9        0.9232             nan     0.1000    0.0052
##     10        0.9137             nan     0.1000    0.0035
##     20        0.8374             nan     0.1000    0.0024
##     40        0.7649             nan     0.1000    0.0010
##     60        0.7259             nan     0.1000   -0.0000
##     80        0.7043             nan     0.1000    0.0005
##    100        0.6932             nan     0.1000   -0.0002
##    120        0.6876             nan     0.1000   -0.0003
##    140        0.6834             nan     0.1000   -0.0005
##    150        0.6813             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0322             nan     0.1000    0.0168
##      2        0.9994             nan     0.1000    0.0163
```

```
##      3        0.9745             nan     0.1000    0.0109
##      4        0.9500             nan     0.1000    0.0120
##      5        0.9300             nan     0.1000    0.0101
##      6        0.9109             nan     0.1000    0.0065
##      7        0.8954             nan     0.1000    0.0059
##      8        0.8820             nan     0.1000    0.0063
##      9        0.8683             nan     0.1000    0.0063
##     10        0.8568             nan     0.1000    0.0045
##     20        0.7697             nan     0.1000    0.0005
##     40        0.6955             nan     0.1000    0.0001
##     60        0.6616             nan     0.1000    0.0000
##     80        0.6405             nan     0.1000    0.0005
##    100        0.6240             nan     0.1000   -0.0004
##    120        0.6101             nan     0.1000    0.0003
##    140        0.5971             nan     0.1000   -0.0003
##    150        0.5904             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0256             nan     0.1000    0.0197
##      2        0.9891             nan     0.1000    0.0172
##      3        0.9573             nan     0.1000    0.0146
##      4        0.9302             nan     0.1000    0.0118
##      5        0.9065             nan     0.1000    0.0107
##      6        0.8837             nan     0.1000    0.0103
##      7        0.8641             nan     0.1000    0.0087
##      8        0.8505             nan     0.1000    0.0058
##      9        0.8348             nan     0.1000    0.0055
##     10        0.8201             nan     0.1000    0.0060
##     20        0.7280             nan     0.1000    0.0024
##     40        0.6565             nan     0.1000    0.0009
##     60        0.6194             nan     0.1000    0.0001
##     80        0.5931             nan     0.1000   -0.0005
##    100        0.5714             nan     0.1000   -0.0005
##    120        0.5548             nan     0.1000   -0.0004
##    140        0.5351             nan     0.1000    0.0001
##    150        0.5284             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0121             nan     0.1000    0.0098
##      2        0.9927             nan     0.1000    0.0095
##      3        0.9738             nan     0.1000    0.0107
##      4        0.9583             nan     0.1000    0.0067
##      5        0.9388             nan     0.1000    0.0083
##      6        0.9242             nan     0.1000    0.0069
##      7        0.9142             nan     0.1000    0.0049
##      8        0.9024             nan     0.1000    0.0059
##      9        0.8916             nan     0.1000    0.0047
##     10        0.8875             nan     0.1000    0.0007
##     20        0.8232             nan     0.1000    0.0033
##     40        0.7545             nan     0.1000    0.0005
##     60        0.7189             nan     0.1000   -0.0001
##     80        0.6996             nan     0.1000    0.0000
##    100        0.6884             nan     0.1000    0.0000
##    120        0.6815             nan     0.1000   -0.0004
```

```
##    140        0.6777             nan     0.1000   -0.0004
##    150        0.6757             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9988             nan     0.1000    0.0181
##      2        0.9701             nan     0.1000    0.0149
##      3        0.9441             nan     0.1000    0.0105
##      4        0.9242             nan     0.1000    0.0097
##      5        0.9059             nan     0.1000    0.0076
##      6        0.8881             nan     0.1000    0.0076
##      7        0.8710             nan     0.1000    0.0068
##      8        0.8543             nan     0.1000    0.0073
##      9        0.8441             nan     0.1000    0.0032
##     10        0.8340             nan     0.1000    0.0037
##     20        0.7614             nan     0.1000    0.0014
##     40        0.6916             nan     0.1000   -0.0001
##     60        0.6590             nan     0.1000   -0.0001
##     80        0.6376             nan     0.1000   -0.0004
##    100        0.6248             nan     0.1000   -0.0002
##    120        0.6148             nan     0.1000   -0.0002
##    140        0.6057             nan     0.1000   -0.0002
##    150        0.6015             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9905             nan     0.1000    0.0201
##      2        0.9594             nan     0.1000    0.0159
##      3        0.9351             nan     0.1000    0.0113
##      4        0.9069             nan     0.1000    0.0108
##      5        0.8890             nan     0.1000    0.0062
##      6        0.8749             nan     0.1000    0.0051
##      7        0.8548             nan     0.1000    0.0095
##      8        0.8388             nan     0.1000    0.0056
##      9        0.8208             nan     0.1000    0.0072
##     10        0.8108             nan     0.1000    0.0030
##     20        0.7180             nan     0.1000    0.0012
##     40        0.6559             nan     0.1000   -0.0004
##     60        0.6183             nan     0.1000   -0.0001
##     80        0.5985             nan     0.1000   -0.0005
##    100        0.5740             nan     0.1000   -0.0003
##    120        0.5574             nan     0.1000   -0.0003
##    140        0.5382             nan     0.1000   -0.0006
##    150        0.5303             nan     0.1000   -0.0006
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0034             nan     0.1000    0.0095
##      2        0.9850             nan     0.1000    0.0066
##      3        0.9655             nan     0.1000    0.0093
##      4        0.9505             nan     0.1000    0.0077
##      5        0.9375             nan     0.1000    0.0064
##      6        0.9283             nan     0.1000    0.0042
##      7        0.9207             nan     0.1000    0.0034
##      8        0.9115             nan     0.1000    0.0047
##      9        0.9013             nan     0.1000    0.0044
##     10        0.8930             nan     0.1000    0.0037
```

```
##     20        0.8447             nan     0.1000    0.0021
##     40        0.7937             nan     0.1000    0.0003
##     60        0.7703             nan     0.1000   -0.0008
##     80        0.7580             nan     0.1000   -0.0005
##    100        0.7479             nan     0.1000   -0.0001
##    120        0.7430             nan     0.1000   -0.0002
##    140        0.7377             nan     0.1000   -0.0001
##    150        0.7350             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9964             nan     0.1000    0.0158
##      2        0.9720             nan     0.1000    0.0115
##      3        0.9488             nan     0.1000    0.0115
##      4        0.9314             nan     0.1000    0.0076
##      5        0.9152             nan     0.1000    0.0067
##      6        0.8980             nan     0.1000    0.0074
##      7        0.8870             nan     0.1000    0.0043
##      8        0.8761             nan     0.1000    0.0047
##      9        0.8631             nan     0.1000    0.0057
##     10        0.8569             nan     0.1000    0.0017
##     20        0.7935             nan     0.1000    0.0018
##     40        0.7431             nan     0.1000   -0.0002
##     60        0.7138             nan     0.1000    0.0001
##     80        0.6960             nan     0.1000    0.0001
##    100        0.6805             nan     0.1000   -0.0006
##    120        0.6680             nan     0.1000   -0.0003
##    140        0.6576             nan     0.1000   -0.0009
##    150        0.6540             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9885             nan     0.1000    0.0193
##      2        0.9594             nan     0.1000    0.0142
##      3        0.9316             nan     0.1000    0.0123
##      4        0.9097             nan     0.1000    0.0108
##      5        0.8900             nan     0.1000    0.0073
##      6        0.8764             nan     0.1000    0.0060
##      7        0.8624             nan     0.1000    0.0054
##      8        0.8503             nan     0.1000    0.0050
##      9        0.8378             nan     0.1000    0.0047
##     10        0.8266             nan     0.1000    0.0050
##     20        0.7642             nan     0.1000    0.0010
##     40        0.7031             nan     0.1000    0.0011
##     60        0.6717             nan     0.1000   -0.0007
##     80        0.6495             nan     0.1000   -0.0009
##    100        0.6293             nan     0.1000   -0.0004
##    120        0.6117             nan     0.1000    0.0001
##    140        0.5965             nan     0.1000   -0.0002
##    150        0.5866             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9466             nan     0.1000    0.0127
##      2        0.9307             nan     0.1000    0.0073
##      3        0.9113             nan     0.1000    0.0091
##      4        0.8975             nan     0.1000    0.0069
```

```
##      5        0.8839             nan     0.1000    0.0053
##      6        0.8712             nan     0.1000    0.0061
##      7        0.8627             nan     0.1000    0.0033
##      8        0.8532             nan     0.1000    0.0049
##      9        0.8432             nan     0.1000    0.0046
##     10        0.8360             nan     0.1000    0.0029
##     20        0.7783             nan     0.1000    0.0021
##     40        0.7264             nan     0.1000    0.0002
##     60        0.7011             nan     0.1000   -0.0001
##     80        0.6889             nan     0.1000   -0.0003
##    100        0.6800             nan     0.1000   -0.0001
##    120        0.6749             nan     0.1000   -0.0004
##    140        0.6712             nan     0.1000   -0.0004
##    150        0.6683             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9347             nan     0.1000    0.0172
##      2        0.9128             nan     0.1000    0.0068
##      3        0.8852             nan     0.1000    0.0111
##      4        0.8666             nan     0.1000    0.0091
##      5        0.8506             nan     0.1000    0.0069
##      6        0.8356             nan     0.1000    0.0071
##      7        0.8227             nan     0.1000    0.0055
##      8        0.8127             nan     0.1000    0.0042
##      9        0.8019             nan     0.1000    0.0044
##     10        0.7920             nan     0.1000    0.0032
##     20        0.7295             nan     0.1000    0.0018
##     40        0.6698             nan     0.1000    0.0005
##     60        0.6424             nan     0.1000   -0.0003
##     80        0.6254             nan     0.1000   -0.0007
##    100        0.6148             nan     0.1000    0.0001
##    120        0.6061             nan     0.1000   -0.0009
##    140        0.5961             nan     0.1000   -0.0001
##    150        0.5902             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9347             nan     0.1000    0.0178
##      2        0.9038             nan     0.1000    0.0138
##      3        0.8724             nan     0.1000    0.0131
##      4        0.8494             nan     0.1000    0.0090
##      5        0.8288             nan     0.1000    0.0089
##      6        0.8137             nan     0.1000    0.0064
##      7        0.7984             nan     0.1000    0.0063
##      8        0.7879             nan     0.1000    0.0047
##      9        0.7776             nan     0.1000    0.0043
##     10        0.7667             nan     0.1000    0.0043
##     20        0.7030             nan     0.1000    0.0010
##     40        0.6477             nan     0.1000   -0.0009
##     60        0.6166             nan     0.1000   -0.0002
##     80        0.5920             nan     0.1000   -0.0006
##    100        0.5688             nan     0.1000   -0.0004
##    120        0.5523             nan     0.1000    0.0001
##    140        0.5379             nan     0.1000   -0.0003
##    150        0.5293             nan     0.1000   -0.0007
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0585             nan     0.1000    0.0108
##      2        1.0341             nan     0.1000    0.0120
##      3        1.0149             nan     0.1000    0.0097
##      4        0.9981             nan     0.1000    0.0079
##      5        0.9842             nan     0.1000    0.0052
##      6        0.9727             nan     0.1000    0.0053
##      7        0.9640             nan     0.1000    0.0033
##      8        0.9515             nan     0.1000    0.0057
##      9        0.9412             nan     0.1000    0.0055
##     10        0.9296             nan     0.1000    0.0054
##     20        0.8571             nan     0.1000    0.0022
##     40        0.7868             nan     0.1000    0.0004
##     60        0.7520             nan     0.1000   -0.0002
##     80        0.7366             nan     0.1000   -0.0001
##    100        0.7261             nan     0.1000   -0.0003
##    120        0.7214             nan     0.1000   -0.0003
##    140        0.7173             nan     0.1000    0.0001
##    150        0.7153             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0459             nan     0.1000    0.0173
##      2        1.0180             nan     0.1000    0.0149
##      3        0.9918             nan     0.1000    0.0117
##      4        0.9662             nan     0.1000    0.0104
##      5        0.9448             nan     0.1000    0.0094
##      6        0.9269             nan     0.1000    0.0081
##      7        0.9102             nan     0.1000    0.0069
##      8        0.8969             nan     0.1000    0.0065
##      9        0.8837             nan     0.1000    0.0051
##     10        0.8716             nan     0.1000    0.0045
##     20        0.7947             nan     0.1000    0.0025
##     40        0.7291             nan     0.1000    0.0001
##     60        0.7014             nan     0.1000   -0.0001
##     80        0.6827             nan     0.1000   -0.0008
##    100        0.6683             nan     0.1000   -0.0004
##    120        0.6580             nan     0.1000   -0.0004
##    140        0.6462             nan     0.1000   -0.0002
##    150        0.6400             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0421             nan     0.1000    0.0182
##      2        1.0060             nan     0.1000    0.0185
##      3        0.9744             nan     0.1000    0.0145
##      4        0.9496             nan     0.1000    0.0105
##      5        0.9265             nan     0.1000    0.0104
##      6        0.9069             nan     0.1000    0.0087
##      7        0.8875             nan     0.1000    0.0065
##      8        0.8713             nan     0.1000    0.0057
##      9        0.8619             nan     0.1000    0.0029
##     10        0.8516             nan     0.1000    0.0032
##     20        0.7633             nan     0.1000    0.0019
##     40        0.6960             nan     0.1000    0.0003
```

```
##     60        0.6660             nan     0.1000   -0.0011
##     80        0.6393             nan     0.1000   -0.0002
##    100        0.6160             nan     0.1000   -0.0004
##    120        0.5996             nan     0.1000   -0.0009
##    140        0.5839             nan     0.1000   -0.0005
##    150        0.5761             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0169             nan     0.1000    0.0102
##      2        1.0003             nan     0.1000    0.0072
##      3        0.9804             nan     0.1000    0.0102
##      4        0.9638             nan     0.1000    0.0083
##      5        0.9491             nan     0.1000    0.0068
##      6        0.9367             nan     0.1000    0.0059
##      7        0.9262             nan     0.1000    0.0047
##      8        0.9163             nan     0.1000    0.0051
##      9        0.9062             nan     0.1000    0.0036
##     10        0.8983             nan     0.1000    0.0029
##     20        0.8421             nan     0.1000    0.0018
##     40        0.7726             nan     0.1000    0.0002
##     60        0.7392             nan     0.1000   -0.0001
##     80        0.7204             nan     0.1000    0.0000
##    100        0.7101             nan     0.1000   -0.0001
##    120        0.7013             nan     0.1000   -0.0002
##    140        0.6964             nan     0.1000   -0.0003
##    150        0.6936             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0083             nan     0.1000    0.0130
##      2        0.9812             nan     0.1000    0.0111
##      3        0.9547             nan     0.1000    0.0113
##      4        0.9324             nan     0.1000    0.0103
##      5        0.9165             nan     0.1000    0.0080
##      6        0.8972             nan     0.1000    0.0086
##      7        0.8844             nan     0.1000    0.0061
##      8        0.8727             nan     0.1000    0.0045
##      9        0.8593             nan     0.1000    0.0064
##     10        0.8470             nan     0.1000    0.0048
##     20        0.7671             nan     0.1000    0.0011
##     40        0.7010             nan     0.1000    0.0003
##     60        0.6665             nan     0.1000   -0.0007
##     80        0.6445             nan     0.1000   -0.0005
##    100        0.6249             nan     0.1000   -0.0003
##    120        0.6105             nan     0.1000   -0.0006
##    140        0.5948             nan     0.1000   -0.0007
##    150        0.5892             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0034             nan     0.1000    0.0158
##      2        0.9681             nan     0.1000    0.0164
##      3        0.9415             nan     0.1000    0.0112
##      4        0.9117             nan     0.1000    0.0123
##      5        0.8922             nan     0.1000    0.0090
##      6        0.8709             nan     0.1000    0.0097
```

```
##      7        0.8530             nan     0.1000    0.0078
##      8        0.8366             nan     0.1000    0.0068
##      9        0.8217             nan     0.1000    0.0059
##     10        0.8091             nan     0.1000    0.0055
##     20        0.7339             nan     0.1000    0.0030
##     40        0.6610             nan     0.1000    0.0001
##     60        0.6253             nan     0.1000   -0.0004
##     80        0.5994             nan     0.1000   -0.0002
##    100        0.5768             nan     0.1000    0.0000
##    120        0.5538             nan     0.1000   -0.0006
##    140        0.5400             nan     0.1000   -0.0003
##    150        0.5303             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0222             nan     0.1000    0.0100
##      2        1.0012             nan     0.1000    0.0102
##      3        0.9892             nan     0.1000    0.0044
##      4        0.9722             nan     0.1000    0.0082
##      5        0.9597             nan     0.1000    0.0044
##      6        0.9477             nan     0.1000    0.0063
##      7        0.9364             nan     0.1000    0.0043
##      8        0.9262             nan     0.1000    0.0051
##      9        0.9184             nan     0.1000    0.0037
##     10        0.9093             nan     0.1000    0.0037
##     20        0.8556             nan     0.1000    0.0020
##     40        0.8073             nan     0.1000    0.0007
##     60        0.7876             nan     0.1000   -0.0002
##     80        0.7754             nan     0.1000   -0.0005
##    100        0.7700             nan     0.1000   -0.0002
##    120        0.7655             nan     0.1000   -0.0002
##    140        0.7616             nan     0.1000   -0.0002
##    150        0.7606             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0141             nan     0.1000    0.0123
##      2        0.9912             nan     0.1000    0.0083
##      3        0.9693             nan     0.1000    0.0107
##      4        0.9536             nan     0.1000    0.0071
##      5        0.9346             nan     0.1000    0.0095
##      6        0.9195             nan     0.1000    0.0079
##      7        0.9078             nan     0.1000    0.0049
##      8        0.8981             nan     0.1000    0.0046
##      9        0.8891             nan     0.1000    0.0042
##     10        0.8803             nan     0.1000    0.0030
##     20        0.8179             nan     0.1000    0.0011
##     40        0.7585             nan     0.1000   -0.0003
##     60        0.7373             nan     0.1000   -0.0001
##     80        0.7205             nan     0.1000   -0.0003
##    100        0.7066             nan     0.1000   -0.0006
##    120        0.6911             nan     0.1000   -0.0008
##    140        0.6822             nan     0.1000   -0.0001
##    150        0.6759             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

```
##      1        1.0098             nan     0.1000    0.0164
##      2        0.9810             nan     0.1000    0.0134
##      3        0.9550             nan     0.1000    0.0130
##      4        0.9337             nan     0.1000    0.0083
##      5        0.9177             nan     0.1000    0.0053
##      6        0.9036             nan     0.1000    0.0066
##      7        0.8884             nan     0.1000    0.0070
##      8        0.8741             nan     0.1000    0.0061
##      9        0.8626             nan     0.1000    0.0052
##     10        0.8536             nan     0.1000    0.0029
##     20        0.7835             nan     0.1000    0.0014
##     40        0.7244             nan     0.1000   -0.0006
##     60        0.6916             nan     0.1000   -0.0001
##     80        0.6638             nan     0.1000   -0.0001
##    100        0.6464             nan     0.1000   -0.0002
##    120        0.6280             nan     0.1000   -0.0004
##    140        0.6103             nan     0.1000   -0.0007
##    150        0.6010             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0195             nan     0.1000    0.0116
##      2        0.9972             nan     0.1000    0.0119
##      3        0.9824             nan     0.1000    0.0065
##      4        0.9629             nan     0.1000    0.0096
##      5        0.9487             nan     0.1000    0.0077
##      6        0.9348             nan     0.1000    0.0063
##      7        0.9209             nan     0.1000    0.0073
##      8        0.9083             nan     0.1000    0.0061
##      9        0.8974             nan     0.1000    0.0048
##     10        0.8895             nan     0.1000    0.0027
##     20        0.8240             nan     0.1000    0.0025
##     40        0.7644             nan     0.1000    0.0002
##     60        0.7346             nan     0.1000    0.0001
##     80        0.7180             nan     0.1000   -0.0002
##    100        0.7070             nan     0.1000   -0.0002
##    120        0.7031             nan     0.1000   -0.0003
##    140        0.6976             nan     0.1000   -0.0003
##    150        0.6967             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0043             nan     0.1000    0.0187
##      2        0.9775             nan     0.1000    0.0133
##      3        0.9558             nan     0.1000    0.0103
##      4        0.9300             nan     0.1000    0.0122
##      5        0.9150             nan     0.1000    0.0063
##      6        0.8937             nan     0.1000    0.0088
##      7        0.8778             nan     0.1000    0.0068
##      8        0.8631             nan     0.1000    0.0070
##      9        0.8507             nan     0.1000    0.0050
##     10        0.8396             nan     0.1000    0.0044
##     20        0.7730             nan     0.1000    0.0016
##     40        0.7085             nan     0.1000    0.0008
##     60        0.6812             nan     0.1000    0.0004
##     80        0.6596             nan     0.1000   -0.0005
```

```
##    100        0.6431             nan     0.1000   -0.0005
##    120        0.6314             nan     0.1000   -0.0002
##    140        0.6204             nan     0.1000   -0.0005
##    150        0.6133             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0064             nan     0.1000    0.0171
##      2        0.9738             nan     0.1000    0.0154
##      3        0.9408             nan     0.1000    0.0153
##      4        0.9139             nan     0.1000    0.0120
##      5        0.8889             nan     0.1000    0.0118
##      6        0.8729             nan     0.1000    0.0058
##      7        0.8539             nan     0.1000    0.0083
##      8        0.8359             nan     0.1000    0.0070
##      9        0.8234             nan     0.1000    0.0051
##     10        0.8113             nan     0.1000    0.0044
##     20        0.7333             nan     0.1000    0.0025
##     40        0.6706             nan     0.1000    0.0001
##     60        0.6318             nan     0.1000   -0.0003
##     80        0.6041             nan     0.1000   -0.0004
##    100        0.5840             nan     0.1000   -0.0004
##    120        0.5648             nan     0.1000   -0.0002
##    140        0.5457             nan     0.1000   -0.0001
##    150        0.5351             nan     0.1000   -0.0011
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0470             nan     0.1000    0.0101
##      2        1.0188             nan     0.1000    0.0126
##      3        0.9973             nan     0.1000    0.0094
##      4        0.9764             nan     0.1000    0.0101
##      5        0.9599             nan     0.1000    0.0083
##      6        0.9449             nan     0.1000    0.0073
##      7        0.9327             nan     0.1000    0.0055
##      8        0.9208             nan     0.1000    0.0051
##      9        0.9068             nan     0.1000    0.0051
##     10        0.8951             nan     0.1000    0.0059
##     20        0.8287             nan     0.1000    0.0027
##     40        0.7567             nan     0.1000    0.0001
##     60        0.7198             nan     0.1000   -0.0004
##     80        0.7024             nan     0.1000   -0.0001
##    100        0.6918             nan     0.1000    0.0001
##    120        0.6851             nan     0.1000   -0.0002
##    140        0.6788             nan     0.1000    0.0003
##    150        0.6775             nan     0.1000    0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0280             nan     0.1000    0.0191
##      2        0.9947             nan     0.1000    0.0153
##      3        0.9673             nan     0.1000    0.0118
##      4        0.9437             nan     0.1000    0.0113
##      5        0.9238             nan     0.1000    0.0096
##      6        0.9060             nan     0.1000    0.0079
##      7        0.8839             nan     0.1000    0.0106
##      8        0.8700             nan     0.1000    0.0054
```

```
##      9        0.8526             nan     0.1000    0.0079
##     10        0.8432             nan     0.1000    0.0039
##     20        0.7647             nan     0.1000    0.0021
##     40        0.6881             nan     0.1000    0.0010
##     60        0.6574             nan     0.1000    0.0001
##     80        0.6345             nan     0.1000   -0.0000
##    100        0.6223             nan     0.1000   -0.0009
##    120        0.6095             nan     0.1000   -0.0003
##    140        0.5990             nan     0.1000   -0.0006
##    150        0.5947             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0264             nan     0.1000    0.0252
##      2        0.9899             nan     0.1000    0.0172
##      3        0.9602             nan     0.1000    0.0140
##      4        0.9281             nan     0.1000    0.0164
##      5        0.9035             nan     0.1000    0.0109
##      6        0.8806             nan     0.1000    0.0095
##      7        0.8629             nan     0.1000    0.0085
##      8        0.8476             nan     0.1000    0.0051
##      9        0.8299             nan     0.1000    0.0066
##     10        0.8174             nan     0.1000    0.0055
##     20        0.7231             nan     0.1000    0.0013
##     40        0.6485             nan     0.1000    0.0003
##     60        0.6127             nan     0.1000   -0.0007
##     80        0.5844             nan     0.1000   -0.0004
##    100        0.5673             nan     0.1000    0.0002
##    120        0.5516             nan     0.1000   -0.0009
##    140        0.5381             nan     0.1000   -0.0000
##    150        0.5297             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0348             nan     0.1000    0.0120
##      2        1.0133             nan     0.1000    0.0084
##      3        0.9937             nan     0.1000    0.0098
##      4        0.9755             nan     0.1000    0.0087
##      5        0.9599             nan     0.1000    0.0078
##      6        0.9452             nan     0.1000    0.0065
##      7        0.9335             nan     0.1000    0.0051
##      8        0.9215             nan     0.1000    0.0059
##      9        0.9101             nan     0.1000    0.0047
##     10        0.9030             nan     0.1000    0.0019
##     20        0.8352             nan     0.1000    0.0020
##     40        0.7663             nan     0.1000    0.0006
##     60        0.7309             nan     0.1000    0.0005
##     80        0.7123             nan     0.1000   -0.0000
##    100        0.7009             nan     0.1000   -0.0003
##    120        0.6926             nan     0.1000   -0.0000
##    140        0.6877             nan     0.1000   -0.0003
##    150        0.6854             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0228             nan     0.1000    0.0171
##      2        0.9938             nan     0.1000    0.0124
```

```
##      3        0.9686             nan     0.1000    0.0124
##      4        0.9463             nan     0.1000    0.0103
##      5        0.9275             nan     0.1000    0.0078
##      6        0.9103             nan     0.1000    0.0076
##      7        0.8953             nan     0.1000    0.0063
##      8        0.8801             nan     0.1000    0.0056
##      9        0.8668             nan     0.1000    0.0059
##     10        0.8561             nan     0.1000    0.0044
##     20        0.7782             nan     0.1000    0.0021
##     40        0.7080             nan     0.1000   -0.0006
##     60        0.6751             nan     0.1000    0.0002
##     80        0.6554             nan     0.1000   -0.0002
##    100        0.6398             nan     0.1000   -0.0008
##    120        0.6271             nan     0.1000   -0.0002
##    140        0.6119             nan     0.1000   -0.0009
##    150        0.6070             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0244             nan     0.1000    0.0189
##      2        0.9878             nan     0.1000    0.0159
##      3        0.9579             nan     0.1000    0.0134
##      4        0.9304             nan     0.1000    0.0109
##      5        0.9059             nan     0.1000    0.0111
##      6        0.8890             nan     0.1000    0.0073
##      7        0.8671             nan     0.1000    0.0088
##      8        0.8522             nan     0.1000    0.0049
##      9        0.8392             nan     0.1000    0.0054
##     10        0.8280             nan     0.1000    0.0051
##     20        0.7419             nan     0.1000    0.0026
##     40        0.6712             nan     0.1000    0.0000
##     60        0.6370             nan     0.1000   -0.0000
##     80        0.6095             nan     0.1000   -0.0009
##    100        0.5929             nan     0.1000   -0.0002
##    120        0.5720             nan     0.1000   -0.0005
##    140        0.5540             nan     0.1000   -0.0001
##    150        0.5466             nan     0.1000   -0.0008
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0446             nan     0.1000    0.0135
##      2        1.0227             nan     0.1000    0.0108
##      3        1.0026             nan     0.1000    0.0095
##      4        0.9851             nan     0.1000    0.0081
##      5        0.9686             nan     0.1000    0.0070
##      6        0.9537             nan     0.1000    0.0078
##      7        0.9394             nan     0.1000    0.0064
##      8        0.9257             nan     0.1000    0.0050
##      9        0.9161             nan     0.1000    0.0043
##     10        0.9064             nan     0.1000    0.0043
##     20        0.8419             nan     0.1000    0.0004
##     40        0.7778             nan     0.1000    0.0003
##     60        0.7448             nan     0.1000   -0.0002
##     80        0.7300             nan     0.1000   -0.0001
##    100        0.7213             nan     0.1000   -0.0001
##    120        0.7136             nan     0.1000   -0.0002
```

```
##    140        0.7083             nan     0.1000   -0.0003
##    150        0.7063             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0306             nan     0.1000    0.0181
##      2        1.0006             nan     0.1000    0.0137
##      3        0.9762             nan     0.1000    0.0122
##      4        0.9543             nan     0.1000    0.0099
##      5        0.9360             nan     0.1000    0.0085
##      6        0.9126             nan     0.1000    0.0094
##      7        0.8933             nan     0.1000    0.0083
##      8        0.8793             nan     0.1000    0.0070
##      9        0.8675             nan     0.1000    0.0057
##     10        0.8561             nan     0.1000    0.0049
##     20        0.7796             nan     0.1000    0.0016
##     40        0.7176             nan     0.1000    0.0004
##     60        0.6907             nan     0.1000    0.0003
##     80        0.6730             nan     0.1000   -0.0007
##    100        0.6598             nan     0.1000   -0.0011
##    120        0.6489             nan     0.1000   -0.0007
##    140        0.6381             nan     0.1000   -0.0009
##    150        0.6346             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0251             nan     0.1000    0.0219
##      2        0.9877             nan     0.1000    0.0178
##      3        0.9548             nan     0.1000    0.0148
##      4        0.9289             nan     0.1000    0.0119
##      5        0.9096             nan     0.1000    0.0075
##      6        0.8896             nan     0.1000    0.0086
##      7        0.8711             nan     0.1000    0.0077
##      8        0.8548             nan     0.1000    0.0077
##      9        0.8415             nan     0.1000    0.0058
##     10        0.8316             nan     0.1000    0.0043
##     20        0.7480             nan     0.1000    0.0014
##     40        0.6878             nan     0.1000   -0.0004
##     60        0.6560             nan     0.1000    0.0002
##     80        0.6291             nan     0.1000   -0.0012
##    100        0.6064             nan     0.1000   -0.0004
##    120        0.5843             nan     0.1000   -0.0003
##    140        0.5656             nan     0.1000   -0.0005
##    150        0.5596             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0258             nan     0.1000    0.0115
##      2        1.0060             nan     0.1000    0.0095
##      3        0.9906             nan     0.1000    0.0077
##      4        0.9752             nan     0.1000    0.0050
##      5        0.9613             nan     0.1000    0.0059
##      6        0.9498             nan     0.1000    0.0045
##      7        0.9393             nan     0.1000    0.0049
##      8        0.9265             nan     0.1000    0.0059
##      9        0.9179             nan     0.1000    0.0038
##     10        0.9118             nan     0.1000    0.0011
```

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##     20        0.8472             nan     0.1000    0.0018
##     40        0.7782             nan     0.1000    0.0004
##     60        0.7443             nan     0.1000    0.0007
##     80        0.7244             nan     0.1000   -0.0001
##    100        0.7128             nan     0.1000    0.0000
##    120        0.7030             nan     0.1000   -0.0001
##    140        0.6972             nan     0.1000   -0.0003
##    150        0.6950             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0167             nan     0.1000    0.0154
##      2        0.9854             nan     0.1000    0.0139
##      3        0.9628             nan     0.1000    0.0106
##      4        0.9409             nan     0.1000    0.0091
##      5        0.9199             nan     0.1000    0.0086
##      6        0.9011             nan     0.1000    0.0083
##      7        0.8875             nan     0.1000    0.0062
##      8        0.8734             nan     0.1000    0.0045
##      9        0.8608             nan     0.1000    0.0054
##     10        0.8519             nan     0.1000    0.0035
##     20        0.7829             nan     0.1000    0.0018
##     40        0.7146             nan     0.1000    0.0004
##     60        0.6805             nan     0.1000    0.0007
##     80        0.6598             nan     0.1000   -0.0003
##    100        0.6412             nan     0.1000    0.0001
##    120        0.6285             nan     0.1000   -0.0002
##    140        0.6187             nan     0.1000   -0.0005
##    150        0.6114             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0055             nan     0.1000    0.0187
##      2        0.9753             nan     0.1000    0.0129
##      3        0.9488             nan     0.1000    0.0111
##      4        0.9251             nan     0.1000    0.0112
##      5        0.9078             nan     0.1000    0.0062
##      6        0.8864             nan     0.1000    0.0101
##      7        0.8682             nan     0.1000    0.0082
##      8        0.8530             nan     0.1000    0.0069
##      9        0.8383             nan     0.1000    0.0060
##     10        0.8246             nan     0.1000    0.0046
##     20        0.7477             nan     0.1000    0.0009
##     40        0.6788             nan     0.1000    0.0008
##     60        0.6408             nan     0.1000    0.0002
##     80        0.6191             nan     0.1000   -0.0005
##    100        0.5924             nan     0.1000    0.0003
##    120        0.5747             nan     0.1000   -0.0009
##    140        0.5542             nan     0.1000    0.0001
##    150        0.5457             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0075             nan     0.1000    0.0124
##      2        0.9831             nan     0.1000    0.0109
##      3        0.9659             nan     0.1000    0.0077
##      4        0.9512             nan     0.1000    0.0051
```

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##      5        0.9365             nan     0.1000    0.0057
##      6        0.9224             nan     0.1000    0.0066
##      7        0.9086             nan     0.1000    0.0078
##      8        0.8940             nan     0.1000    0.0064
##      9        0.8826             nan     0.1000    0.0039
##     10        0.8720             nan     0.1000    0.0050
##     20        0.8025             nan     0.1000    0.0015
##     40        0.7325             nan     0.1000    0.0007
##     60        0.6970             nan     0.1000    0.0002
##     80        0.6811             nan     0.1000   -0.0005
##    100        0.6708             nan     0.1000   -0.0002
##    120        0.6643             nan     0.1000   -0.0004
##    140        0.6587             nan     0.1000   -0.0002
##    150        0.6570             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9952             nan     0.1000    0.0171
##      2        0.9621             nan     0.1000    0.0138
##      3        0.9328             nan     0.1000    0.0130
##      4        0.9129             nan     0.1000    0.0087
##      5        0.8958             nan     0.1000    0.0077
##      6        0.8772             nan     0.1000    0.0080
##      7        0.8672             nan     0.1000    0.0031
##      8        0.8508             nan     0.1000    0.0065
##      9        0.8340             nan     0.1000    0.0073
##     10        0.8213             nan     0.1000    0.0047
##     20        0.7350             nan     0.1000    0.0016
##     40        0.6744             nan     0.1000   -0.0004
##     60        0.6420             nan     0.1000    0.0004
##     80        0.6212             nan     0.1000   -0.0002
##    100        0.6033             nan     0.1000    0.0001
##    120        0.5897             nan     0.1000    0.0002
##    140        0.5780             nan     0.1000   -0.0002
##    150        0.5727             nan     0.1000   -0.0000
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9932             nan     0.1000    0.0181
##      2        0.9536             nan     0.1000    0.0190
##      3        0.9232             nan     0.1000    0.0120
##      4        0.8985             nan     0.1000    0.0095
##      5        0.8733             nan     0.1000    0.0119
##      6        0.8509             nan     0.1000    0.0091
##      7        0.8346             nan     0.1000    0.0063
##      8        0.8171             nan     0.1000    0.0057
##      9        0.7997             nan     0.1000    0.0069
##     10        0.7852             nan     0.1000    0.0060
##     20        0.7022             nan     0.1000    0.0021
##     40        0.6321             nan     0.1000    0.0002
##     60        0.5946             nan     0.1000   -0.0002
##     80        0.5721             nan     0.1000    0.0002
##    100        0.5499             nan     0.1000   -0.0002
##    120        0.5338             nan     0.1000   -0.0004
##    140        0.5160             nan     0.1000   -0.0004
##    150        0.5079             nan     0.1000   -0.0003
```

```
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0332             nan     0.1000    0.0130
##      2        1.0133             nan     0.1000    0.0107
##      3        0.9975             nan     0.1000    0.0064
##      4        0.9796             nan     0.1000    0.0085
##      5        0.9659             nan     0.1000    0.0063
##      6        0.9559             nan     0.1000    0.0042
##      7        0.9434             nan     0.1000    0.0049
##      8        0.9337             nan     0.1000    0.0041
##      9        0.9222             nan     0.1000    0.0043
##     10        0.9096             nan     0.1000    0.0054
##     20        0.8461             nan     0.1000    0.0013
##     40        0.7852             nan     0.1000    0.0002
##     60        0.7575             nan     0.1000   -0.0005
##     80        0.7407             nan     0.1000   -0.0002
##    100        0.7298             nan     0.1000   -0.0002
##    120        0.7239             nan     0.1000    0.0000
##    140        0.7182             nan     0.1000   -0.0002
##    150        0.7157             nan     0.1000   -0.0001
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0219             nan     0.1000    0.0180
##      2        0.9876             nan     0.1000    0.0142
##      3        0.9610             nan     0.1000    0.0116
##      4        0.9446             nan     0.1000    0.0075
##      5        0.9282             nan     0.1000    0.0078
##      6        0.9097             nan     0.1000    0.0084
##      7        0.8977             nan     0.1000    0.0053
##      8        0.8878             nan     0.1000    0.0036
##      9        0.8737             nan     0.1000    0.0048
##     10        0.8615             nan     0.1000    0.0053
##     20        0.7897             nan     0.1000    0.0015
##     40        0.7279             nan     0.1000    0.0003
##     60        0.6983             nan     0.1000   -0.0005
##     80        0.6818             nan     0.1000   -0.0012
##    100        0.6670             nan     0.1000    0.0002
##    120        0.6537             nan     0.1000   -0.0001
##    140        0.6435             nan     0.1000   -0.0004
##    150        0.6370             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0147             nan     0.1000    0.0207
##      2        0.9764             nan     0.1000    0.0171
##      3        0.9505             nan     0.1000    0.0082
##      4        0.9324             nan     0.1000    0.0089
##      5        0.9165             nan     0.1000    0.0050
##      6        0.8928             nan     0.1000    0.0100
##      7        0.8751             nan     0.1000    0.0072
##      8        0.8642             nan     0.1000    0.0033
##      9        0.8473             nan     0.1000    0.0060
##     10        0.8341             nan     0.1000    0.0054
##     20        0.7635             nan     0.1000    0.0020
##     40        0.7015             nan     0.1000   -0.0007
```

```
##     60        0.6640             nan     0.1000    0.0003
##     80        0.6382             nan     0.1000   -0.0003
##    100        0.6136             nan     0.1000   -0.0000
##    120        0.5924             nan     0.1000   -0.0004
##    140        0.5716             nan     0.1000   -0.0000
##    150        0.5649             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9909             nan     0.1000    0.0106
##      2        0.9721             nan     0.1000    0.0078
##      3        0.9549             nan     0.1000    0.0083
##      4        0.9366             nan     0.1000    0.0080
##      5        0.9220             nan     0.1000    0.0064
##      6        0.9110             nan     0.1000    0.0033
##      7        0.8995             nan     0.1000    0.0052
##      8        0.8896             nan     0.1000    0.0042
##      9        0.8806             nan     0.1000    0.0039
##     10        0.8733             nan     0.1000    0.0026
##     20        0.8163             nan     0.1000    0.0018
##     40        0.7527             nan     0.1000    0.0009
##     60        0.7248             nan     0.1000   -0.0001
##     80        0.7103             nan     0.1000   -0.0006
##    100        0.7002             nan     0.1000   -0.0001
##    120        0.6921             nan     0.1000    0.0000
##    140        0.6884             nan     0.1000   -0.0006
##    150        0.6868             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9850             nan     0.1000    0.0141
##      2        0.9663             nan     0.1000    0.0071
##      3        0.9393             nan     0.1000    0.0123
##      4        0.9165             nan     0.1000    0.0092
##      5        0.8931             nan     0.1000    0.0106
##      6        0.8795             nan     0.1000    0.0067
##      7        0.8627             nan     0.1000    0.0075
##      8        0.8521             nan     0.1000    0.0045
##      9        0.8418             nan     0.1000    0.0031
##     10        0.8304             nan     0.1000    0.0036
##     20        0.7613             nan     0.1000    0.0017
##     40        0.6947             nan     0.1000   -0.0003
##     60        0.6679             nan     0.1000    0.0004
##     80        0.6496             nan     0.1000   -0.0001
##    100        0.6373             nan     0.1000   -0.0003
##    120        0.6218             nan     0.1000   -0.0003
##    140        0.6114             nan     0.1000   -0.0001
##    150        0.6057             nan     0.1000   -0.0010
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9815             nan     0.1000    0.0156
##      2        0.9443             nan     0.1000    0.0165
##      3        0.9143             nan     0.1000    0.0156
##      4        0.8945             nan     0.1000    0.0084
##      5        0.8723             nan     0.1000    0.0103
##      6        0.8562             nan     0.1000    0.0069
```

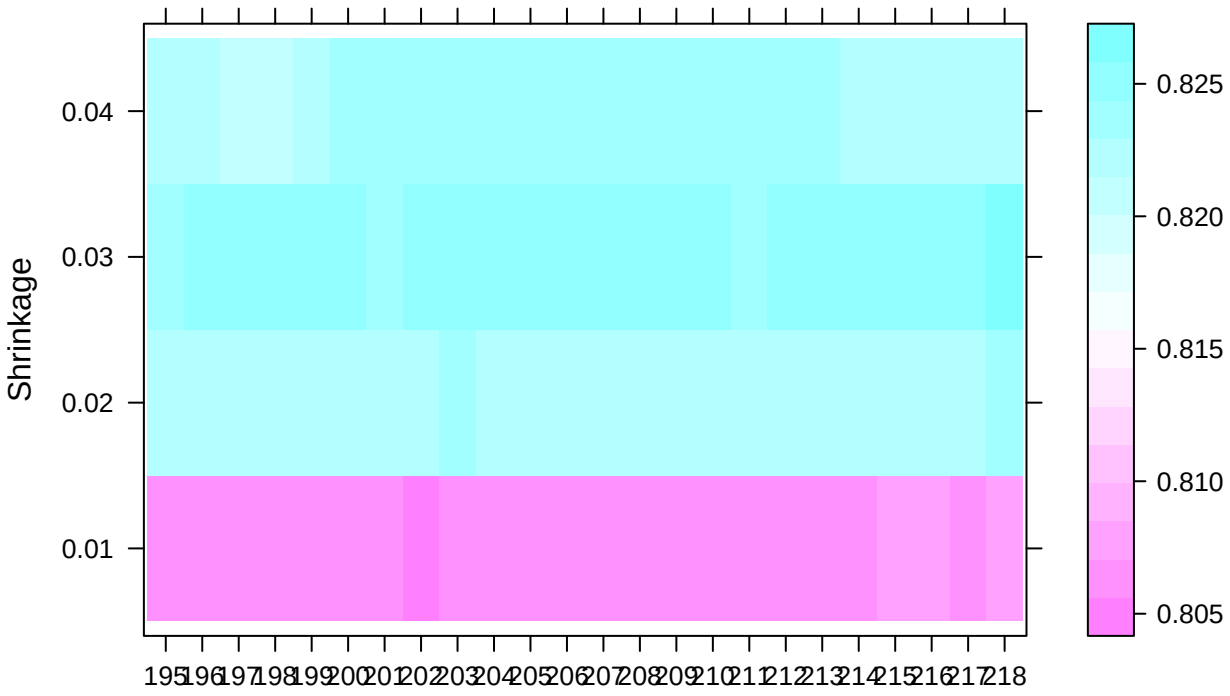
```
##      7        0.8422             nan     0.1000    0.0041
##      8        0.8322             nan     0.1000    0.0033
##      9        0.8152             nan     0.1000    0.0085
##     10        0.8015             nan     0.1000    0.0044
##     20        0.7297             nan     0.1000    0.0011
##     40        0.6625             nan     0.1000    0.0006
##     60        0.6279             nan     0.1000   -0.0002
##     80        0.6080             nan     0.1000   -0.0005
##    100        0.5900             nan     0.1000   -0.0005
##    120        0.5739             nan     0.1000   -0.0001
##    140        0.5579             nan     0.1000   -0.0009
##    150        0.5503             nan     0.1000   -0.0009
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9949             nan     0.1000    0.0094
##      2        0.9732             nan     0.1000    0.0104
##      3        0.9578             nan     0.1000    0.0075
##      4        0.9402             nan     0.1000    0.0076
##      5        0.9263             nan     0.1000    0.0063
##      6        0.9155             nan     0.1000    0.0051
##      7        0.9076             nan     0.1000    0.0030
##      8        0.8967             nan     0.1000    0.0047
##      9        0.8874             nan     0.1000    0.0043
##     10        0.8801             nan     0.1000    0.0034
##     20        0.8246             nan     0.1000    0.0012
##     40        0.7635             nan     0.1000    0.0003
##     60        0.7350             nan     0.1000    0.0006
##     80        0.7191             nan     0.1000   -0.0001
##    100        0.7089             nan     0.1000   -0.0003
##    120        0.7009             nan     0.1000   -0.0002
##    140        0.6972             nan     0.1000   -0.0006
##    150        0.6953             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.9820             nan     0.1000    0.0141
##      2        0.9515             nan     0.1000    0.0131
##      3        0.9326             nan     0.1000    0.0078
##      4        0.9139             nan     0.1000    0.0070
##      5        0.8946             nan     0.1000    0.0091
##      6        0.8784             nan     0.1000    0.0066
##      7        0.8631             nan     0.1000    0.0055
##      8        0.8487             nan     0.1000    0.0054
##      9        0.8403             nan     0.1000    0.0038
##     10        0.8320             nan     0.1000    0.0038
##     20        0.7639             nan     0.1000    0.0015
##     40        0.7036             nan     0.1000   -0.0005
##     60        0.6723             nan     0.1000   -0.0004
##     80        0.6525             nan     0.1000   -0.0007
##    100        0.6384             nan     0.1000   -0.0011
##    120        0.6261             nan     0.1000   -0.0004
##    140        0.6086             nan     0.1000   -0.0004
##    150        0.6042             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
```

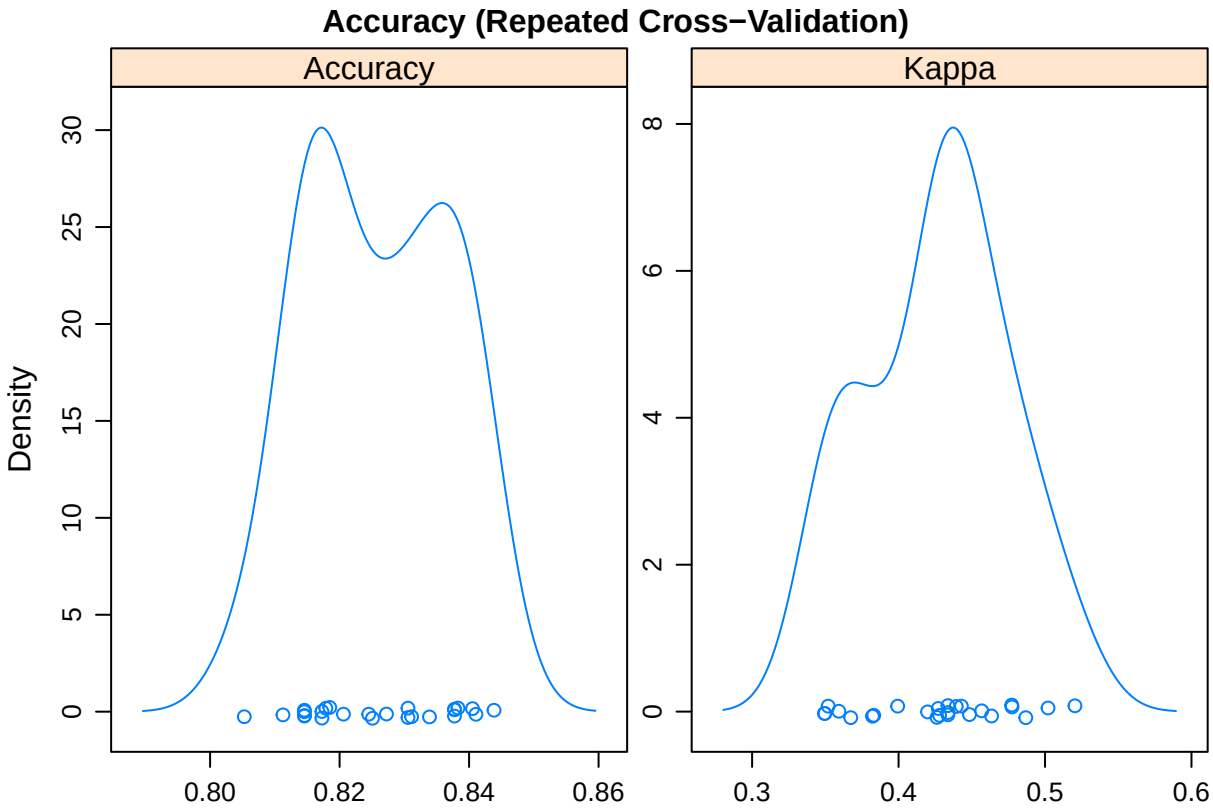
```
##      1        0.9772             nan     0.1000    0.0184
##      2        0.9464             nan     0.1000    0.0143
##      3        0.9211             nan     0.1000    0.0133
##      4        0.8994             nan     0.1000    0.0093
##      5        0.8750             nan     0.1000    0.0110
##      6        0.8591             nan     0.1000    0.0064
##      7        0.8436             nan     0.1000    0.0069
##      8        0.8305             nan     0.1000    0.0057
##      9        0.8162             nan     0.1000    0.0047
##     10        0.8056             nan     0.1000    0.0042
##     20        0.7301             nan     0.1000    0.0007
##     40        0.6690             nan     0.1000   -0.0003
##     60        0.6397             nan     0.1000   -0.0008
##     80        0.6160             nan     0.1000   -0.0003
##    100        0.5962             nan     0.1000   -0.0001
##    120        0.5790             nan     0.1000   -0.0006
##    140        0.5595             nan     0.1000   -0.0011
##    150        0.5518             nan     0.1000   -0.0007
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0625             nan     0.1000    0.0124
##      2        1.0410             nan     0.1000    0.0102
##      3        1.0222             nan     0.1000    0.0079
##      4        1.0064             nan     0.1000    0.0077
##      5        0.9938             nan     0.1000    0.0060
##      6        0.9805             nan     0.1000    0.0062
##      7        0.9702             nan     0.1000    0.0039
##      8        0.9578             nan     0.1000    0.0061
##      9        0.9484             nan     0.1000    0.0039
##     10        0.9404             nan     0.1000    0.0031
##     20        0.8729             nan     0.1000    0.0014
##     40        0.8055             nan     0.1000   -0.0003
##     60        0.7708             nan     0.1000    0.0006
##     80        0.7507             nan     0.1000    0.0001
##    100        0.7410             nan     0.1000   -0.0002
##    120        0.7350             nan     0.1000   -0.0003
##    140        0.7286             nan     0.1000   -0.0003
##    150        0.7254             nan     0.1000   -0.0003
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0559             nan     0.1000    0.0173
##      2        1.0300             nan     0.1000    0.0117
##      3        1.0042             nan     0.1000    0.0126
##      4        0.9821             nan     0.1000    0.0100
##      5        0.9639             nan     0.1000    0.0083
##      6        0.9427             nan     0.1000    0.0092
##      7        0.9300             nan     0.1000    0.0058
##      8        0.9139             nan     0.1000    0.0069
##      9        0.9021             nan     0.1000    0.0053
##     10        0.8927             nan     0.1000    0.0019
##     20        0.8163             nan     0.1000    0.0024
##     40        0.7465             nan     0.1000    0.0002
##     60        0.7170             nan     0.1000   -0.0003
##     80        0.6957             nan     0.1000   -0.0004
```

```
##    100        0.6775             nan     0.1000   -0.0007
##    120        0.6655             nan     0.1000   -0.0005
##    140        0.6549             nan     0.1000   -0.0011
##    150        0.6519             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0465             nan     0.1000    0.0211
##      2        1.0112             nan     0.1000    0.0185
##      3        0.9820             nan     0.1000    0.0146
##      4        0.9559             nan     0.1000    0.0115
##      5        0.9371             nan     0.1000    0.0076
##      6        0.9169             nan     0.1000    0.0092
##      7        0.8982             nan     0.1000    0.0087
##      8        0.8850             nan     0.1000    0.0054
##      9        0.8712             nan     0.1000    0.0059
##     10        0.8608             nan     0.1000    0.0041
##     20        0.7791             nan     0.1000    0.0011
##     40        0.7113             nan     0.1000   -0.0004
##     60        0.6765             nan     0.1000   -0.0006
##     80        0.6528             nan     0.1000   -0.0004
##    100        0.6357             nan     0.1000   -0.0005
##    120        0.6186             nan     0.1000   -0.0004
##    140        0.6043             nan     0.1000   -0.0011
##    150        0.5934             nan     0.1000   -0.0004
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0779             nan     0.1000    0.0096
##      2        1.0567             nan     0.1000    0.0079
##      3        1.0392             nan     0.1000    0.0089
##      4        1.0232             nan     0.1000    0.0070
##      5        1.0076             nan     0.1000    0.0064
##      6        0.9935             nan     0.1000    0.0065
##      7        0.9815             nan     0.1000    0.0050
##      8        0.9710             nan     0.1000    0.0045
##      9        0.9605             nan     0.1000    0.0046
##     10        0.9506             nan     0.1000    0.0042
##     20        0.8845             nan     0.1000    0.0026
##     40        0.8258             nan     0.1000    0.0002
##     60        0.7967             nan     0.1000   -0.0003
##     80        0.7805             nan     0.1000    0.0001
##    100        0.7688             nan     0.1000    0.0002
##    120        0.7614             nan     0.1000   -0.0002
##    140        0.7549             nan     0.1000   -0.0002
##    150        0.7530             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0699             nan     0.1000    0.0123
##      2        1.0392             nan     0.1000    0.0145
##      3        1.0143             nan     0.1000    0.0123
##      4        0.9929             nan     0.1000    0.0104
##      5        0.9763             nan     0.1000    0.0065
##      6        0.9571             nan     0.1000    0.0088
##      7        0.9417             nan     0.1000    0.0065
##      8        0.9269             nan     0.1000    0.0065
```

```
##      9        0.9170             nan     0.1000    0.0039
##     10        0.9053             nan     0.1000    0.0052
##     20        0.8302             nan     0.1000    0.0023
##     40        0.7660             nan     0.1000   -0.0000
##     60        0.7359             nan     0.1000    0.0005
##     80        0.7168             nan     0.1000   -0.0004
##    100        0.7001             nan     0.1000   -0.0001
##    120        0.6852             nan     0.1000   -0.0003
##    140        0.6759             nan     0.1000   -0.0004
##    150        0.6720             nan     0.1000   -0.0005
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0599             nan     0.1000    0.0196
##      2        1.0263             nan     0.1000    0.0143
##      3        0.9979             nan     0.1000    0.0132
##      4        0.9743             nan     0.1000    0.0085
##      5        0.9529             nan     0.1000    0.0092
##      6        0.9343             nan     0.1000    0.0069
##      7        0.9192             nan     0.1000    0.0063
##      8        0.9047             nan     0.1000    0.0053
##      9        0.8894             nan     0.1000    0.0053
##     10        0.8785             nan     0.1000    0.0050
##     20        0.8025             nan     0.1000    0.0026
##     40        0.7257             nan     0.1000    0.0001
##     60        0.6884             nan     0.1000    0.0001
##     80        0.6654             nan     0.1000   -0.0004
##    100        0.6430             nan     0.1000    0.0003
##    120        0.6239             nan     0.1000    0.0001
##    140        0.6078             nan     0.1000   -0.0008
##    150        0.5985             nan     0.1000   -0.0002
##
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.0228             nan     0.1000    0.0138
##      2        0.9943             nan     0.1000    0.0135
##      3        0.9719             nan     0.1000    0.0097
##      4        0.9504             nan     0.1000    0.0095
##      5        0.9369             nan     0.1000    0.0053
##      6        0.9179             nan     0.1000    0.0085
##      7        0.9021             nan     0.1000    0.0065
##      8        0.8911             nan     0.1000    0.0046
##      9        0.8781             nan     0.1000    0.0040
##     10        0.8660             nan     0.1000    0.0061
##     20        0.8040             nan     0.1000    0.0018
##     40        0.7466             nan     0.1000   -0.0000
##     60        0.7240             nan     0.1000   -0.0003
##     80        0.7097             nan     0.1000   -0.0004
##    100        0.6986             nan     0.1000   -0.0008

## [1] "Running GBM"
```





Neural network

```
## # weights:  11
## initial  value 1003.270658
```

```
## iter  10 value 564.148528
## iter  20 value 534.023871
## iter  30 value 530.755375
## iter  40 value 530.498584
## final  value 530.326344
## converged
## # weights:  31
## initial  value 1077.241940
## iter  10 value 532.060207
## iter  20 value 510.179687
## iter  30 value 497.851390
## iter  40 value 494.391436
## iter  50 value 490.279048
## iter  60 value 486.983681
## iter  70 value 486.152279
## iter  80 value 485.113696
## iter  90 value 484.177718
## iter 100 value 483.684180
## final  value 483.684180
## stopped after 100 iterations
## # weights:  51
## initial  value 1349.809091
## iter  10 value 518.482926
## iter  20 value 476.835878
## iter  30 value 460.168605
## iter  40 value 450.255286
## iter  50 value 442.918680
## iter  60 value 433.453886
## iter  70 value 418.002808
## iter  80 value 410.898310
## iter  90 value 406.565995
## iter 100 value 405.956282
## final  value 405.956282
## stopped after 100 iterations
## # weights:  11
## initial  value 990.804818
## iter  10 value 556.499187
## iter  20 value 540.768308
## iter  30 value 537.002941
## iter  40 value 537.001837
## final  value 537.001812
## converged
## # weights:  31
## initial  value 1152.847690
## iter  10 value 538.721784
## iter  20 value 530.961904
## iter  30 value 523.578487
## iter  40 value 518.319026
## iter  50 value 514.621539
## iter  60 value 513.347090
## iter  70 value 513.157084
## iter  80 value 513.110021
## iter  90 value 513.104611
## final  value 513.104602
```

```
## converged
## # weights:  51
## initial  value 875.271058
## iter  10 value 527.811491
## iter  20 value 507.867403
## iter  30 value 501.022686
## iter  40 value 496.585174
## iter  50 value 494.537716
## iter  60 value 493.416149
## iter  70 value 492.576437
## iter  80 value 491.976656
## iter  90 value 489.939994
## iter 100 value 488.178720
## final  value 488.178720
## stopped after 100 iterations
## # weights:  11
## initial  value 1055.032485
## iter  10 value 584.544124
## iter  20 value 549.629532
## iter  30 value 538.883839
## iter  40 value 531.513243
## iter  50 value 530.402001
## final  value 530.332716
## converged
## # weights:  31
## initial  value 1176.451486
## iter  10 value 549.609759
## iter  20 value 514.481977
## iter  30 value 499.554683
## iter  40 value 496.189634
## iter  50 value 493.675487
## iter  60 value 490.322344
## iter  70 value 488.873451
## iter  80 value 487.624235
## iter  90 value 486.405017
## iter 100 value 485.890228
## final  value 485.890228
## stopped after 100 iterations
## # weights:  51
## initial  value 1464.225828
## iter  10 value 536.982114
## iter  20 value 485.599987
## iter  30 value 469.854807
## iter  40 value 462.548480
## iter  50 value 450.714003
## iter  60 value 441.432268
## iter  70 value 428.642837
## iter  80 value 426.169320
## iter  90 value 425.816819
## iter 100 value 425.447997
## final  value 425.447997
## stopped after 100 iterations
## # weights:  11
## initial  value 858.856450
```

```
## iter  10 value 613.775817
## iter  20 value 601.753309
## iter  30 value 592.637524
## iter  40 value 579.236300
## iter  50 value 575.476870
## iter  60 value 574.553504
## iter  70 value 574.104167
## iter  80 value 574.072795
## iter  90 value 574.038069
## iter 100 value 574.034320
## final  value 574.034320
## stopped after 100 iterations
## # weights:  31
## initial  value 944.947214
## iter  10 value 587.674761
## iter  20 value 543.515524
## iter  30 value 538.047457
## iter  40 value 535.407867
## iter  50 value 533.262214
## iter  60 value 525.634685
## iter  70 value 517.056147
## iter  80 value 513.743026
## iter  90 value 512.743586
## iter 100 value 511.901261
## final  value 511.901261
## stopped after 100 iterations
## # weights:  51
## initial  value 1075.741283
## iter  10 value 555.836598
## iter  20 value 514.348652
## iter  30 value 487.305145
## iter  40 value 475.341575
## iter  50 value 462.714041
## iter  60 value 443.822998
## iter  70 value 434.114038
## iter  80 value 433.069006
## iter  90 value 433.063660
## final  value 433.063450
## converged
## # weights:  11
## initial  value 869.736568
## iter  10 value 624.295161
## iter  20 value 595.198468
## iter  30 value 582.417016
## iter  40 value 580.162710
## final  value 580.156991
## converged
## # weights:  31
## initial  value 979.533564
## iter  10 value 580.957881
## iter  20 value 558.548922
## iter  30 value 552.025584
## iter  40 value 547.958281
## iter  50 value 546.855821
```

```
## iter  60 value 544.699834
## iter  70 value 544.109307
## iter  80 value 543.180489
## iter  90 value 539.356482
## iter 100 value 538.676313
## final  value 538.676313
## stopped after 100 iterations
## # weights:  51
## initial  value 1114.942655
## iter  10 value 639.723853
## iter  20 value 601.257328
## iter  30 value 568.148234
## iter  40 value 549.766266
## iter  50 value 535.872027
## iter  60 value 532.297353
## iter  70 value 530.635011
## iter  80 value 530.480317
## iter  90 value 530.448785
## iter 100 value 530.444586
## final  value 530.444586
## stopped after 100 iterations
## # weights:  11
## initial  value 1485.040253
## iter  10 value 661.076896
## iter  20 value 633.523586
## iter  30 value 613.554231
## iter  40 value 582.054588
## iter  50 value 576.212909
## iter  60 value 574.607946
## iter  70 value 574.131670
## iter  80 value 574.106925
## iter  90 value 574.060514
## final  value 574.056951
## converged
## # weights:  31
## initial  value 1131.456970
## iter  10 value 629.026388
## iter  20 value 560.434331
## iter  30 value 545.775447
## iter  40 value 536.964010
## iter  50 value 530.618715
## iter  60 value 529.329122
## iter  70 value 529.268510
## iter  80 value 529.098436
## iter  90 value 528.980699
## iter 100 value 528.916004
## final  value 528.916004
## stopped after 100 iterations
## # weights:  51
## initial  value 1074.109919
## iter  10 value 583.950947
## iter  20 value 536.159130
## iter  30 value 508.739042
## iter  40 value 494.402036
```

```
## iter  50 value 479.411635
## iter  60 value 473.907746
## iter  70 value 472.566458
## iter  80 value 471.961456
## iter  90 value 471.464383
## iter 100 value 471.221745
## final  value 471.221745
## stopped after 100 iterations
## # weights:  11
## initial  value 1420.961864
## iter  10 value 589.150969
## iter  20 value 581.817304
## iter  30 value 575.578753
## iter  40 value 572.670244
## iter  50 value 571.612258
## iter  60 value 571.313240
## iter  70 value 570.953328
## iter  80 value 570.915860
## iter  90 value 570.784848
## iter 100 value 570.771525
## final  value 570.771525
## stopped after 100 iterations
## # weights:  31
## initial  value 1358.102975
## iter  10 value 564.875186
## iter  20 value 543.182940
## iter  30 value 527.391554
## iter  40 value 520.022346
## iter  50 value 517.693916
## iter  60 value 514.285781
## iter  70 value 513.704106
## iter  80 value 513.393197
## iter  90 value 512.380129
## iter 100 value 511.341453
## final  value 511.341453
## stopped after 100 iterations
## # weights:  51
## initial  value 854.329869
## iter  10 value 561.487463
## iter  20 value 518.380870
## iter  30 value 496.810763
## iter  40 value 479.430864
## iter  50 value 473.468331
## iter  60 value 468.288947
## iter  70 value 464.993782
## iter  80 value 460.593658
## iter  90 value 454.622633
## iter 100 value 446.125062
## final  value 446.125062
## stopped after 100 iterations
## # weights:  11
## initial  value 852.156342
## iter  10 value 586.651776
## iter  20 value 578.902015
```

```
## iter  30 value 578.893020
## final  value 578.891737
## converged
## # weights:  31
## initial  value 1386.279266
## iter  10 value 570.039669
## iter  20 value 549.374799
## iter  30 value 535.343376
## iter  40 value 530.920799
## iter  50 value 529.634619
## iter  60 value 527.252529
## iter  70 value 527.131935
## iter  80 value 527.092729
## iter  90 value 527.090334
## iter  90 value 527.090329
## iter  90 value 527.090329
## final  value 527.090329
## converged
## # weights:  51
## initial  value 962.291366
## iter  10 value 567.773018
## iter  20 value 539.625947
## iter  30 value 528.991334
## iter  40 value 523.709631
## iter  50 value 522.043060
## iter  60 value 516.473768
## iter  70 value 512.766499
## iter  80 value 512.113597
## iter  90 value 510.555238
## iter 100 value 505.593064
## final  value 505.593064
## stopped after 100 iterations
## # weights:  11
## initial  value 1165.652280
## iter  10 value 610.083379
## iter  20 value 608.171503
## iter  30 value 603.134291
## iter  40 value 586.245141
## iter  50 value 573.188753
## iter  60 value 572.447641
## iter  70 value 571.308852
## iter  80 value 571.114067
## iter  90 value 570.930277
## iter 100 value 570.864592
## final  value 570.864592
## stopped after 100 iterations
## # weights:  31
## initial  value 1549.545916
## iter  10 value 564.697325
## iter  20 value 525.913338
## iter  30 value 513.253703
## iter  40 value 497.017153
## iter  50 value 495.282845
## iter  60 value 495.155415
```

```
## iter  70 value 495.127956
## iter  80 value 495.027151
## iter  90 value 494.336959
## iter 100 value 494.170425
## final  value 494.170425
## stopped after 100 iterations
## # weights:  51
## initial  value 890.929036
## iter  10 value 599.982995
## iter  20 value 553.056364
## iter  30 value 515.456883
## iter  40 value 485.408007
## iter  50 value 477.295668
## iter  60 value 468.895224
## iter  70 value 456.035727
## iter  80 value 452.273282
## iter  90 value 451.733863
## iter 100 value 451.429792
## final  value 451.429792
## stopped after 100 iterations
## # weights:  11
## initial  value 1088.169486
## iter  10 value 565.846449
## iter  20 value 550.992869
## final  value 550.990994
## converged
## # weights:  31
## initial  value 1317.324614
## iter  10 value 567.147065
## iter  20 value 542.272741
## iter  30 value 529.482426
## iter  40 value 515.901468
## iter  50 value 510.232410
## iter  60 value 509.598769
## final  value 509.595996
## converged
## # weights:  51
## initial  value 1133.415756
## iter  10 value 554.324247
## iter  20 value 526.380042
## iter  30 value 489.966595
## iter  40 value 477.285637
## iter  50 value 464.011852
## iter  60 value 437.769951
## iter  70 value 427.509685
## iter  80 value 424.685791
## iter  90 value 424.372858
## iter 100 value 424.341457
## final  value 424.341457
## stopped after 100 iterations
## # weights:  11
## initial  value 1082.832256
## iter  10 value 569.973901
## iter  20 value 557.180769
```

```
## iter  30 value 555.653687
## iter  40 value 555.648737
## final  value 555.648626
## converged
## # weights:  31
## initial  value 1563.400728
## iter  10 value 569.915926
## iter  20 value 543.480350
## iter  30 value 538.067351
## iter  40 value 536.537756
## iter  50 value 533.583032
## iter  60 value 530.015263
## iter  70 value 529.709938
## iter  80 value 529.660301
## iter  90 value 529.643563
## final  value 529.643438
## converged
## # weights:  51
## initial  value 809.778048
## iter  10 value 559.818515
## iter  20 value 531.945369
## iter  30 value 517.117788
## iter  40 value 511.885415
## iter  50 value 511.188424
## iter  60 value 510.662749
## iter  70 value 510.530084
## iter  80 value 510.513343
## final  value 510.511776
## converged
## # weights:  11
## initial  value 829.234012
## iter  10 value 584.073575
## iter  20 value 554.831421
## iter  30 value 553.722636
## iter  40 value 547.664857
## iter  50 value 546.203226
## iter  60 value 546.187468
## final  value 546.187333
## converged
## # weights:  31
## initial  value 936.001350
## iter  10 value 555.037403
## iter  20 value 527.240502
## iter  30 value 513.094933
## iter  40 value 501.446000
## iter  50 value 496.805675
## iter  60 value 494.250927
## iter  70 value 493.722114
## iter  80 value 493.573990
## iter  90 value 492.953033
## iter 100 value 490.769346
## final  value 490.769346
## stopped after 100 iterations
## # weights:  51
```

```
## initial  value 819.772372
## iter  10 value 540.977197
## iter  20 value 517.643705
## iter  30 value 490.755368
## iter  40 value 480.186964
## iter  50 value 469.479257
## iter  60 value 461.386967
## iter  70 value 459.909602
## iter  80 value 459.439795
## iter  90 value 458.919167
## iter 100 value 457.923005
## final  value 457.923005
## stopped after 100 iterations
## # weights:  11
## initial  value 910.198866
## iter  10 value 564.781033
## iter  20 value 549.889130
## iter  30 value 549.719175
## iter  40 value 549.156442
## final  value 549.114629
## converged
## # weights:  31
## initial  value 1014.587027
## iter  10 value 587.034783
## iter  20 value 554.038864
## iter  30 value 539.667648
## iter  40 value 528.529734
## iter  50 value 522.420204
## iter  60 value 518.815183
## iter  70 value 515.489190
## iter  80 value 514.998478
## iter  90 value 514.930132
## iter 100 value 514.823423
## final  value 514.823423
## stopped after 100 iterations
## # weights:  51
## initial  value 1258.156395
## iter  10 value 533.330133
## iter  20 value 496.552715
## iter  30 value 476.043466
## iter  40 value 462.317725
## iter  50 value 442.048597
## iter  60 value 430.564341
## iter  70 value 427.454100
## iter  80 value 427.165552
## final  value 427.165362
## converged
## # weights:  11
## initial  value 978.726972
## iter  10 value 576.012448
## iter  20 value 561.106099
## iter  30 value 553.150915
## iter  40 value 552.981646
## final  value 552.977516
```

```
## converged
## # weights:  31
## initial  value 877.994465
## iter  10 value 558.033267
## iter  20 value 535.496302
## iter  30 value 527.533730
## iter  40 value 524.820892
## iter  50 value 522.604188
## iter  60 value 522.198501
## iter  70 value 522.179368
## iter  80 value 522.177959
## final  value 522.177930
## converged
## # weights:  51
## initial  value 1536.173642
## iter  10 value 547.523293
## iter  20 value 528.698388
## iter  30 value 512.296324
## iter  40 value 506.397595
## iter  50 value 505.972158
## iter  60 value 505.898820
## iter  70 value 505.736133
## iter  80 value 504.884173
## iter  90 value 504.511073
## iter 100 value 504.294062
## final  value 504.294062
## stopped after 100 iterations
## # weights:  11
## initial  value 863.976642
## iter  10 value 568.837831
## iter  20 value 563.665870
## iter  30 value 563.498337
## iter  40 value 554.214725
## iter  50 value 549.274356
## iter  60 value 549.131759
## final  value 549.118801
## converged
## # weights:  31
## initial  value 1803.925537
## iter  10 value 546.825824
## iter  20 value 532.124288
## iter  30 value 517.898314
## iter  40 value 503.979739
## iter  50 value 499.504128
## iter  60 value 496.028925
## iter  70 value 492.185790
## iter  80 value 489.711304
## iter  90 value 486.975210
## iter 100 value 484.236148
## final  value 484.236148
## stopped after 100 iterations
## # weights:  51
## initial  value 1373.384805
## iter  10 value 543.147302
```

```
## iter  20 value 512.325770
## iter  30 value 498.611548
## iter  40 value 475.726807
## iter  50 value 461.852887
## iter  60 value 453.589901
## iter  70 value 452.126539
## iter  80 value 451.944556
## iter  90 value 451.626701
## iter 100 value 451.337580
## final  value 451.337580
## stopped after 100 iterations
## # weights:  11
## initial  value 1321.226454
## iter  10 value 628.952462
## iter  20 value 603.951766
## iter  30 value 593.678310
## iter  40 value 587.958370
## iter  50 value 585.446437
## iter  60 value 585.380988
## iter  70 value 585.284086
## final  value 585.283081
## converged
## # weights:  31
## initial  value 1381.637418
## iter  10 value 584.987896
## iter  20 value 560.193862
## iter  30 value 544.045072
## iter  40 value 541.166700
## iter  50 value 536.397539
## iter  60 value 532.534384
## iter  70 value 529.633239
## iter  80 value 526.978753
## iter  90 value 525.024078
## iter 100 value 523.898653
## final  value 523.898653
## stopped after 100 iterations
## # weights:  51
## initial  value 1212.045565
## iter  10 value 580.893518
## iter  20 value 551.392061
## iter  30 value 528.792395
## iter  40 value 509.831946
## iter  50 value 490.270764
## iter  60 value 482.008686
## iter  70 value 472.678700
## iter  80 value 461.223673
## iter  90 value 456.991111
## iter 100 value 456.890975
## final  value 456.890975
## stopped after 100 iterations
## # weights:  11
## initial  value 1444.515709
## iter  10 value 661.400795
## iter  20 value 596.963351
```

```
## iter  30 value 592.635086
## final  value 592.502788
## converged
## # weights:  31
## initial  value 873.296463
## iter  10 value 612.655382
## iter  20 value 572.963371
## iter  30 value 564.273698
## iter  40 value 561.371289
## iter  50 value 559.497120
## iter  60 value 559.021720
## iter  70 value 558.390088
## iter  80 value 557.169070
## iter  90 value 556.689497
## final  value 556.680334
## converged
## # weights:  51
## initial  value 1384.627968
## iter  10 value 584.841876
## iter  20 value 555.836946
## iter  30 value 539.255330
## iter  40 value 532.394931
## iter  50 value 530.430998
## iter  60 value 529.980286
## iter  70 value 529.506084
## iter  80 value 529.046772
## iter  90 value 528.918015
## iter 100 value 528.915239
## final  value 528.915239
## stopped after 100 iterations
## # weights:  11
## initial  value 1266.935479
## iter  10 value 612.371507
## iter  20 value 594.607876
## iter  30 value 588.398213
## iter  40 value 585.861227
## iter  50 value 585.333357
## iter  60 value 585.312468
## final  value 585.296799
## converged
## # weights:  31
## initial  value 1334.638290
## iter  10 value 618.152985
## iter  20 value 574.445582
## iter  30 value 561.056074
## iter  40 value 552.114682
## iter  50 value 540.346817
## iter  60 value 533.319746
## iter  70 value 532.763289
## iter  80 value 532.636789
## iter  90 value 532.153017
## iter 100 value 531.790478
## final  value 531.790478
## stopped after 100 iterations
```

```
## # weights:  51
## initial  value 1368.943900
## iter  10 value 596.323432
## iter  20 value 562.055682
## iter  30 value 533.878794
## iter  40 value 514.440029
## iter  50 value 505.101972
## iter  60 value 500.428252
## iter  70 value 498.101902
## iter  80 value 496.128421
## iter  90 value 495.204539
## iter 100 value 494.689464
## final  value 494.689464
## stopped after 100 iterations
## # weights:  11
## initial  value 1017.716679
## iter  10 value 598.176348
## iter  20 value 586.983777
## iter  30 value 577.305014
## iter  40 value 576.551442
## final  value 576.542163
## converged
## # weights:  31
## initial  value 900.565714
## iter  10 value 578.252689
## iter  20 value 557.890626
## iter  30 value 538.117768
## iter  40 value 530.437452
## iter  50 value 522.529847
## iter  60 value 516.707138
## iter  70 value 514.669879
## iter  80 value 514.150734
## iter  90 value 513.752379
## iter 100 value 513.585502
## final  value 513.585502
## stopped after 100 iterations
## # weights:  51
## initial  value 1134.695021
## iter  10 value 561.883432
## iter  20 value 529.473966
## iter  30 value 505.198016
## iter  40 value 494.499177
## iter  50 value 474.370272
## iter  60 value 460.115096
## iter  70 value 458.351849
## iter  80 value 458.314667
## final  value 458.314622
## converged
## # weights:  11
## initial  value 889.207532
## iter  10 value 601.370461
## iter  20 value 580.487719
## final  value 580.430113
## converged
```

```
## # weights:  31
## initial  value 1347.092442
## iter  10 value 588.617364
## iter  20 value 559.103359
## iter  30 value 551.984033
## iter  40 value 550.789801
## iter  50 value 548.824827
## iter  60 value 547.039758
## iter  70 value 546.779392
## iter  80 value 546.602809
## iter  90 value 546.543325
## final  value 546.540769
## converged
## # weights:  51
## initial  value 1080.886383
## iter  10 value 571.960042
## iter  20 value 544.989271
## iter  30 value 530.319260
## iter  40 value 525.317647
## iter  50 value 523.217128
## iter  60 value 521.447090
## iter  70 value 520.254112
## iter  80 value 520.219585
## final  value 520.219088
## converged
## # weights:  11
## initial  value 1130.608537
## iter  10 value 594.263009
## iter  20 value 577.053913
## iter  30 value 576.551989
## final  value 576.546218
## converged
## # weights:  31
## initial  value 1176.148777
## iter  10 value 573.333600
## iter  20 value 546.176105
## iter  30 value 533.088340
## iter  40 value 526.056412
## iter  50 value 512.203967
## iter  60 value 510.332728
## iter  70 value 510.181935
## iter  80 value 509.297107
## iter  90 value 506.937821
## iter 100 value 506.859023
## final  value 506.859023
## stopped after 100 iterations
## # weights:  51
## initial  value 848.104721
## iter  10 value 574.348236
## iter  20 value 536.305034
## iter  30 value 516.893597
## iter  40 value 496.398878
## iter  50 value 479.035130
## iter  60 value 471.159057
```

```
## iter  70 value 469.254005
## iter  80 value 469.000517
## iter  90 value 468.889339
## iter 100 value 468.058269
## final  value 468.058269
## stopped after 100 iterations
## # weights:  11
## initial  value 1315.772261
## iter  10 value 605.745363
## iter  20 value 593.369346
## iter  30 value 589.978541
## iter  40 value 589.575795
## iter  40 value 589.575792
## iter  40 value 589.575792
## final  value 589.575792
## converged
## # weights:  31
## initial  value 1298.643697
## iter  10 value 632.888352
## iter  20 value 574.227233
## iter  30 value 562.632496
## iter  40 value 554.605816
## iter  50 value 549.206702
## iter  60 value 544.266546
## iter  70 value 542.811644
## iter  80 value 541.743027
## iter  90 value 540.601425
## iter 100 value 539.412964
## final  value 539.412964
## stopped after 100 iterations
## # weights:  51
## initial  value 899.747966
## iter  10 value 590.748250
## iter  20 value 548.858276
## iter  30 value 527.142346
## iter  40 value 505.179236
## iter  50 value 486.451187
## iter  60 value 478.530731
## iter  70 value 474.730593
## iter  80 value 474.530313
## iter  90 value 474.257596
## iter 100 value 474.251303
## final  value 474.251303
## stopped after 100 iterations
## # weights:  11
## initial  value 1313.263190
## iter  10 value 643.271012
## iter  20 value 597.694806
## iter  30 value 594.311493
## final  value 594.123493
## converged
## # weights:  31
## initial  value 876.335370
## iter  10 value 593.262446
```

```
## iter  20 value 571.833865
## iter  30 value 566.135805
## iter  40 value 561.531031
## iter  50 value 559.074635
## iter  60 value 558.978092
## final  value 558.976757
## converged
## # weights:  51
## initial  value 1130.805792
## iter  10 value 598.325795
## iter  20 value 576.993633
## iter  30 value 567.209656
## iter  40 value 552.557993
## iter  50 value 541.277999
## iter  60 value 536.786385
## iter  70 value 534.837183
## iter  80 value 534.027596
## iter  90 value 533.933122
## iter 100 value 533.927001
## final  value 533.927001
## stopped after 100 iterations
## # weights:  11
## initial  value 819.496326
## iter  10 value 596.069858
## iter  20 value 589.950360
## iter  30 value 589.581424
## final  value 589.581074
## converged
## # weights:  31
## initial  value 881.655311
## iter  10 value 587.221462
## iter  20 value 557.107182
## iter  30 value 544.812011
## iter  40 value 535.187375
## iter  50 value 533.584996
## iter  60 value 533.291162
## iter  70 value 533.255497
## iter  80 value 533.204489
## iter  90 value 533.004215
## iter 100 value 532.900817
## final  value 532.900817
## stopped after 100 iterations
## # weights:  51
## initial  value 1990.573349
## iter  10 value 596.080147
## iter  20 value 554.775207
## iter  30 value 531.510793
## iter  40 value 521.336543
## iter  50 value 508.879323
## iter  60 value 497.068906
## iter  70 value 492.951290
## iter  80 value 491.942655
## iter  90 value 491.690697
## iter 100 value 491.297833
```

```
## final  value 491.297833
## stopped after 100 iterations
## # weights:  11
## initial  value 1350.331343
## iter  10 value 583.637722
## iter  20 value 558.612435
## iter  30 value 556.234912
## iter  40 value 546.139708
## iter  50 value 543.402496
## iter  60 value 543.056155
## final  value 543.048769
## converged
## # weights:  31
## initial  value 1124.267010
## iter  10 value 565.900797
## iter  20 value 521.204945
## iter  30 value 508.951457
## iter  40 value 496.054366
## iter  50 value 494.423966
## iter  60 value 493.146729
## iter  70 value 488.815105
## iter  80 value 486.731030
## iter  90 value 486.234152
## iter 100 value 483.749262
## final  value 483.749262
## stopped after 100 iterations
## # weights:  51
## initial  value 790.460038
## iter  10 value 513.430649
## iter  20 value 486.228378
## iter  30 value 459.641952
## iter  40 value 440.922292
## iter  50 value 428.603527
## iter  60 value 419.881712
## iter  70 value 414.085356
## iter  80 value 412.961975
## iter  90 value 412.414689
## iter 100 value 412.362067
## final  value 412.362067
## stopped after 100 iterations
## # weights:  11
## initial  value 827.945441
## iter  10 value 617.523051
## iter  20 value 564.067155
## iter  30 value 550.293868
## iter  40 value 548.562070
## final  value 548.562006
## converged
## # weights:  31
## initial  value 1665.609185
## iter  10 value 612.342595
## iter  20 value 545.560227
## iter  30 value 520.444405
## iter  40 value 515.444117
```

```
## iter  50 value 508.181508
## iter  60 value 507.327303
## iter  70 value 507.240393
## iter  80 value 507.182364
## iter  90 value 507.177665
## final  value 507.177442
## converged
## # weights:  51
## initial  value 1301.940382
## iter  10 value 553.571721
## iter  20 value 519.527059
## iter  30 value 499.181089
## iter  40 value 493.804349
## iter  50 value 493.194329
## iter  60 value 492.549961
## iter  70 value 492.065114
## iter  80 value 490.095129
## iter  90 value 487.648229
## iter 100 value 486.803096
## final  value 486.803096
## stopped after 100 iterations
## # weights:  11
## initial  value 948.023353
## iter  10 value 587.928670
## iter  20 value 551.861511
## iter  30 value 546.118916
## iter  40 value 543.156560
## final  value 543.055484
## converged
## # weights:  31
## initial  value 1193.976440
## iter  10 value 557.314327
## iter  20 value 519.739736
## iter  30 value 512.620538
## iter  40 value 510.138089
## iter  50 value 509.675107
## iter  60 value 508.687822
## iter  70 value 508.374038
## iter  80 value 507.730626
## iter  90 value 506.634130
## iter 100 value 506.486145
## final  value 506.486145
## stopped after 100 iterations
## # weights:  51
## initial  value 848.907880
## iter  10 value 532.950833
## iter  20 value 497.206754
## iter  30 value 475.426374
## iter  40 value 461.454935
## iter  50 value 450.033040
## iter  60 value 439.458071
## iter  70 value 436.822465
## iter  80 value 436.411059
## iter  90 value 436.222432
```

```
## iter 100 value 435.601386
## final  value 435.601386
## stopped after 100 iterations
## # weights:  11
## initial  value 906.734019
## iter  10 value 565.460910
## iter  20 value 561.143318
## iter  30 value 561.134017
## final  value 561.134010
## converged
## # weights:  31
## initial  value 1035.038500
## iter  10 value 567.952827
## iter  20 value 533.402336
## iter  30 value 522.271277
## iter  40 value 518.617010
## iter  50 value 513.665690
## iter  60 value 506.598539
## iter  70 value 503.270472
## iter  80 value 502.258819
## iter  90 value 500.447418
## iter 100 value 499.868899
## final  value 499.868899
## stopped after 100 iterations
## # weights:  51
## initial  value 1480.953187
## iter  10 value 563.422111
## iter  20 value 527.879135
## iter  30 value 510.807367
## iter  40 value 488.488244
## iter  50 value 478.595716
## iter  60 value 463.044952
## iter  70 value 450.216092
## iter  80 value 442.848309
## iter  90 value 439.111531
## iter 100 value 438.458955
## final  value 438.458955
## stopped after 100 iterations
## # weights:  11
## initial  value 996.157232
## iter  10 value 639.101296
## iter  20 value 572.818698
## iter  30 value 566.209727
## final  value 565.958250
## converged
## # weights:  31
## initial  value 1010.638125
## iter  10 value 657.640321
## iter  20 value 607.422147
## iter  30 value 558.853724
## iter  40 value 547.933674
## iter  50 value 545.018285
## iter  60 value 542.153592
## iter  70 value 541.998686
```

```
## iter  80 value 541.691216
## iter  90 value 541.619750
## final  value 541.619017
## converged
## # weights:  51
## initial  value 1032.833214
## iter  10 value 569.489613
## iter  20 value 543.399148
## iter  30 value 527.770013
## iter  40 value 523.133495
## iter  50 value 516.523334
## iter  60 value 511.794760
## iter  70 value 509.924062
## iter  80 value 509.619309
## iter  90 value 509.599903
## final  value 509.599697
## converged
## # weights:  11
## initial  value 876.257320
## iter  10 value 616.486516
## iter  20 value 584.218850
## iter  30 value 581.315823
## iter  40 value 580.529892
## iter  50 value 577.305171
## iter  60 value 577.151993
## iter  70 value 577.027675
## iter  80 value 576.993479
## iter  90 value 576.983179
## iter 100 value 576.970024
## final  value 576.970024
## stopped after 100 iterations
## # weights:  31
## initial  value 872.710873
## iter  10 value 558.150159
## iter  20 value 542.794763
## iter  30 value 537.340093
## iter  40 value 527.565309
## iter  50 value 521.408965
## iter  60 value 521.122352
## iter  70 value 520.066664
## iter  80 value 519.150833
## iter  90 value 518.617372
## iter 100 value 518.485580
## final  value 518.485580
## stopped after 100 iterations
## # weights:  51
## initial  value 816.870085
## iter  10 value 554.294723
## iter  20 value 528.522336
## iter  30 value 505.302595
## iter  40 value 487.981657
## iter  50 value 478.217218
## iter  60 value 468.522265
## iter  70 value 458.512078
```

```
## iter  80 value 452.099871
## iter  90 value 450.397591
## iter 100 value 449.903667
## final  value 449.903667
## stopped after 100 iterations
## # weights:  11
## initial  value 1218.556013
## iter  10 value 659.483203
## iter  20 value 592.621325
## iter  30 value 570.079677
## iter  40 value 567.358185
## iter  50 value 566.229862
## final  value 566.229487
## converged
## # weights:  31
## initial  value 824.348446
## iter  10 value 598.776316
## iter  20 value 540.339753
## iter  30 value 524.759396
## iter  40 value 522.446481
## iter  50 value 520.550537
## iter  60 value 517.702835
## iter  70 value 516.736079
## iter  80 value 516.297262
## iter  90 value 513.724604
## iter 100 value 510.211896
## final  value 510.211896
## stopped after 100 iterations
## # weights:  51
## initial  value 826.227530
## iter  10 value 569.215501
## iter  20 value 526.274972
## iter  30 value 503.875647
## iter  40 value 491.137452
## iter  50 value 471.146656
## iter  60 value 455.451900
## iter  70 value 452.457614
## iter  80 value 452.094189
## iter  90 value 452.076738
## final  value 452.076469
## converged
## # weights:  11
## initial  value 1069.319422
## iter  10 value 616.333550
## iter  20 value 586.551159
## iter  30 value 573.405717
## iter  40 value 572.068514
## final  value 572.068488
## converged
## # weights:  31
## initial  value 967.340704
## iter  10 value 596.159400
## iter  20 value 549.084578
## iter  30 value 538.905990
```

```
## iter  40 value 536.009403
## iter  50 value 534.870849
## iter  60 value 534.626286
## iter  70 value 534.621601
## iter  80 value 534.619387
## final  value 534.619262
## converged
## # weights:  51
## initial  value 874.812258
## iter  10 value 571.520406
## iter  20 value 532.837623
## iter  30 value 518.759395
## iter  40 value 514.722717
## iter  50 value 513.560107
## iter  60 value 512.699909
## iter  70 value 508.180390
## iter  80 value 506.122736
## iter  90 value 505.222345
## iter 100 value 504.980005
## final  value 504.980005
## stopped after 100 iterations
## # weights:  11
## initial  value 1401.135453
## iter  10 value 621.715865
## iter  20 value 610.280583
## iter  30 value 586.012097
## iter  40 value 568.309384
## iter  50 value 566.553993
## iter  60 value 566.235550
## iter  60 value 566.235547
## iter  60 value 566.235546
## final  value 566.235546
## converged
## # weights:  31
## initial  value 994.336960
## iter  10 value 576.787245
## iter  20 value 541.575579
## iter  30 value 525.012477
## iter  40 value 514.746946
## iter  50 value 512.677695
## iter  60 value 505.251113
## iter  70 value 502.348976
## iter  80 value 501.755885
## iter  90 value 501.328268
## iter 100 value 499.269827
## final  value 499.269827
## stopped after 100 iterations
## # weights:  51
## initial  value 1197.583844
## iter  10 value 584.764602
## iter  20 value 531.038165
## iter  30 value 503.787195
## iter  40 value 482.366219
## iter  50 value 473.561238
```

```
## iter  60 value 463.818469
## iter  70 value 450.823919
## iter  80 value 448.218830
## iter  90 value 447.344037
## iter 100 value 446.960932
## final  value 446.960932
## stopped after 100 iterations
## # weights:  11
## initial  value 841.335379
## iter  10 value 560.620411
## iter  20 value 544.828472
## iter  30 value 538.557337
## iter  40 value 532.275286
## iter  50 value 531.787421
## final  value 531.730204
## converged
## # weights:  31
## initial  value 836.289063
## iter  10 value 536.044413
## iter  20 value 513.026549
## iter  30 value 495.541745
## iter  40 value 491.249503
## iter  50 value 482.325826
## iter  60 value 472.079703
## iter  70 value 469.181554
## iter  80 value 468.267562
## iter  90 value 467.421528
## iter 100 value 466.605300
## final  value 466.605300
## stopped after 100 iterations
## # weights:  51
## initial  value 891.398528
## iter  10 value 527.963636
## iter  20 value 490.714093
## iter  30 value 465.699310
## iter  40 value 453.655701
## iter  50 value 445.085751
## iter  60 value 430.481184
## iter  70 value 425.550477
## iter  80 value 422.125636
## iter  90 value 416.955370
## iter 100 value 413.965897
## final  value 413.965897
## stopped after 100 iterations
## # weights:  11
## initial  value 896.603420
## iter  10 value 557.355105
## iter  20 value 537.205696
## iter  30 value 536.101049
## final  value 536.050910
## converged
## # weights:  31
## initial  value 1388.045639
## iter  10 value 591.736761
```

```
## iter  20 value 524.790022
## iter  30 value 509.630273
## iter  40 value 505.139704
## iter  50 value 504.935710
## iter  60 value 504.875798
## iter  70 value 504.867604
## iter  80 value 504.865169
## final  value 504.865123
## converged
## # weights:  51
## initial  value 727.221197
## iter  10 value 531.589147
## iter  20 value 508.429349
## iter  30 value 493.083957
## iter  40 value 486.816810
## iter  50 value 482.760247
## iter  60 value 479.590428
## iter  70 value 477.798408
## iter  80 value 477.717980
## iter  90 value 477.345877
## iter 100 value 476.888108
## final  value 476.888108
## stopped after 100 iterations
## # weights:  11
## initial  value 1411.182134
## iter  10 value 587.851975
## iter  20 value 556.795834
## iter  30 value 553.534555
## iter  40 value 552.767677
## iter  50 value 548.221962
## iter  60 value 541.753284
## iter  70 value 539.094087
## iter  80 value 532.543330
## iter  90 value 531.795173
## final  value 531.736087
## converged
## # weights:  31
## initial  value 1220.651735
## iter  10 value 537.466970
## iter  20 value 515.666811
## iter  30 value 504.049634
## iter  40 value 494.420531
## iter  50 value 489.655711
## iter  60 value 487.981690
## iter  70 value 487.172240
## iter  80 value 486.636153
## iter  90 value 485.974064
## iter 100 value 485.141542
## final  value 485.141542
## stopped after 100 iterations
## # weights:  51
## initial  value 968.852600
## iter  10 value 529.243555
## iter  20 value 491.522711
```

```
## iter  30 value 459.032277
## iter  40 value 443.879596
## iter  50 value 425.505615
## iter  60 value 418.100117
## iter  70 value 416.904522
## iter  80 value 416.683948
## iter  90 value 416.329071
## iter 100 value 416.249245
## final  value 416.249245
## stopped after 100 iterations
## # weights:  11
## initial  value 1019.546794
## iter  10 value 602.426774
## iter  20 value 531.873008
## iter  30 value 529.922846
## final  value 529.874301
## converged
## # weights:  31
## initial  value 1086.974854
## iter  10 value 523.547533
## iter  20 value 488.497504
## iter  30 value 480.217363
## iter  40 value 471.385565
## iter  50 value 462.429294
## iter  60 value 454.185300
## iter  70 value 452.628842
## iter  80 value 451.741760
## iter  90 value 451.428258
## iter 100 value 450.715928
## final  value 450.715928
## stopped after 100 iterations
## # weights:  51
## initial  value 1477.108229
## iter  10 value 522.759083
## iter  20 value 488.544080
## iter  30 value 478.354460
## iter  40 value 467.994884
## iter  50 value 436.276907
## iter  60 value 421.206274
## iter  70 value 420.284243
## iter  80 value 420.278652
## final  value 420.278644
## converged
## # weights:  11
## initial  value 1220.780876
## iter  10 value 556.534261
## iter  20 value 537.431714
## iter  30 value 534.885557
## final  value 534.723452
## converged
## # weights:  31
## initial  value 860.447011
## iter  10 value 554.356972
## iter  20 value 528.572822
```

```
## iter  30 value 521.109559
## iter  40 value 515.990883
## iter  50 value 510.306784
## iter  60 value 508.743294
## iter  70 value 508.687746
## final  value 508.687654
## converged
## # weights:  51
## initial  value 808.041251
## iter  10 value 529.907226
## iter  20 value 510.202427
## iter  30 value 499.344089
## iter  40 value 493.345936
## iter  50 value 491.841683
## iter  60 value 491.508739
## iter  70 value 491.097009
## iter  80 value 491.092485
## iter  80 value 491.092483
## iter  80 value 491.092483
## final  value 491.092483
## converged
## # weights:  11
## initial  value 860.843914
## iter  10 value 548.288101
## iter  20 value 530.355673
## iter  30 value 529.880334
## iter  40 value 529.879620
## iter  40 value 529.879620
## iter  40 value 529.879620
## final  value 529.879620
## converged
## # weights:  31
## initial  value 804.690932
## iter  10 value 536.782054
## iter  20 value 505.490237
## iter  30 value 488.660870
## iter  40 value 482.677418
## iter  50 value 473.613272
## iter  60 value 472.400158
## iter  70 value 471.232037
## iter  80 value 470.706887
## iter  90 value 469.816889
## iter 100 value 467.812564
## final  value 467.812564
## stopped after 100 iterations
## # weights:  51
## initial  value 843.258072
## iter  10 value 517.987525
## iter  20 value 494.711384
## iter  30 value 477.446012
## iter  40 value 460.188134
## iter  50 value 451.278664
## iter  60 value 442.004746
## iter  70 value 427.587545
```

```
## iter  80 value 423.580804
## iter  90 value 422.794519
## iter 100 value 422.558151
## final  value 422.558151
## stopped after 100 iterations
## # weights:  11
## initial  value 1520.950169
## iter  10 value 759.523203
## iter  20 value 638.655995
## iter  30 value 616.365293
## iter  40 value 608.526275
## iter  50 value 585.815752
## iter  60 value 584.210389
## final  value 584.164214
## converged
## # weights:  31
## initial  value 1123.070828
## iter  10 value 579.996688
## iter  20 value 560.213064
## iter  30 value 546.715042
## iter  40 value 524.365128
## iter  50 value 511.476873
## iter  60 value 509.826297
## iter  70 value 509.107324
## iter  80 value 508.535998
## iter  90 value 507.659169
## iter 100 value 507.519467
## final  value 507.519467
## stopped after 100 iterations
## # weights:  51
## initial  value 935.709623
## iter  10 value 576.114006
## iter  20 value 529.571993
## iter  30 value 504.887452
## iter  40 value 493.426548
## iter  50 value 468.426040
## iter  60 value 459.802941
## iter  70 value 458.279497
## iter  80 value 457.910062
## iter  90 value 457.826675
## iter 100 value 457.780963
## final  value 457.780963
## stopped after 100 iterations
## # weights:  11
## initial  value 955.089740
## iter  10 value 645.273612
## iter  20 value 599.826230
## iter  30 value 588.942580
## iter  40 value 588.204213
## final  value 588.204194
## converged
## # weights:  31
## initial  value 1029.967028
## iter  10 value 597.138554
```

```
## iter  20 value 570.160273
## iter  30 value 562.838109
## iter  40 value 560.674353
## iter  50 value 557.226452
## iter  60 value 548.783282
## iter  70 value 548.442747
## iter  80 value 548.385381
## final  value 548.383299
## converged
## # weights:  51
## initial  value 1429.365652
## iter  10 value 585.469430
## iter  20 value 551.827596
## iter  30 value 537.649490
## iter  40 value 530.602448
## iter  50 value 526.739050
## iter  60 value 525.891386
## iter  70 value 525.543790
## iter  80 value 525.308646
## iter  90 value 525.296353
## final  value 525.296125
## converged
## # weights:  11
## initial  value 887.032510
## iter  10 value 590.688849
## iter  20 value 584.185134
## final  value 584.168599
## converged
## # weights:  31
## initial  value 847.239496
## iter  10 value 621.138531
## iter  20 value 582.291793
## iter  30 value 572.114125
## iter  40 value 564.763337
## iter  50 value 558.777190
## iter  60 value 557.684560
## iter  70 value 556.875701
## iter  80 value 556.145785
## iter  90 value 555.620981
## iter 100 value 555.309013
## final  value 555.309013
## stopped after 100 iterations
## # weights:  51
## initial  value 873.263244
## iter  10 value 572.009628
## iter  20 value 527.542584
## iter  30 value 506.426039
## iter  40 value 496.274040
## iter  50 value 482.173981
## iter  60 value 469.776547
## iter  70 value 467.435530
## iter  80 value 466.908353
## iter  90 value 466.720009
## iter 100 value 466.562651
```

```
## final  value 466.562651
## stopped after 100 iterations
## # weights:  11
## initial  value 1058.562738
## iter  10 value 593.438759
## iter  20 value 576.654374
## iter  30 value 573.403673
## iter  40 value 573.205415
## final  value 573.179827
## converged
## # weights:  31
## initial  value 860.481341
## iter  10 value 571.226822
## iter  20 value 547.401554
## iter  30 value 527.529384
## iter  40 value 511.977232
## iter  50 value 503.618960
## iter  60 value 499.268449
## iter  70 value 496.251347
## iter  80 value 495.076834
## iter  90 value 494.781746
## iter 100 value 494.733085
## final  value 494.733085
## stopped after 100 iterations
## # weights:  51
## initial  value 1212.713637
## iter  10 value 571.835308
## iter  20 value 530.413940
## iter  30 value 510.567999
## iter  40 value 490.132787
## iter  50 value 472.484927
## iter  60 value 458.267923
## iter  70 value 456.215162
## iter  80 value 455.701875
## iter  90 value 455.573718
## final  value 455.573419
## converged
## # weights:  11
## initial  value 1223.105616
## iter  10 value 610.578032
## iter  20 value 601.022901
## iter  30 value 581.558273
## iter  40 value 577.897145
## iter  50 value 577.839296
## final  value 577.836794
## converged
## # weights:  31
## initial  value 1449.942195
## iter  10 value 581.429742
## iter  20 value 558.399346
## iter  30 value 551.337936
## iter  40 value 548.547719
## iter  50 value 548.372093
## final  value 548.370620
```

```
## converged
## # weights:  51
## initial  value 1178.187606
## iter  10 value 579.961430
## iter  20 value 556.649800
## iter  30 value 541.530059
## iter  40 value 535.656776
## iter  50 value 532.818504
## iter  60 value 529.694413
## iter  70 value 528.023684
## iter  80 value 526.525948
## iter  90 value 515.211033
## iter 100 value 508.542339
## final  value 508.542339
## stopped after 100 iterations
## # weights:  11
## initial  value 1143.646203
## iter  10 value 580.788341
## iter  20 value 573.803166
## iter  30 value 573.393959
## iter  40 value 573.186042
## final  value 573.185614
## converged
## # weights:  31
## initial  value 874.750005
## iter  10 value 602.373771
## iter  20 value 565.114748
## iter  30 value 548.093492
## iter  40 value 538.683237
## iter  50 value 531.437518
## iter  60 value 520.668191
## iter  70 value 520.135620
## iter  80 value 519.883907
## iter  90 value 519.810595
## iter 100 value 519.728825
## final  value 519.728825
## stopped after 100 iterations
## # weights:  51
## initial  value 1120.865926
## iter  10 value 568.421695
## iter  20 value 529.724964
## iter  30 value 495.231830
## iter  40 value 477.403252
## iter  50 value 467.024784
## iter  60 value 457.176948
## iter  70 value 455.248586
## iter  80 value 454.218370
## iter  90 value 454.104999
## iter 100 value 453.968629
## final  value 453.968629
## stopped after 100 iterations
## # weights:  11
## initial  value 917.818366
## iter  10 value 583.209798
```

```
## iter  20 value 569.090416
## iter  30 value 568.035979
## iter  40 value 567.783610
## final  value 567.783495
## converged
## # weights:  31
## initial  value 838.093189
## iter  10 value 561.469231
## iter  20 value 541.499307
## iter  30 value 531.171395
## iter  40 value 520.269462
## iter  50 value 510.222769
## iter  60 value 506.688333
## iter  70 value 506.386045
## iter  80 value 505.883210
## iter  90 value 503.305527
## iter 100 value 502.783385
## final  value 502.783385
## stopped after 100 iterations
## # weights:  51
## initial  value 1004.085866
## iter  10 value 562.403139
## iter  20 value 521.698757
## iter  30 value 507.521999
## iter  40 value 496.143095
## iter  50 value 470.586682
## iter  60 value 451.853716
## iter  70 value 446.305672
## iter  80 value 445.800033
## iter  90 value 445.798727
## iter  90 value 445.798727
## final  value 445.798727
## converged
## # weights:  11
## initial  value 1368.498553
## iter  10 value 709.714614
## iter  20 value 606.088895
## iter  30 value 578.348254
## iter  40 value 573.278407
## iter  50 value 573.036768
## final  value 573.036245
## converged
## # weights:  31
## initial  value 1013.690151
## iter  10 value 585.642977
## iter  20 value 559.437318
## iter  30 value 551.051863
## iter  40 value 546.847139
## iter  50 value 545.504177
## iter  60 value 544.129782
## iter  70 value 542.632763
## iter  80 value 539.595261
## iter  90 value 536.063867
## iter 100 value 535.635663
```

```
## final  value 535.635663
## stopped after 100 iterations
## # weights:  51
## initial  value 1069.748556
## iter  10 value 562.643168
## iter  20 value 543.983642
## iter  30 value 527.066699
## iter  40 value 519.657938
## iter  50 value 516.971320
## iter  60 value 515.918637
## iter  70 value 515.590190
## iter  80 value 515.525732
## iter  90 value 515.507274
## iter 100 value 515.505773
## final  value 515.505773
## stopped after 100 iterations
## # weights:  11
## initial  value 1079.154100
## iter  10 value 579.923431
## iter  20 value 567.877195
## iter  30 value 567.796770
## final  value 567.787609
## converged
## # weights:  31
## initial  value 1149.497535
## iter  10 value 566.488361
## iter  20 value 535.428425
## iter  30 value 528.619493
## iter  40 value 524.607252
## iter  50 value 518.269838
## iter  60 value 512.764632
## iter  70 value 510.930162
## iter  80 value 508.220033
## iter  90 value 506.978815
## iter 100 value 504.100835
## final  value 504.100835
## stopped after 100 iterations
## # weights:  51
## initial  value 1418.084036
## iter  10 value 556.361250
## iter  20 value 518.426006
## iter  30 value 501.020422
## iter  40 value 492.023604
## iter  50 value 476.529303
## iter  60 value 467.284407
## iter  70 value 465.059074
## iter  80 value 464.849139
## iter  90 value 464.535799
## iter 100 value 463.610936
## final  value 463.610936
## stopped after 100 iterations
## # weights:  11
## initial  value 987.164002
## iter  10 value 574.148204
```

```
## iter  20 value 558.750242
## iter  30 value 556.598117
## iter  40 value 556.170508
## final  value 556.170498
## converged
## # weights:  31
## initial  value 795.788981
## iter  10 value 546.320703
## iter  20 value 528.400006
## iter  30 value 520.322327
## iter  40 value 512.144585
## iter  50 value 508.609212
## iter  60 value 500.675440
## iter  70 value 499.937133
## iter  80 value 499.107176
## iter  90 value 498.449379
## iter 100 value 498.129102
## final  value 498.129102
## stopped after 100 iterations
## # weights:  51
## initial  value 1046.053713
## iter  10 value 562.030633
## iter  20 value 517.808901
## iter  30 value 488.056049
## iter  40 value 475.017693
## iter  50 value 459.425623
## iter  60 value 441.000925
## iter  70 value 428.807443
## iter  80 value 423.765326
## iter  90 value 423.737162
## final  value 423.736014
## converged
## # weights:  11
## initial  value 946.835136
## iter  10 value 695.773177
## iter  20 value 574.757388
## iter  30 value 563.402159
## final  value 561.842332
## converged
## # weights:  31
## initial  value 896.835096
## iter  10 value 574.568747
## iter  20 value 542.294850
## iter  30 value 529.625741
## iter  40 value 527.977053
## iter  50 value 527.897867
## iter  60 value 527.650169
## iter  70 value 525.201552
## iter  80 value 523.997515
## iter  90 value 521.768495
## iter 100 value 519.943896
## final  value 519.943896
## stopped after 100 iterations
## # weights:  51
```

```
## initial  value 1254.393141
## iter  10 value 568.880253
## iter  20 value 540.685953
## iter  30 value 528.030150
## iter  40 value 519.696799
## iter  50 value 515.890456
## iter  60 value 514.382059
## iter  70 value 510.706453
## iter  80 value 498.131390
## iter  90 value 495.387217
## iter 100 value 494.388767
## final  value 494.388767
## stopped after 100 iterations
## # weights:  11
## initial  value 1083.125990
## iter  10 value 578.284069
## iter  20 value 556.572859
## iter  30 value 556.180065
## iter  40 value 556.176773
## iter  40 value 556.176769
## final  value 556.176538
## converged
## # weights:  31
## initial  value 1249.807794
## iter  10 value 554.221809
## iter  20 value 525.582592
## iter  30 value 510.476571
## iter  40 value 497.148387
## iter  50 value 493.888034
## iter  60 value 491.980189
## iter  70 value 491.497224
## iter  80 value 491.414827
## iter  90 value 491.262129
## iter 100 value 490.973416
## final  value 490.973416
## stopped after 100 iterations
## # weights:  51
## initial  value 1086.003484
## iter  10 value 541.680161
## iter  20 value 511.938768
## iter  30 value 492.978202
## iter  40 value 478.378543
## iter  50 value 471.447840
## iter  60 value 453.567228
## iter  70 value 448.704898
## iter  80 value 446.021927
## iter  90 value 444.923171
## iter 100 value 444.526502
## final  value 444.526502
## stopped after 100 iterations
## # weights:  11
## initial  value 1050.392134
## iter  10 value 595.831480
## iter  20 value 579.765116
```

```
## iter  30 value 579.153054
## iter  40 value 577.637641
## iter  50 value 577.077912
## iter  60 value 577.067197
## final  value 577.067039
## converged
## # weights:  31
## initial  value 1104.771111
## iter  10 value 581.048055
## iter  20 value 554.543240
## iter  30 value 538.312968
## iter  40 value 532.819783
## iter  50 value 523.950545
## iter  60 value 515.797125
## iter  70 value 515.160305
## iter  80 value 515.072204
## iter  90 value 515.040910
## iter 100 value 513.397433
## final  value 513.397433
## stopped after 100 iterations
## # weights:  51
## initial  value 925.768538
## iter  10 value 573.983372
## iter  20 value 537.604837
## iter  30 value 512.731763
## iter  40 value 495.136366
## iter  50 value 485.176037
## iter  60 value 474.887826
## iter  70 value 460.746581
## iter  80 value 458.879766
## iter  90 value 458.831099
## final  value 458.830425
## converged
## # weights:  11
## initial  value 1027.252527
## iter  10 value 588.521670
## iter  20 value 581.297706
## iter  30 value 581.138264
## final  value 581.134671
## converged
## # weights:  31
## initial  value 1392.974053
## iter  10 value 586.997645
## iter  20 value 569.860163
## iter  30 value 560.337933
## iter  40 value 558.329549
## iter  50 value 557.291768
## iter  60 value 557.235448
## final  value 557.235302
## converged
## # weights:  51
## initial  value 1249.907994
## iter  10 value 593.898008
## iter  20 value 561.690931
```

```
## iter  30 value 545.419122
## iter  40 value 535.091868
## iter  50 value 527.750390
## iter  60 value 525.123882
## iter  70 value 524.001814
## iter  80 value 523.574924
## iter  90 value 523.552186
## iter 100 value 523.551482
## final  value 523.551482
## stopped after 100 iterations
## # weights:  11
## initial  value 1360.904291
## iter  10 value 589.269674
## iter  20 value 577.281905
## iter  30 value 577.072335
## final  value 577.072278
## converged
## # weights:  31
## initial  value 866.340482
## iter  10 value 600.755869
## iter  20 value 545.070307
## iter  30 value 541.489140
## iter  40 value 537.228428
## iter  50 value 527.492294
## iter  60 value 524.062296
## iter  70 value 523.902964
## iter  80 value 523.581519
## iter  90 value 523.442751
## iter 100 value 523.211675
## final  value 523.211675
## stopped after 100 iterations
## # weights:  51
## initial  value 770.668605
## iter  10 value 560.115590
## iter  20 value 530.954949
## iter  30 value 512.553856
## iter  40 value 494.260589
## iter  50 value 482.834943
## iter  60 value 481.956578
## iter  70 value 481.784551
## iter  80 value 481.563795
## iter  90 value 481.414458
## iter 100 value 481.213597
## final  value 481.213597
## stopped after 100 iterations
## # weights:  11
## initial  value 840.665790
## iter  10 value 637.771767
## iter  20 value 618.900509
## iter  30 value 618.830633
## final  value 618.828958
## converged
## # weights:  31
## initial  value 1320.127964
```

```
## iter  10 value 608.724934
## iter  20 value 587.160389
## iter  30 value 579.112273
## iter  40 value 570.398799
## iter  50 value 556.630820
## iter  60 value 547.765836
## iter  70 value 545.920045
## iter  80 value 545.396978
## iter  90 value 543.880212
## iter 100 value 543.856597
## final  value 543.856597
## stopped after 100 iterations
## # weights:  51
## initial  value 1420.188660
## iter  10 value 608.706865
## iter  20 value 571.413158
## iter  30 value 540.812365
## iter  40 value 527.408859
## iter  50 value 507.846316
## iter  60 value 486.484971
## iter  70 value 479.832244
## iter  80 value 479.764902
## iter  90 value 479.757737
## iter 100 value 479.738069
## final  value 479.738069
## stopped after 100 iterations
## # weights:  11
## initial  value 1048.337689
## iter  10 value 706.450222
## iter  20 value 690.606171
## iter  30 value 636.998738
## iter  40 value 624.900154
## iter  50 value 624.782010
## final  value 624.779435
## converged
## # weights:  31
## initial  value 1061.298305
## iter  10 value 634.779665
## iter  20 value 592.292434
## iter  30 value 587.026837
## iter  40 value 584.903092
## iter  50 value 584.520395
## iter  60 value 583.601487
## iter  70 value 583.145195
## iter  80 value 582.991915
## iter  90 value 582.987258
## final  value 582.987236
## converged
## # weights:  51
## initial  value 1574.273830
## iter  10 value 608.343920
## iter  20 value 585.462769
## iter  30 value 562.671698
## iter  40 value 554.031520
```

```
## iter  50 value 547.311641
## iter  60 value 544.305896
## iter  70 value 542.770009
## iter  80 value 542.147837
## iter  90 value 541.011200
## iter 100 value 540.926650
## final  value 540.926650
## stopped after 100 iterations
## # weights:  11
## initial  value 1049.505672
## iter  10 value 659.734444
## iter  20 value 644.813921
## iter  30 value 623.870630
## iter  40 value 619.657307
## iter  50 value 618.837071
## iter  50 value 618.837065
## iter  50 value 618.837065
## final  value 618.837065
## converged
## # weights:  31
## initial  value 976.937560
## iter  10 value 640.199264
## iter  20 value 605.053856
## iter  30 value 588.672492
## iter  40 value 578.669693
## iter  50 value 574.080469
## iter  60 value 572.933666
## iter  70 value 571.967273
## iter  80 value 571.229700
## iter  90 value 569.944088
## iter 100 value 569.637995
## final  value 569.637995
## stopped after 100 iterations
## # weights:  51
## initial  value 1018.636413
## iter  10 value 597.171585
## iter  20 value 547.562153
## iter  30 value 528.305740
## iter  40 value 516.808108
## iter  50 value 500.589468
## iter  60 value 496.134861
## iter  70 value 495.143762
## iter  80 value 494.791563
## iter  90 value 494.753422
## iter 100 value 494.614915
## final  value 494.614915
## stopped after 100 iterations
## # weights:  11
## initial  value 1171.459688
## iter  10 value 629.239550
## iter  20 value 594.091836
## iter  30 value 580.862468
## iter  40 value 580.251144
## iter  40 value 580.251138
```

```
## iter  40 value 580.251138
## final  value 580.251138
## converged
## # weights:  31
## initial  value 1547.735722
## iter  10 value 579.171649
## iter  20 value 541.005753
## iter  30 value 527.305492
## iter  40 value 519.712484
## iter  50 value 515.813109
## iter  60 value 511.458840
## iter  70 value 507.442073
## iter  80 value 506.927456
## iter  90 value 506.817323
## iter 100 value 506.713600
## final  value 506.713600
## stopped after 100 iterations
## # weights:  51
## initial  value 1148.277365
## iter  10 value 570.998407
## iter  20 value 519.824468
## iter  30 value 496.605512
## iter  40 value 492.135853
## iter  50 value 487.552039
## iter  60 value 478.722617
## iter  70 value 460.487808
## iter  80 value 454.917551
## iter  90 value 453.859591
## iter 100 value 453.836028
## final  value 453.836028
## stopped after 100 iterations
## # weights:  11
## initial  value 969.553087
## iter  10 value 629.018174
## iter  20 value 586.688494
## iter  30 value 583.735999
## final  value 583.613169
## converged
## # weights:  31
## initial  value 790.468217
## iter  10 value 587.430143
## iter  20 value 560.124094
## iter  30 value 550.201591
## iter  40 value 547.101204
## iter  50 value 545.526589
## iter  60 value 545.344927
## iter  70 value 545.319828
## final  value 545.319789
## converged
## # weights:  51
## initial  value 1584.143243
## iter  10 value 569.692756
## iter  20 value 539.307895
## iter  30 value 527.886345
```

```
## iter  40 value 526.509048
## iter  50 value 524.898419
## iter  60 value 523.119657
## iter  70 value 522.666870
## iter  80 value 522.295995
## iter  90 value 521.996094
## iter 100 value 521.763891
## final  value 521.763891
## stopped after 100 iterations
## # weights:  11
## initial  value 1132.122100
## iter  10 value 591.277958
## iter  20 value 583.206687
## iter  30 value 580.711924
## iter  40 value 580.260912
## final  value 580.254459
## converged
## # weights:  31
## initial  value 831.708907
## iter  10 value 571.279537
## iter  20 value 550.916863
## iter  30 value 542.452472
## iter  40 value 531.987155
## iter  50 value 525.401156
## iter  60 value 516.946798
## iter  70 value 507.712102
## iter  80 value 505.382825
## iter  90 value 504.091975
## iter 100 value 503.532399
## final  value 503.532399
## stopped after 100 iterations
## # weights:  51
## initial  value 866.770623
## iter  10 value 582.992287
## iter  20 value 548.916162
## iter  30 value 530.702727
## iter  40 value 524.513225
## iter  50 value 519.055554
## iter  60 value 510.322718
## iter  70 value 503.102110
## iter  80 value 499.573675
## iter  90 value 497.842204
## iter 100 value 495.760145
## final  value 495.760145
## stopped after 100 iterations
## # weights:  11
## initial  value 1405.034404
## iter  10 value 629.705941
## iter  20 value 591.841981
## iter  30 value 587.149647
## iter  40 value 583.513143
## iter  50 value 582.775769
## iter  60 value 582.760842
## final  value 582.760779
```

```
## converged
## # weights:  31
## initial  value 869.742359
## iter  10 value 579.155622
## iter  20 value 545.937823
## iter  30 value 537.626459
## iter  40 value 519.764653
## iter  50 value 507.672269
## iter  60 value 503.736448
## final  value 503.726638
## converged
## # weights:  51
## initial  value 1115.208163
## iter  10 value 577.006086
## iter  20 value 533.811503
## iter  30 value 504.978888
## iter  40 value 493.174400
## iter  50 value 469.619568
## iter  60 value 458.547592
## iter  70 value 458.326833
## iter  80 value 458.287834
## iter  90 value 458.283758
## iter  90 value 458.283755
## iter  90 value 458.283755
## final  value 458.283755
## converged
## # weights:  11
## initial  value 854.950060
## iter  10 value 625.075508
## iter  20 value 589.389749
## iter  30 value 588.467785
## final  value 588.395847
## converged
## # weights:  31
## initial  value 1101.655161
## iter  10 value 601.724617
## iter  20 value 580.131955
## iter  30 value 564.909533
## iter  40 value 561.187222
## iter  50 value 560.118917
## iter  60 value 560.033684
## final  value 560.032949
## converged
## # weights:  51
## initial  value 1477.112234
## iter  10 value 592.232778
## iter  20 value 567.627636
## iter  30 value 540.859353
## iter  40 value 531.644685
## iter  50 value 529.114219
## iter  60 value 527.788800
## iter  70 value 527.083899
## iter  80 value 525.453777
## iter  90 value 523.581606
```

```
## iter 100 value 522.851020
## final  value 522.851020
## stopped after 100 iterations
## # weights:  11
## initial  value 1105.907481
## iter  10 value 604.497962
## iter  20 value 589.541584
## iter  30 value 583.259561
## iter  40 value 582.780866
## final  value 582.765060
## converged
## # weights:  31
## initial  value 1548.595806
## iter  10 value 587.362228
## iter  20 value 561.997159
## iter  30 value 548.095679
## iter  40 value 537.210983
## iter  50 value 522.602008
## iter  60 value 519.197079
## iter  70 value 518.708217
## iter  80 value 518.089723
## iter  90 value 517.237964
## iter 100 value 516.619300
## final  value 516.619300
## stopped after 100 iterations
## # weights:  51
## initial  value 1218.906544
## iter  10 value 593.001916
## iter  20 value 535.441543
## iter  30 value 492.588743
## iter  40 value 479.374579
## iter  50 value 470.541890
## iter  60 value 464.105090
## iter  70 value 463.452048
## iter  80 value 463.292242
## iter  90 value 463.180886
## iter 100 value 463.086596
## final  value 463.086596
## stopped after 100 iterations
## # weights:  11
## initial  value 840.910432
## iter  10 value 610.810563
## iter  20 value 594.207479
## iter  30 value 586.492902
## iter  40 value 576.448563
## iter  50 value 572.617084
## iter  60 value 569.217903
## iter  70 value 569.003622
## iter  80 value 568.706660
## iter  90 value 568.638837
## iter 100 value 568.627274
## final  value 568.627274
## stopped after 100 iterations
## # weights:  31
```

```
## initial  value 1444.044853
## iter  10 value 598.958719
## iter  20 value 562.849833
## iter  30 value 550.757606
## iter  40 value 543.248974
## iter  50 value 535.401667
## iter  60 value 532.477255
## iter  70 value 530.588532
## iter  80 value 530.079652
## iter  90 value 529.415551
## iter 100 value 527.186113
## final  value 527.186113
## stopped after 100 iterations
## # weights:  51
## initial  value 1012.657433
## iter  10 value 577.342798
## iter  20 value 547.283636
## iter  30 value 501.587011
## iter  40 value 468.957026
## iter  50 value 451.493340
## iter  60 value 444.434286
## iter  70 value 442.910845
## iter  80 value 442.836189
## final  value 442.832175
## converged
## # weights:  11
## initial  value 1286.325401
## iter  10 value 602.430880
## iter  20 value 576.016175
## iter  30 value 575.441705
## final  value 575.373481
## converged
## # weights:  31
## initial  value 804.246447
## iter  10 value 597.367364
## iter  20 value 568.248065
## iter  30 value 552.406741
## iter  40 value 547.494833
## iter  50 value 545.664497
## iter  60 value 545.358620
## iter  70 value 545.262783
## iter  80 value 545.239775
## final  value 545.237478
## converged
## # weights:  51
## initial  value 821.995855
## iter  10 value 581.018871
## iter  20 value 548.653242
## iter  30 value 534.776915
## iter  40 value 529.427251
## iter  50 value 526.653844
## iter  60 value 523.341497
## iter  70 value 522.258159
## iter  80 value 520.662955
```

```
## iter  90 value 520.063554
## iter 100 value 519.994886
## final  value 519.994886
## stopped after 100 iterations
## # weights:  11
## initial  value 1151.501124
## iter  10 value 600.805735
## iter  20 value 577.111860
## iter  30 value 574.566153
## iter  40 value 569.848033
## iter  50 value 568.987660
## iter  60 value 568.810927
## iter  70 value 568.644757
## iter  80 value 568.640297
## iter  90 value 568.626804
## iter 100 value 568.624104
## final  value 568.624104
## stopped after 100 iterations
## # weights:  31
## initial  value 1587.626100
## iter  10 value 584.844602
## iter  20 value 559.432009
## iter  30 value 541.446610
## iter  40 value 519.544677
## iter  50 value 508.785552
## iter  60 value 503.941784
## iter  70 value 502.641436
## iter  80 value 502.121636
## iter  90 value 501.784841
## iter 100 value 501.501939
## final  value 501.501939
## stopped after 100 iterations
## # weights:  51
## initial  value 861.857073
## iter  10 value 570.561589
## iter  20 value 534.863451
## iter  30 value 507.488488
## iter  40 value 484.896239
## iter  50 value 473.770389
## iter  60 value 468.807162
## iter  70 value 456.127416
## iter  80 value 446.123612
## iter  90 value 443.751364
## iter 100 value 443.024383
## final  value 443.024383
## stopped after 100 iterations
## # weights:  11
## initial  value 1078.659430
## iter  10 value 596.512787
## iter  20 value 582.092087
## iter  30 value 576.262620
## iter  40 value 575.222812
## final  value 575.210231
## converged
```

```
## # weights:  31
## initial  value 1041.869068
## iter  10 value 590.671945
## iter  20 value 564.653704
## iter  30 value 553.741897
## iter  40 value 550.027865
## iter  50 value 543.849556
## iter  60 value 541.201934
## iter  70 value 538.290625
## iter  80 value 537.787501
## iter  90 value 537.721563
## iter 100 value 537.700069
## final  value 537.700069
## stopped after 100 iterations
## # weights:  51
## initial  value 794.183714
## iter  10 value 586.826233
## iter  20 value 536.261793
## iter  30 value 513.099680
## iter  40 value 495.222708
## iter  50 value 476.374707
## iter  60 value 450.419577
## iter  70 value 445.542092
## iter  80 value 445.407079
## final  value 445.406908
## converged
## # weights:  11
## initial  value 863.391910
## iter  10 value 593.261844
## iter  20 value 580.930533
## iter  30 value 580.575941
## final  value 580.575556
## converged
## # weights:  31
## initial  value 1102.033098
## iter  10 value 579.761116
## iter  20 value 570.657190
## iter  30 value 560.873548
## iter  40 value 557.524384
## iter  50 value 557.006570
## iter  60 value 556.860671
## iter  70 value 556.535471
## iter  80 value 556.426800
## iter  90 value 556.415703
## iter  90 value 556.415698
## iter  90 value 556.415698
## final  value 556.415698
## converged
## # weights:  51
## initial  value 1151.256759
## iter  10 value 581.532758
## iter  20 value 554.472533
## iter  30 value 541.428045
## iter  40 value 538.790182
```

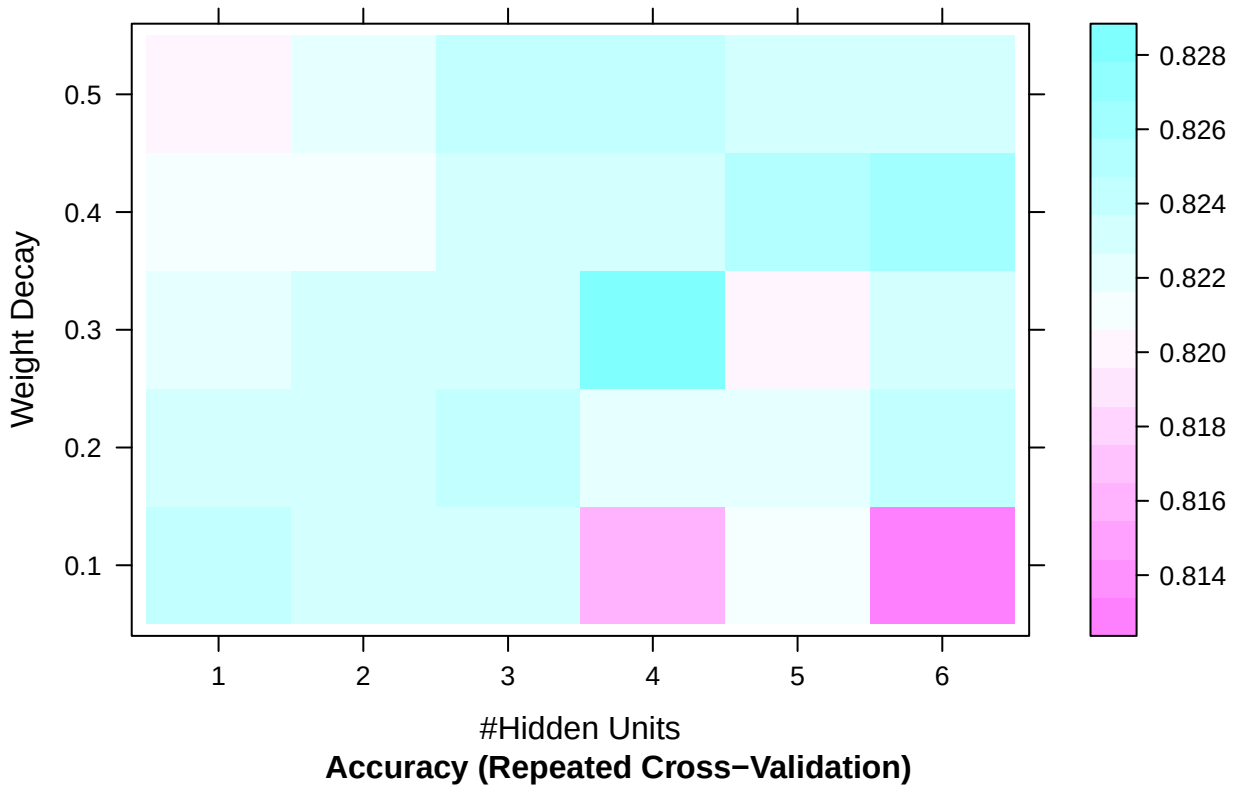
```
## iter  50 value 537.627397
## iter  60 value 536.378438
## iter  70 value 535.843576
## iter  80 value 535.830794
## iter  90 value 535.826852
## final  value 535.826690
## converged
## # weights:  11
## initial  value 1015.481915
## iter  10 value 609.816089
## iter  20 value 598.060336
## iter  30 value 589.261213
## iter  40 value 584.901161
## iter  50 value 579.335994
## iter  60 value 575.382322
## iter  70 value 575.216871
## iter  80 value 575.215212
## final  value 575.214945
## converged
## # weights:  31
## initial  value 1473.210386
## iter  10 value 585.835672
## iter  20 value 544.539375
## iter  30 value 522.183633
## iter  40 value 511.012251
## iter  50 value 505.170237
## iter  60 value 502.171853
## iter  70 value 500.161945
## iter  80 value 500.057540
## iter  90 value 499.954108
## iter 100 value 499.851791
## final  value 499.851791
## stopped after 100 iterations
## # weights:  51
## initial  value 900.415632
## iter  10 value 570.385381
## iter  20 value 536.128936
## iter  30 value 514.445344
## iter  40 value 499.630615
## iter  50 value 493.660932
## iter  60 value 487.795216
## iter  70 value 480.503739
## iter  80 value 477.542946
## iter  90 value 476.629112
## iter 100 value 475.521513
## final  value 475.521513
## stopped after 100 iterations
## # weights:  11
## initial  value 853.921157
## iter  10 value 582.855886
## iter  20 value 561.146235
## iter  30 value 559.152719
## final  value 558.989715
## converged
```

```
## # weights:  31
## initial  value 1236.282979
## iter  10 value 558.854477
## iter  20 value 535.441772
## iter  30 value 532.582056
## iter  40 value 528.082194
## iter  50 value 523.248542
## iter  60 value 520.160195
## iter  70 value 518.495473
## iter  80 value 517.790909
## iter  90 value 514.902390
## iter 100 value 510.599663
## final  value 510.599663
## stopped after 100 iterations
## # weights:  51
## initial  value 1324.547870
## iter  10 value 543.787480
## iter  20 value 505.325538
## iter  30 value 486.375765
## iter  40 value 478.302080
## iter  50 value 457.607403
## iter  60 value 435.172318
## iter  70 value 429.274740
## iter  80 value 429.157353
## final  value 429.153254
## converged
## # weights:  11
## initial  value 1104.103472
## iter  10 value 587.647471
## iter  20 value 565.455865
## iter  30 value 563.064083
## final  value 562.986855
## converged
## # weights:  31
## initial  value 1203.968929
## iter  10 value 562.216977
## iter  20 value 543.682632
## iter  30 value 535.917340
## iter  40 value 533.501393
## iter  50 value 532.448868
## iter  60 value 532.415249
## iter  60 value 532.415248
## iter  60 value 532.415248
## final  value 532.415248
## converged
## # weights:  51
## initial  value 1222.514890
## iter  10 value 536.192091
## iter  20 value 519.792627
## iter  30 value 508.225482
## iter  40 value 502.851105
## iter  50 value 501.801222
## iter  60 value 501.069521
## iter  70 value 500.691041
```

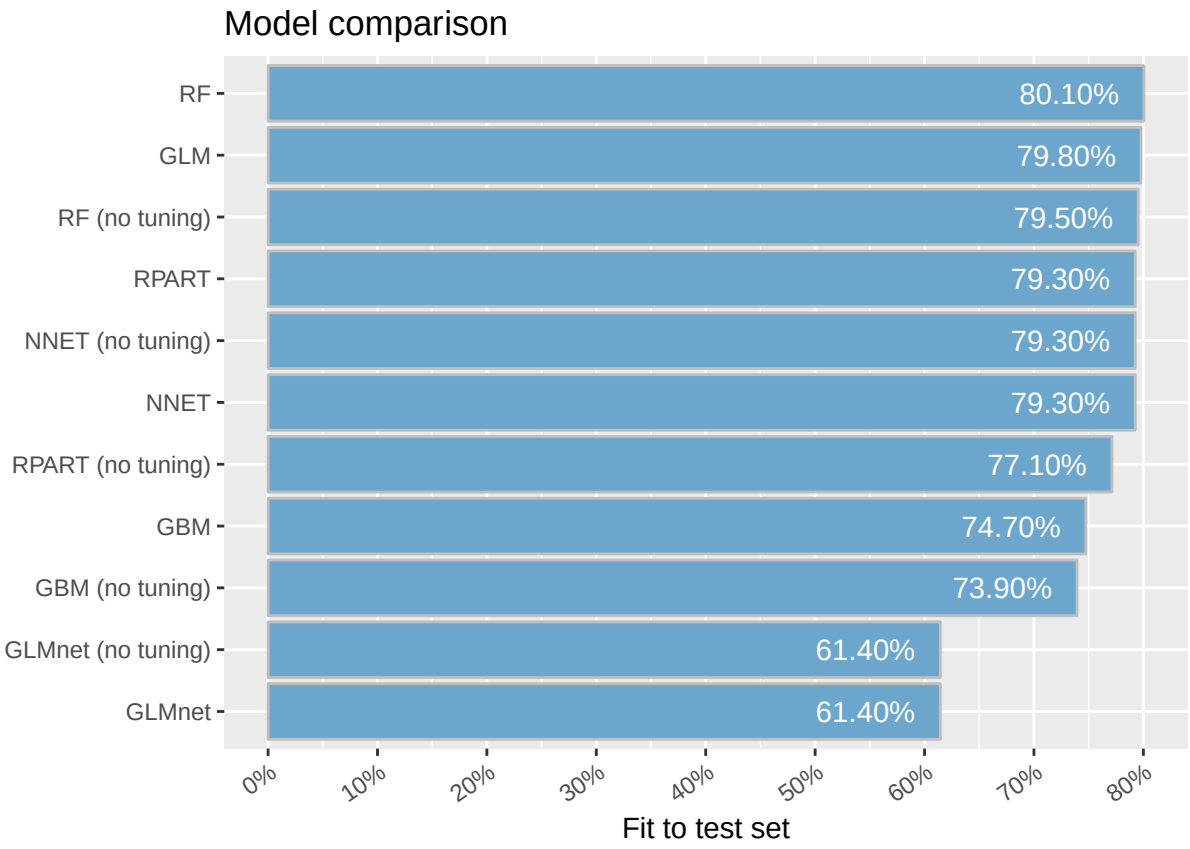
```
## iter  80 value 498.710740
## iter  90 value 496.017267
## iter 100 value 495.620503
## final  value 495.620503
## stopped after 100 iterations
## # weights:  11
## initial  value 946.433735
## iter  10 value 591.458721
## iter  20 value 580.550525
## iter  30 value 569.885290
## iter  40 value 559.666280
## iter  50 value 559.071953
## final  value 558.993972
## converged
## # weights:  31
## initial  value 868.384833
## iter  10 value 565.810410
## iter  20 value 537.600487
## iter  30 value 523.585356
## iter  40 value 519.892054
## iter  50 value 516.182081
## iter  60 value 515.125953
## iter  70 value 512.807242
## iter  80 value 511.982181
## iter  90 value 510.931329
## iter 100 value 508.152511
## final  value 508.152511
## stopped after 100 iterations
## # weights:  51
## initial  value 1089.635221
## iter  10 value 562.148709
## iter  20 value 505.553967
## iter  30 value 483.255998
## iter  40 value 463.062302
## iter  50 value 455.181796
## iter  60 value 454.142012
## iter  70 value 453.984002
## iter  80 value 453.767869
## iter  90 value 453.514629
## iter 100 value 452.994216
## final  value 452.994216
## stopped after 100 iterations
## # weights:  11
## initial  value 910.443988
## iter  10 value 566.308801
## iter  20 value 554.432595
## iter  30 value 552.011158
## iter  40 value 545.357975
## iter  50 value 542.799419
## iter  60 value 542.589828
## final  value 542.585356
## converged
## # weights:  31
## initial  value 1003.424346
```

```
## iter  10 value 573.957361
## iter  20 value 530.216625
## iter  30 value 512.639281
## iter  40 value 507.941799
## iter  50 value 504.954318
## iter  60 value 499.023209
## iter  70 value 492.591275
## iter  80 value 484.847451
## iter  90 value 474.418114
## iter 100 value 470.223222
## final  value 470.223222
## stopped after 100 iterations
## # weights:  51
## initial  value 1048.411559
## iter  10 value 533.654786
## iter  20 value 502.144152
## iter  30 value 486.141726
## iter  40 value 473.376832
## iter  50 value 450.473372
## iter  60 value 437.044177
## iter  70 value 435.358544
## iter  80 value 435.329915
## final  value 435.329452
## converged
## # weights:  11
## initial  value 1090.457488
## iter  10 value 597.868914
## iter  20 value 559.474569
## iter  30 value 548.129913
## iter  40 value 546.789565
## final  value 546.788969
## converged
## # weights:  31
## initial  value 1138.083205
## iter  10 value 544.525220
## iter  20 value 534.457194
## iter  30 value 527.692643
## iter  40 value 526.056014
## iter  50 value 525.635607
## iter  60 value 525.595061
## final  value 525.593938
## converged
## # weights:  51
## initial  value 1079.997101
## iter  10 value 548.926728
## iter  20 value 531.690396
## iter  30 value 523.896572
## iter  40 value 513.181660
## iter  50 value 505.519652
## iter  60 value 502.869463
## iter  70 value 501.069689
## iter  80 value 500.201505
## iter  90 value 500.013737
## iter 100 value 499.966678
```

```
## final  value 499.966678
## stopped after 100 iterations
## # weights:  11
## initial  value 853.561184
## iter  10 value 578.431553
## iter  20 value 568.569731
## iter  30 value 555.093950
## iter  40 value 547.352831
## iter  50 value 542.974137
## iter  60 value 542.672992
## final  value 542.589827
## converged
## # weights:  31
## initial  value 1008.946984
## iter  10 value 550.525170
## iter  20 value 530.319703
## iter  30 value 523.168619
## iter  40 value 513.605877
## iter  50 value 510.351894
## iter  60 value 509.596103
## iter  70 value 509.241396
## iter  80 value 508.581141
## iter  90 value 508.558864
## iter 100 value 508.469775
## final  value 508.469775
## stopped after 100 iterations
## # weights:  51
## initial  value 1481.041078
## iter  10 value 538.335802
## iter  20 value 512.331007
## iter  30 value 504.360073
## iter  40 value 497.990409
## iter  50 value 489.980866
## iter  60 value 486.381917
## iter  70 value 484.093084
## iter  80 value 482.795732
## iter  90 value 482.341530
## iter 100 value 482.279969
## final  value 482.279969
## stopped after 100 iterations
## # weights:  11
## initial  value 1406.028489
## iter  10 value 669.778637
## iter  20 value 581.390615
## iter  30 value 564.468903
## iter  40 value 561.811110
## final  value 561.735022
## converged
```


Weight Decay
0.5
0.4
0.3
0.2
0.1
1
2
3
4
5
6
#Hidden Units
0.828
0.826
0.824
0.822
0.820
0.818
0.816
0.814
Accuracy (Repeated Cross−Validation)

Model comparisons



Results

GBM: Little importance is given to the education variable.

Conclusion

Noise introduced by the segmentation of data into very small groups.