# BISST0663_Final_Project

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```
##This chunk is only needed when running on Jason's laptop.If it is on Jason's device change eval=TRUE
options("install.lock"=FALSE)
```

```
library(xfun)
```

```
## Warning: package 'xfun' was built under R version 4.4.2
```

```
##
## Attaching package: 'xfun'
```

```
## The following objects are masked from 'package:base':
##
##     attr, isFALSE
```

```
#This is a test2222
```

### Load Datas

```
ALZH<-read.csv("https://raw.githubusercontent.com/jasonh0509/StatsLearningFinal/refs/heads/main/alzheime
```

### Take a Look

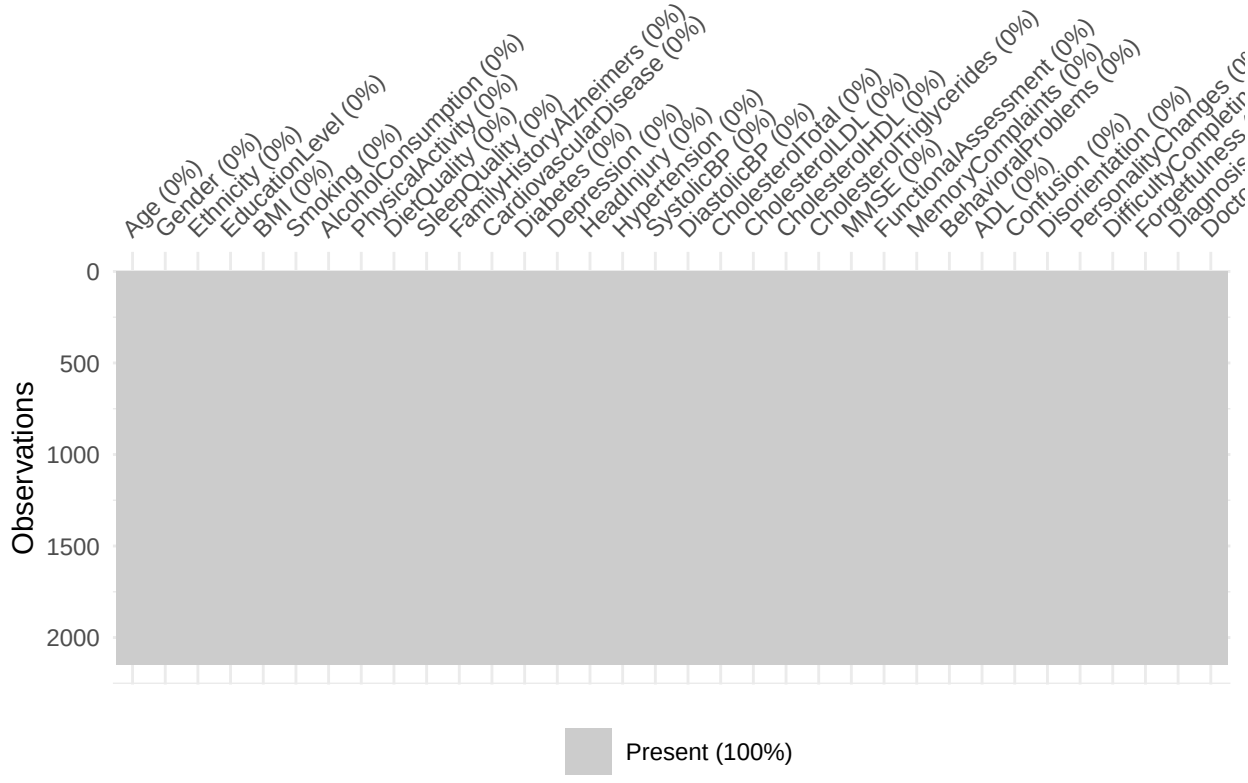
```
glimpse(ALZH)
```

```
## Rows: 2,149
## Columns: 35
## $ PatientID                <int> 4751, 4752, 4753, 4754, 4755, 4756, 4757, 47~
## $ Age                      <int> 73, 89, 73, 74, 89, 86, 68, 75, 72, 87, 89, ~
## $ Gender                   <int> 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1,~
## $ Ethnicity                <int> 0, 0, 3, 0, 0, 1, 3, 0, 1, 0, 3, 0, 0, 0, 0,~
## $ EducationLevel           <int> 2, 0, 1, 1, 0, 1, 2, 1, 0, 0, 1, 2, 1, 1, 2,~
## $ BMI                      <dbl> 22.92775, 26.82768, 17.79588, 33.80082, 20.7~
## $ Smoking                  <int> 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0,~
## $ AlcoholConsumption       <dbl> 13.2972177, 4.5425238, 19.5550845, 12.209265~
## $ PhysicalActivity         <dbl> 6.3271125, 7.6198845, 7.8449878, 8.4280014, ~
## $ DietQuality              <dbl> 1.34721431, 0.51876714, 1.82633466, 7.435604~
## $ SleepQuality             <dbl> 9.025679, 7.151293, 9.673574, 8.392554, 5.59~
## $ FamilyHistoryAlzheimers  <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0,~
## $ CardiovascularDisease    <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1,~
## $ Diabetes                 <int> 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1,~
## $ Depression               <int> 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1,~
## $ HeadInjury               <int> 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0,~
## $ Hypertension             <int> 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0,~
## $ SystolicBP               <int> 142, 115, 99, 118, 94, 168, 143, 117, 117, 1~
## $ DiastolicBP              <int> 72, 64, 116, 115, 117, 62, 88, 63, 119, 78, ~
## $ CholesterolTotal         <dbl> 242.3668, 231.1626, 284.1819, 159.5822, 237.~
## $ CholesterolLDL           <dbl> 56.15090, 193.40800, 153.32276, 65.36664, 92~
```

```
## $ CholesterolHDL            <dbl> 33.68256, 79.02848, 69.77229, 68.45749, 56.8~
## $ CholesterolTriglycerides  <dbl> 162.18914, 294.63091, 83.63832, 277.57736, 2~
## $ MMSE                      <dbl> 21.4635324, 20.6132673, 7.3562486, 13.991127~
## $ FunctionalAssessment      <dbl> 6.5188770, 7.1186955, 5.8950773, 8.9651063, ~
## $ MemoryComplaints          <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0,~
## $ BehavioralProblems        <int> 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0,~
## $ ADL                       <dbl> 1.72588346, 2.59242413, 7.11954774, 6.481225~
## $ Confusion                 <int> 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1,~
## $ Disorientation            <int> 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1,~
## $ PersonalityChanges        <int> 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1,~
## $ DifficultyCompletingTasks <int> 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0,~
## $ Forgetfulness             <int> 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0,~
## $ Diagnosis                 <int> 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0,~
## $ DoctorInCharge            <chr> "XXXConfid", "XXXConfid", "XXXConfid", "XXXC~
```

```
ALZH_noID<-ALZH[,-1]
```

```
na_plot_ALZH<-vis_miss(ALZH_noID);na_plot_ALZH
```




```
colSums(is.na(ALZH_noID))
```

```
##                         Age                      Gender                   Ethnicity
##                           0                           0                           0
##             EducationLevel                         BMI                     Smoking
```

```
##                         0                         0                         0
##        AlcoholConsumption          PhysicalActivity               DietQuality
##                         0                         0                         0
##              SleepQuality   FamilyHistoryAlzheimers     CardiovascularDisease
##                         0                         0                         0
##                  Diabetes                Depression                HeadInjury
##                         0                         0                         0
##              Hypertension               SystolicBP               DiastolicBP
##                         0                         0                         0
##          CholesterolTotal            CholesterolLDL            CholesterolHDL
##                         0                         0                         0
##  CholesterolTriglycerides                      MMSE      FunctionalAssessment
##                         0                         0                         0
##          MemoryComplaints        BehavioralProblems                       ADL
##                         0                         0                         0
##                 Confusion            Disorientation        PersonalityChanges
##                         0                         0                         0
## DifficultyCompletingTasks             Forgetfulness                 Diagnosis
##                         0                         0                         0
##            DoctorInCharge
##                         0
```

```
ALZH_noID$Diagnosis<-as.factor(ALZH_noID$Diagnosis)
ALZH_noID <- ALZH_noID %>%
  mutate(across(c(Gender, Ethnicity,EducationLevel,Smoking,FamilyHistoryAlzheimers,CardiovascularDiseas
```

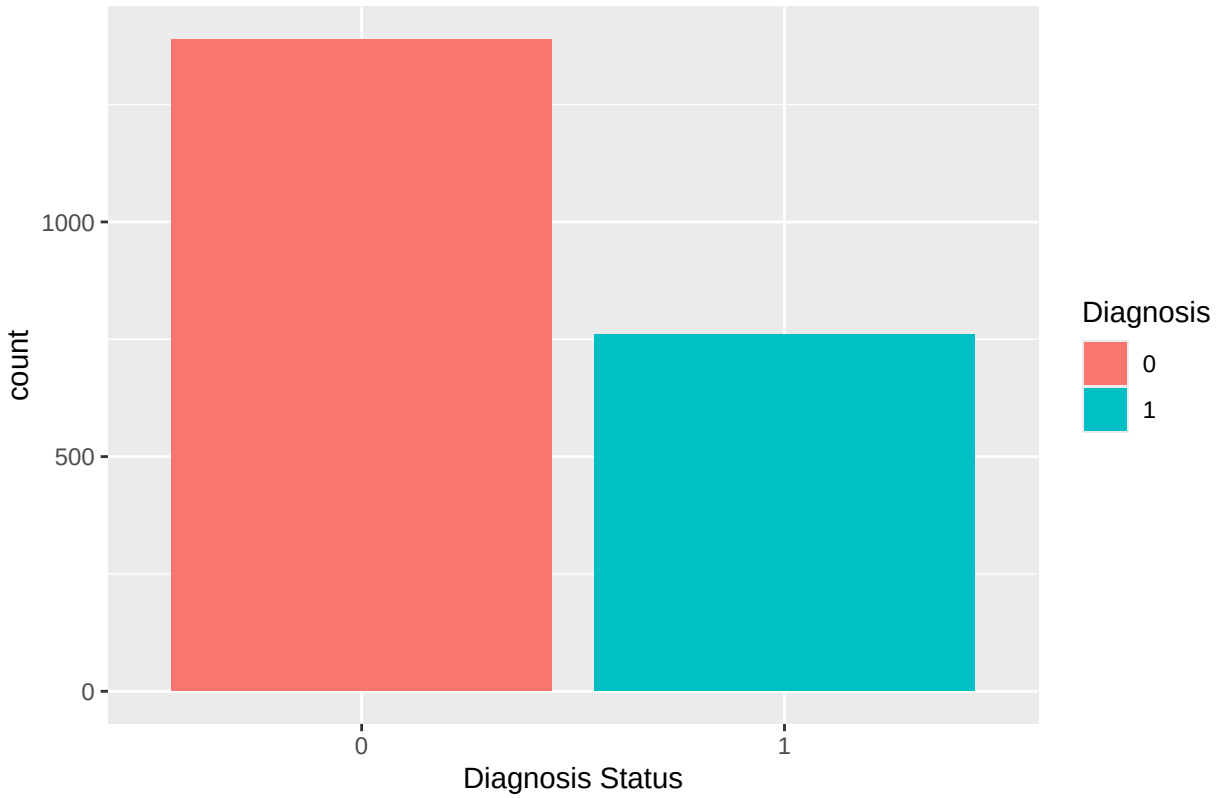
**Set up Data Set(Keep Same Across All Stats Leraning Models)**

```
ALZH.raw <- ALZH_noID %>% select(-DoctorInCharge) %>% mutate(Diagnosis = as.numeric(as.character(Diagno
ALZH.gbm <- ALZH.raw
##Dispite the name, this ALZH.gbm is the data set will be used for all models, the set in other models
```

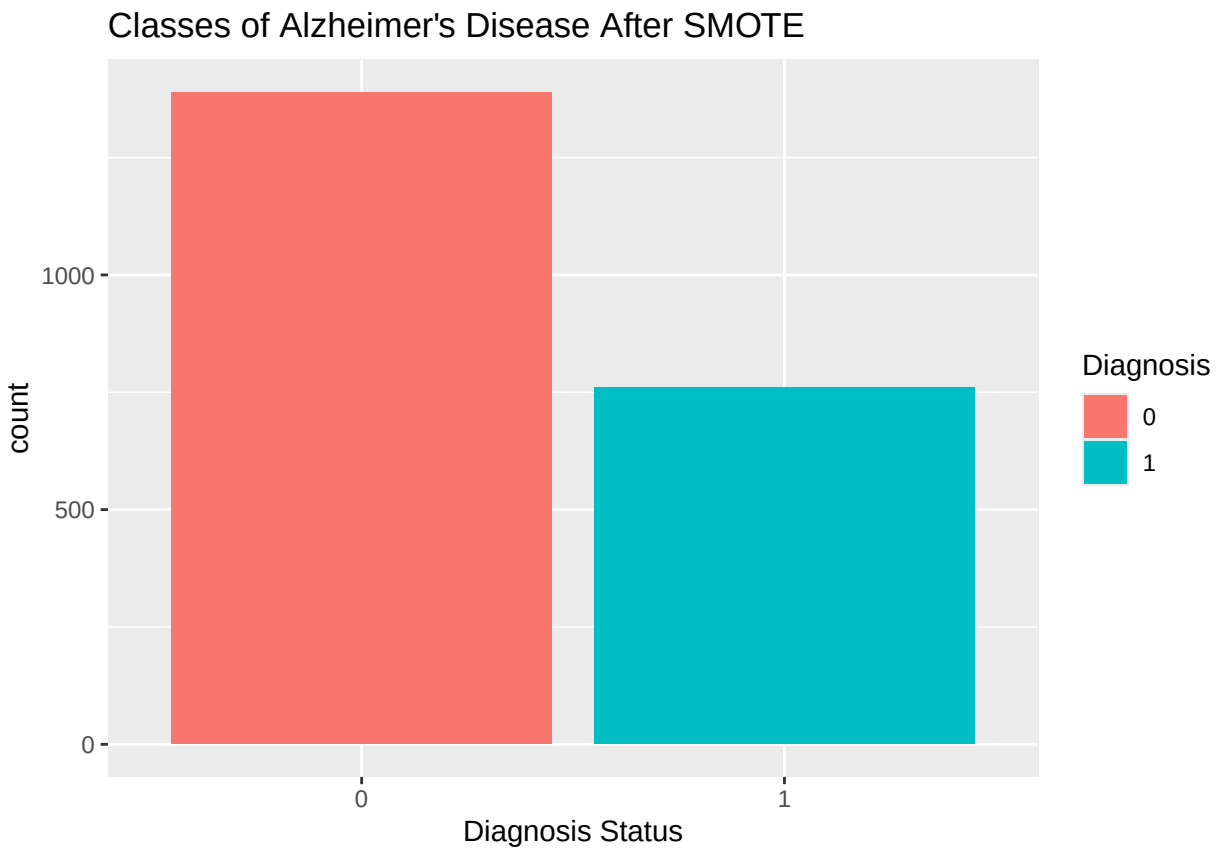
```
ALZH_for_explore<-ALZH.gbm
```

```
alzh_classes<-ggplot(data = ALZH_noID, mapping = aes(x=Diagnosis,fill=Diagnosis))+
  geom_bar()+
  xlab("Diagnosis Status")+
  ggtitle("Figure x.x Classes of Alzheimer's Disease")

alzh_classes
```

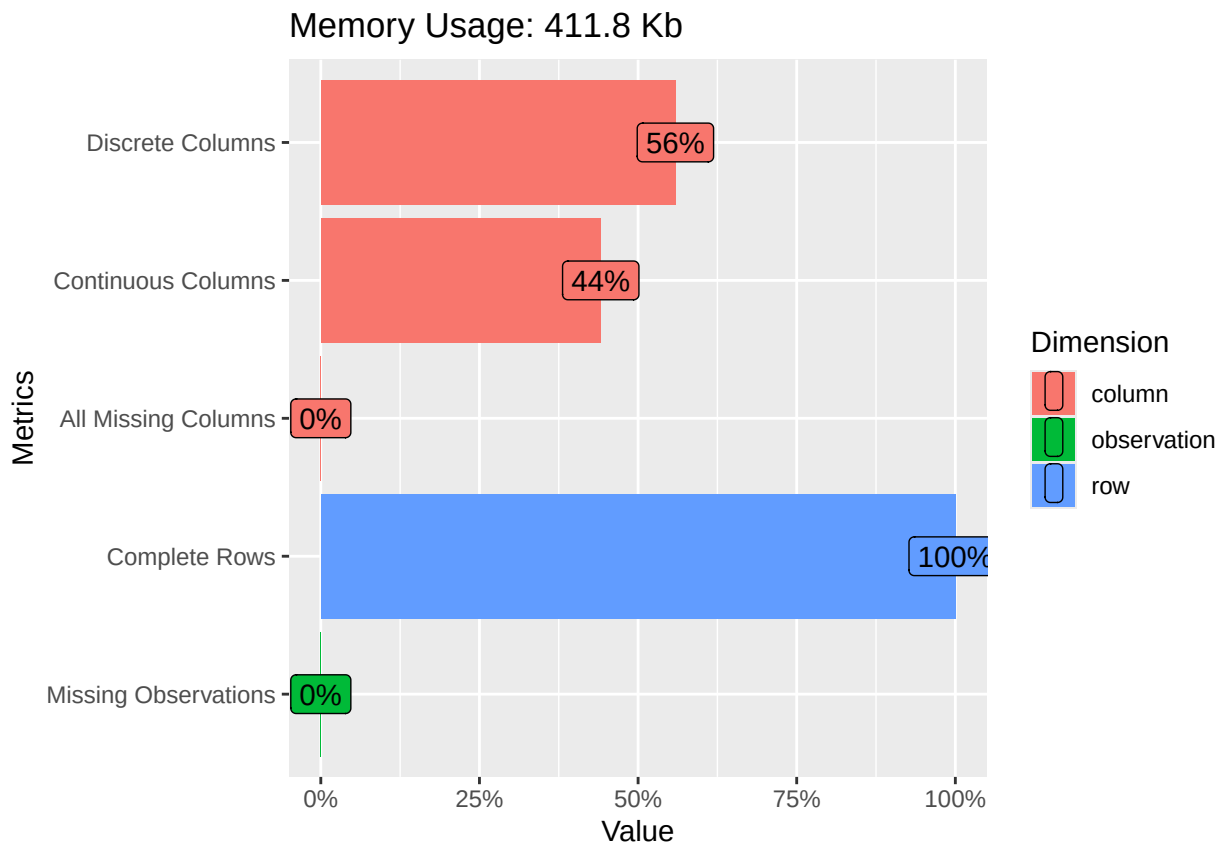
Figure x.x Classes of Alzheimer's Disease




```
ggplot(data = ALZH_noID, mapping = aes(x=Diagnosis,fill=Diagnosis))+
  geom_bar()+
  xlab("Diagnosis Status")+
  ggtitle("Classes of Alzheimer's Disease After SMOTE")
```

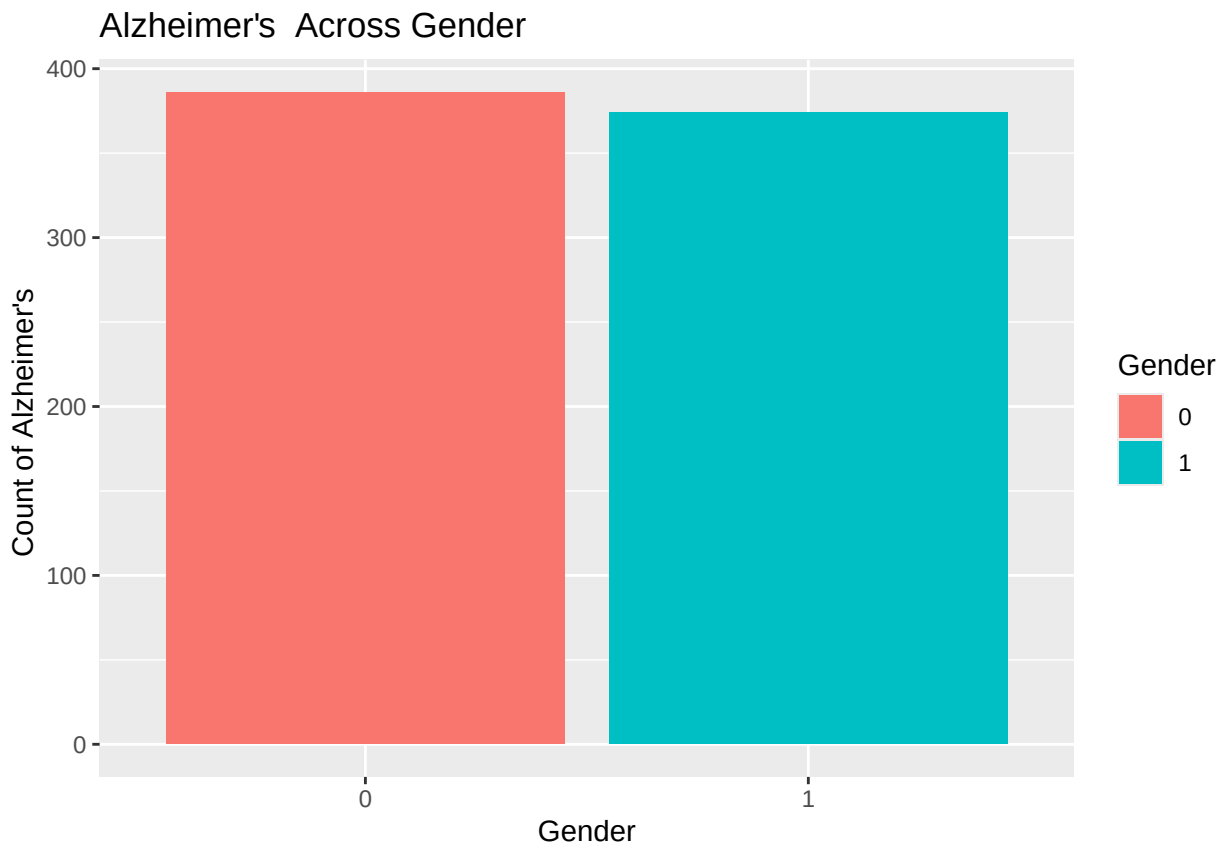



```
plot_intro(ALZH_noID)
```

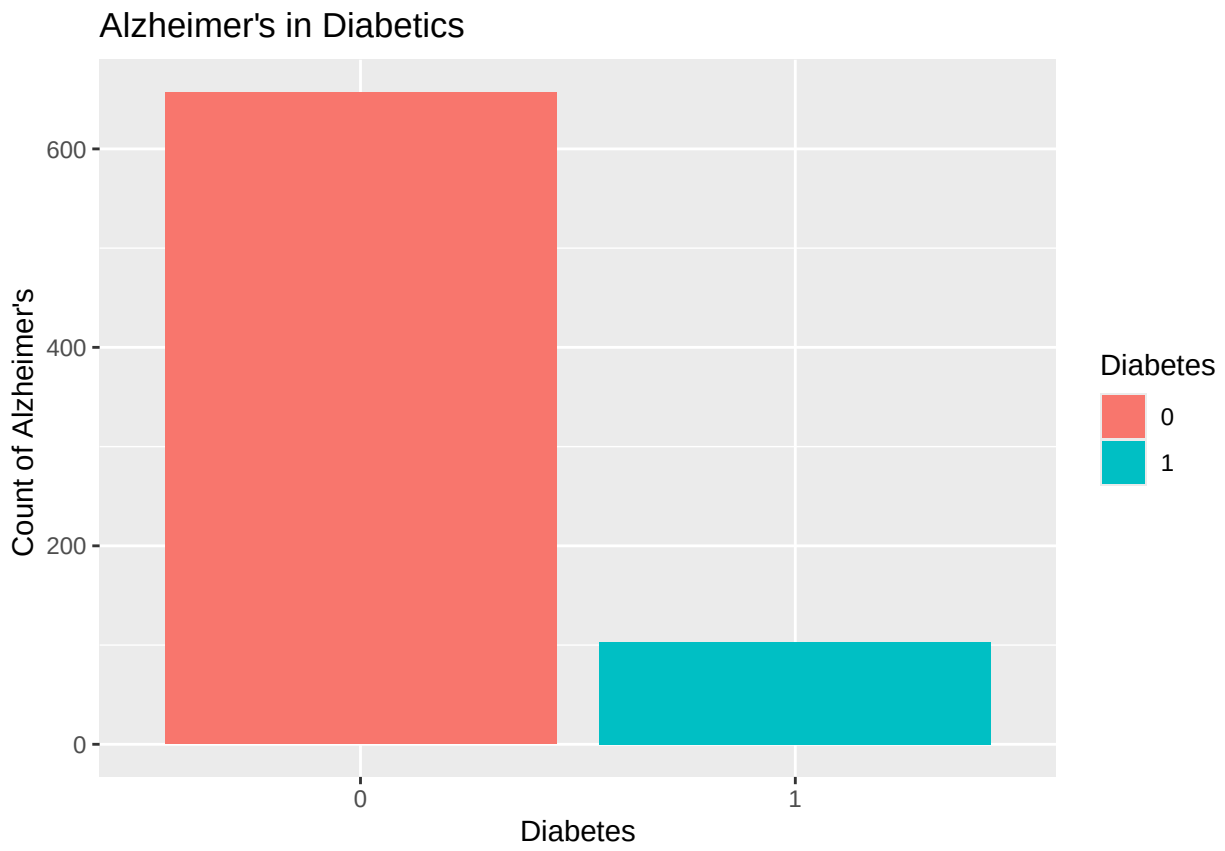



**More EDA focused on positive cases**

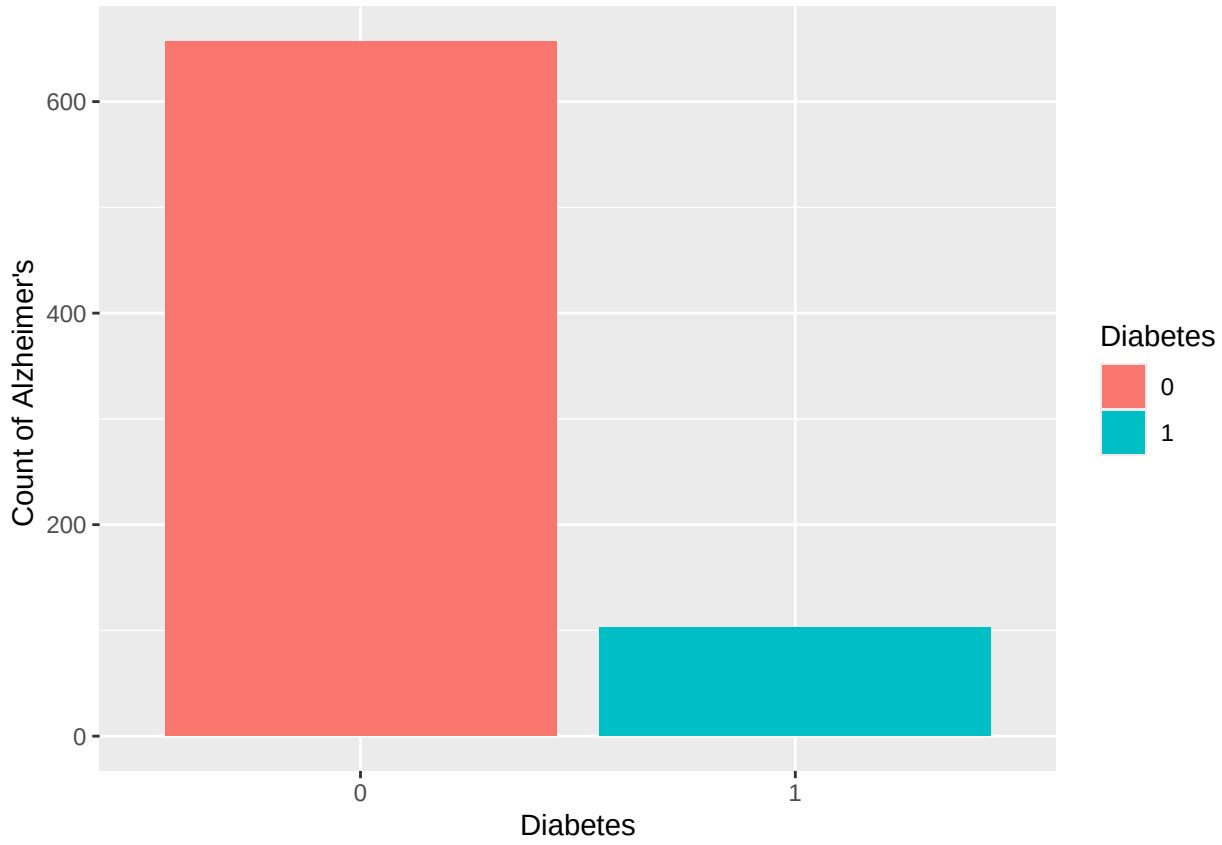
```
alzh_pos<-subset(ALZH_noID,Diagnosis==1)

alzh_gender<-alzh_pos%>%
  group_by(Gender)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = Gender, y = n,fill=Gender))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_gender+ggtitle("Alzheimer's  Across Gender")
```




```
alzh_diab<-alzh_pos%>%
  group_by(Diabetes)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = Diabetes, y = n,fill=Diabetes))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_diab+ggtitle("Alzheimer's in Diabetics")
```

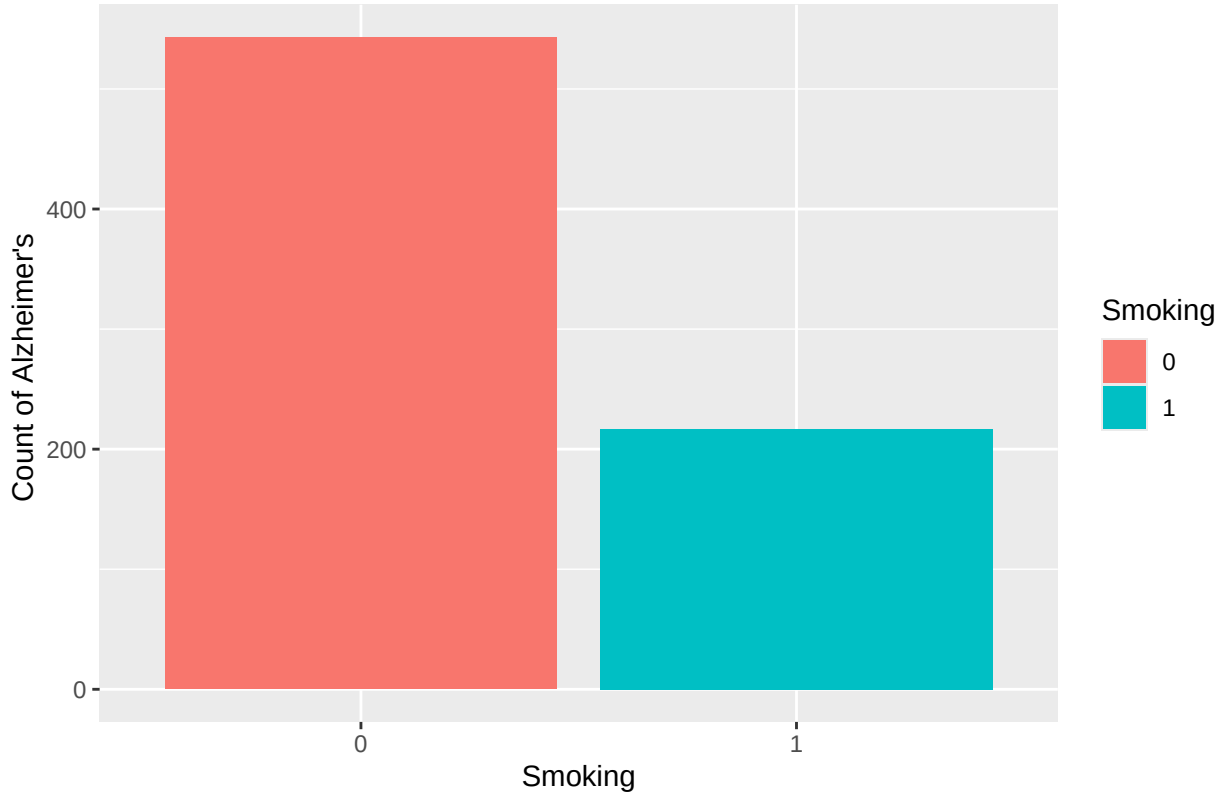

Alzheimer's in Diabetics
Count of Alzheimer's
600
400
200
0
0
1
Diabetes
Diabetes
0
1

```
alzh_diab
```

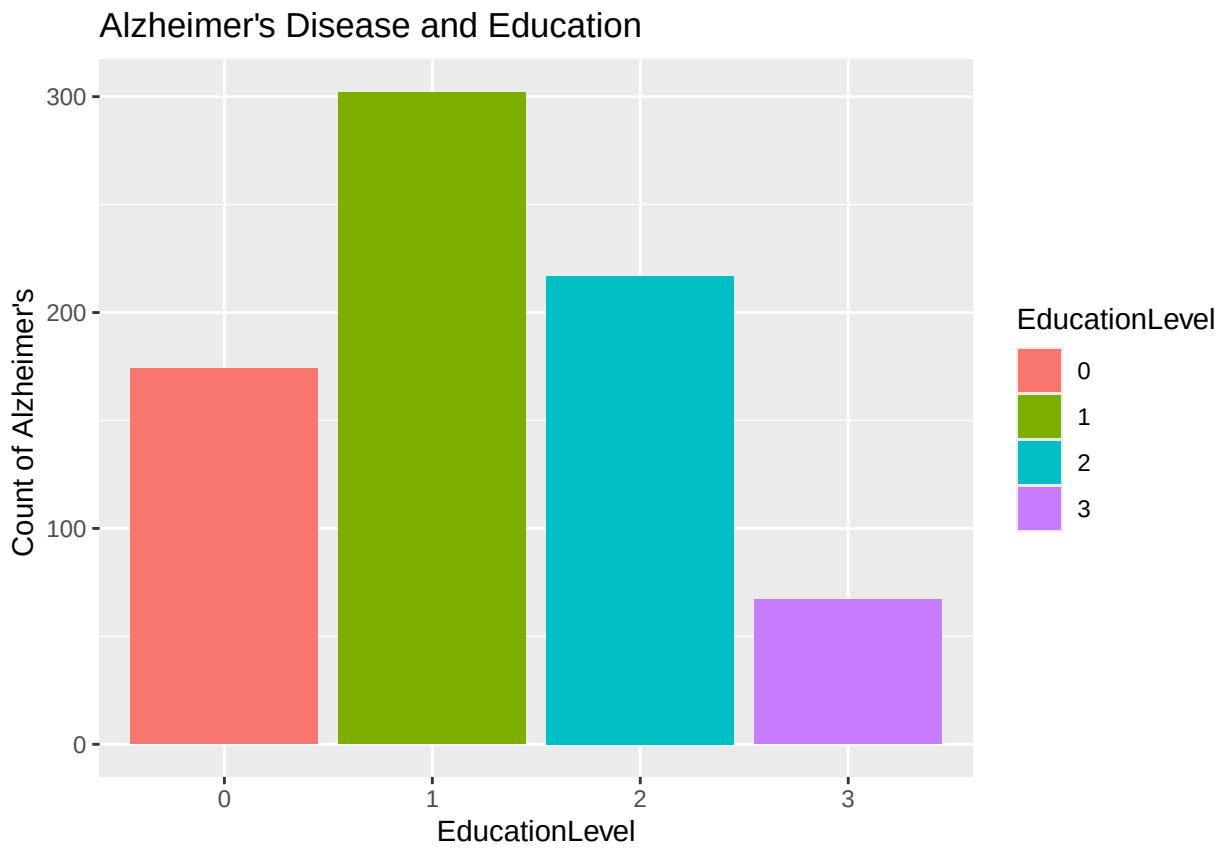



```
alzh_smoke<-alzh_pos%>%
  group_by(Smoking)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = Smoking, y = n,fill=Smoking))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_smoke+ggtitle("Figure x.x Alzheimer's in Cigarette Users")
```

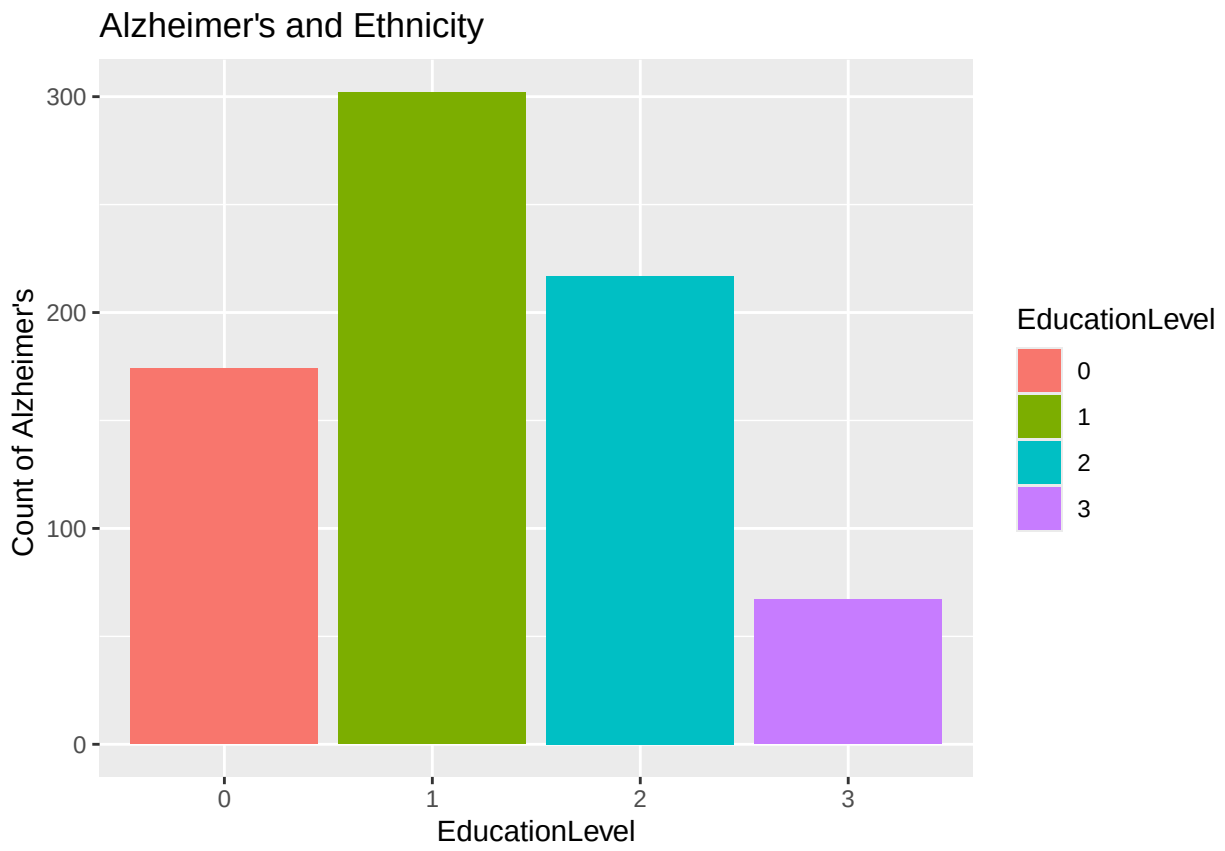
Figure x.x Alzheimer's in Cigarette Users



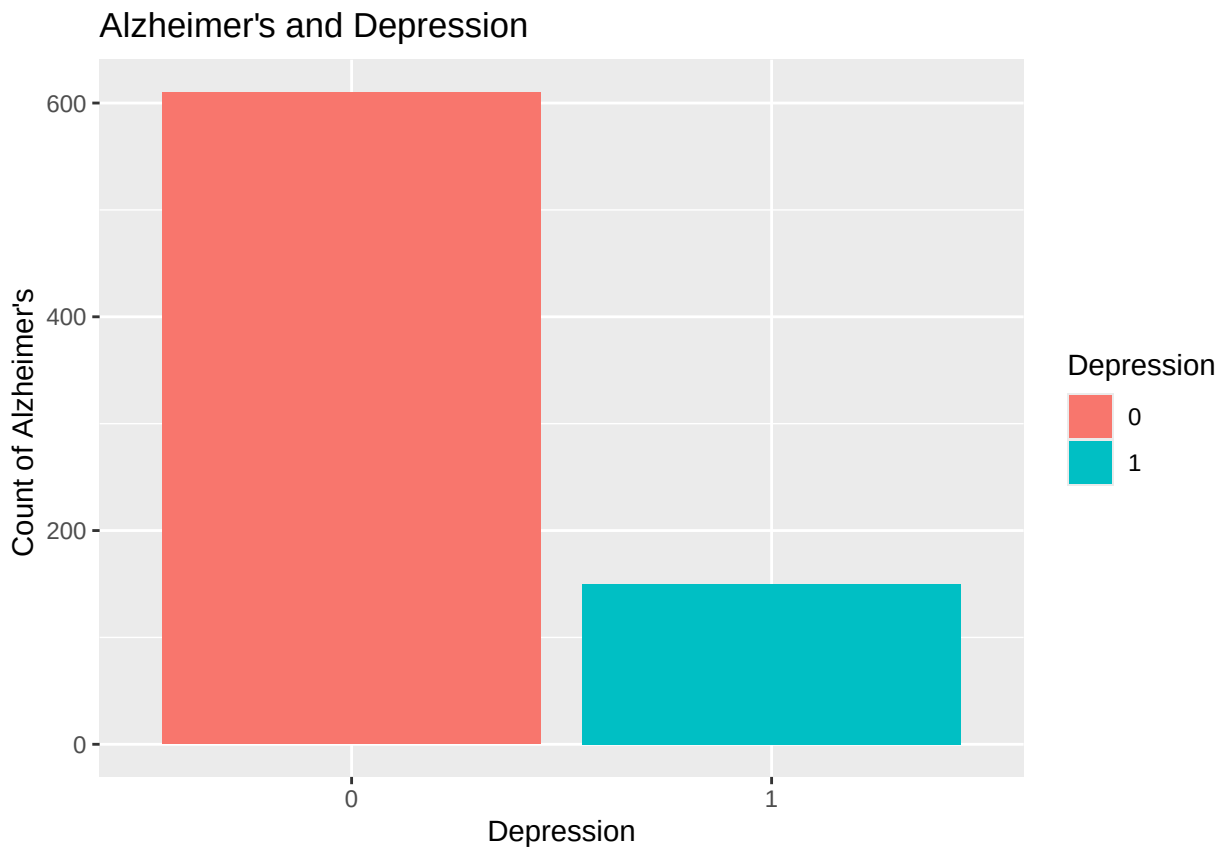

```
alzh_edu<-alzh_pos%>%
  group_by(EducationLevel)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = EducationLevel, y = n,fill=EducationLevel))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_edu+ggtitle("Alzheimer's Disease and Education")
```



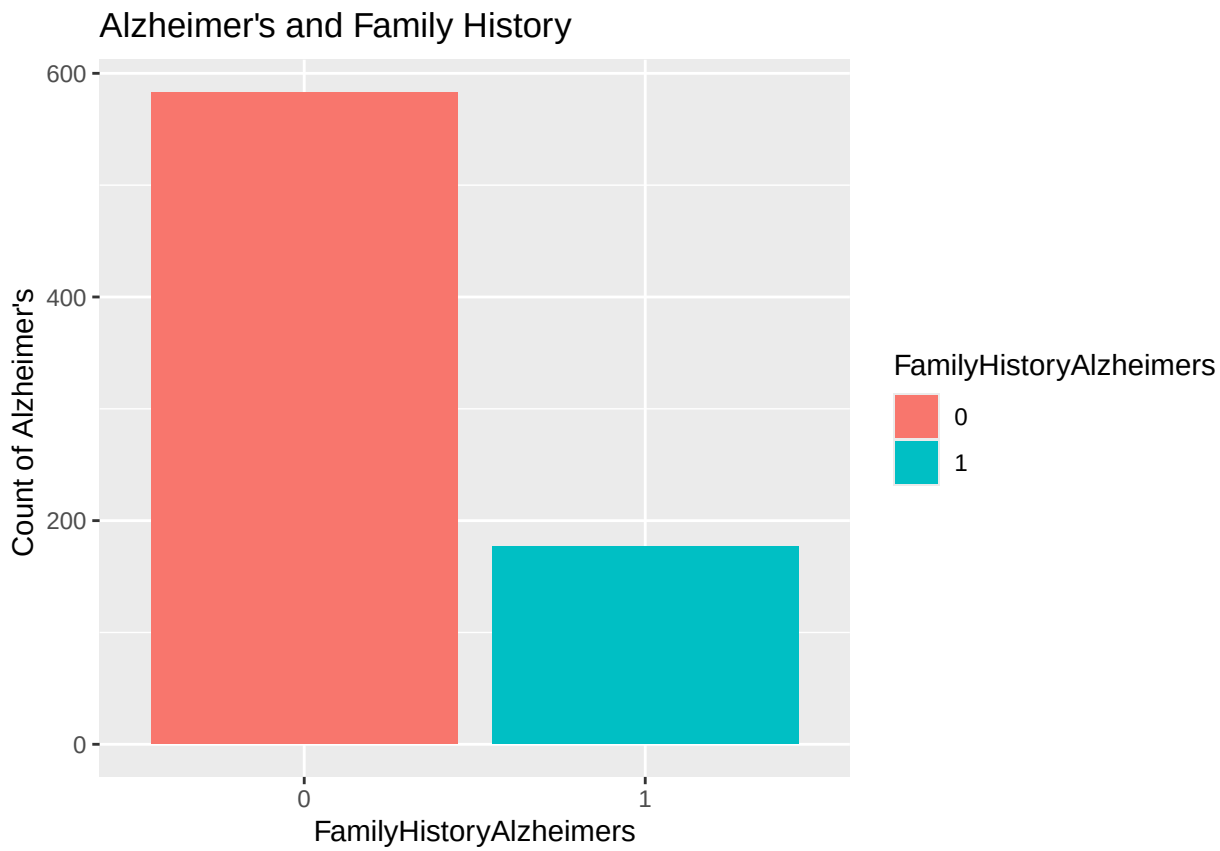

```
alzh_ethnicity<-alzh_pos%>%
  group_by(Ethnicity)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = Ethnicity, y = n,fill=Ethnicity))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_edu+ggtitle("Alzheimer's and Ethnicity")
```




```
alzh_depression<-alzh_pos%>%
  group_by(Depression)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = Depression, y = n,fill=Depression))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_depression+ggtitle("Alzheimer's and Depression")
```




```
alzh_family<-alzh_pos%>%
  group_by(FamilyHistoryAlzheimers)%>%
  summarise(n = n()) %>%
  ggplot(aes(x = FamilyHistoryAlzheimers, y = n,fill=FamilyHistoryAlzheimers))+
  geom_col()+
  labs(y="Count of Alzheimer's ")
alzh_family+ggtitle("Alzheimer's and Family History")
```




```
MMSE.scatter<-ggplot(data = ALZH_noID,mapping = aes(x=Age,y=MMSE,color=Diagnosis))+
  geom_jitter()
MMSE.scatter+ggtitle("Age vs MMSE Respect to Disease Status")
```


**Exploration of Corerlation of 4 Variables related to**

```
correlation.mtx.4var<-cor(ALZH_for_explore[,c("CholesterolHDL", "CholesterolLDL", "CholesterolTotal", "C
correlation.mtx.4var
```

```
##                          CholesterolHDL CholesterolLDL CholesterolTotal
## CholesterolHDL             1.000000000   -0.025311673      0.006420205
## CholesterolLDL            -0.025311673    1.000000000      0.006876872
## CholesterolTotal           0.006420205    0.006876872      1.000000000
## CholesterolTriglycerides   0.010869895   -0.003789385     -0.002216613
##                          CholesterolTriglycerides
## CholesterolHDL                        0.010869895
## CholesterolLDL                       -0.003789385
## CholesterolTotal                     -0.002216613
## CholesterolTriglycerides              1.000000000
```

```
correlation.mtx.4var<-as.data.frame(correlation.mtx.4var)
knitr::kable(correlation.mtx.4var)
```

| | CholesterolHDL | CholesterolLDL | CholesterolTotal | CholesterolTriglycerides |
|---|---|---|---|---|
| CholesterolHDL | 1.0000000 | -0.0253117 | 0.0064202 | 0.0108699 |
| CholesterolLDL | -0.0253117 | 1.0000000 | 0.0068769 | -0.0037894 |

| | CholesterolHDL | CholesterolLDL | CholesterolTotal | CholesterolTriglycerides |
|---|---|---|---|---|
| CholesterolTotal | 0.0064202 | 0.0068769 | 1.0000000 | -0.0022166 |
| CholesterolTriglycerides | 0.0108699 | -0.0037894 | -0.0022166 | 1.0000000 |

```
##4 logistic regression models with only response and one of the 4 cholesterol variables
hdl.logistic<-glm(Diagnosis~CholesterolHDL,data=ALZH_for_explore,family = binomial);summary(hdl.logistic
```

```
##
## Call:
## glm(formula = Diagnosis ~ CholesterolHDL, family = binomial,
##     data = ALZH_for_explore)
##
## Coefficients:
##                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -0.833278   0.125691  -6.630 3.37e-11 ***
## CholesterolHDL  0.003853   0.001953   1.973   0.0485 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 2792.3  on 2148  degrees of freedom
## Residual deviance: 2788.4  on 2147  degrees of freedom
## AIC: 2792.4
##
## Number of Fisher Scoring iterations: 4
```

```
ldl.logistic<-glm(Diagnosis~CholesterolLDL,data=ALZH_for_explore,family = binomial);summary(ldl.logistic
```

```
##
## Call:
## glm(formula = Diagnosis ~ CholesterolLDL, family = binomial,
##     data = ALZH_for_explore)
##
## Coefficients:
##                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)    -0.411680   0.136372  -3.019  0.00254 **
## CholesterolLDL -0.001544   0.001042  -1.482  0.13839
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 2792.3  on 2148  degrees of freedom
## Residual deviance: 2790.1  on 2147  degrees of freedom
## AIC: 2794.1
##
## Number of Fisher Scoring iterations: 4
```

```
total.logistic<-glm(Diagnosis~CholesterolTotal,data=ALZH_for_explore,family = binomial);summary(total.l
```

```
##
## Call:
## glm(formula = Diagnosis ~ CholesterolTotal, family = binomial,
##     data = ALZH_for_explore)
##
## Coefficients:
##                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -0.6738669  0.2433093  -2.770  0.00561 **
## CholesterolTotal  0.0003145  0.0010609   0.296  0.76690
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 2792.3  on 2148  degrees of freedom
## Residual deviance: 2792.2  on 2147  degrees of freedom
## AIC: 2796.2
##
## Number of Fisher Scoring iterations: 4
```

```
tryglycerides.logistic<-glm(Diagnosis~CholesterolTriglycerides,data=ALZH_for_explore,family = binomial)
```

```
##
## Call:
## glm(formula = Diagnosis ~ CholesterolTriglycerides, family = binomial,
##     data = ALZH_for_explore)
##
## Coefficients:
##                            Estimate Std. Error z value Pr(>|z|)
## (Intercept)              -0.7095795  0.1112808  -6.376 1.81e-10 ***
## CholesterolTriglycerides  0.0004653  0.0004428   1.051    0.293
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 2792.3  on 2148  degrees of freedom
## Residual deviance: 2791.2  on 2147  degrees of freedom
## AIC: 2795.2
##
## Number of Fisher Scoring iterations: 4
```

```
##HDL is most correlated with the response variable
```

**logistic**

```
ALZH.logistic<-ALZH.gbm%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglycerides))###set fo
n <-nrow(ALZH.logistic);n
```

```
## [1] 2149
```

```
set.seed(114514)
draw<-sample(1:n,size = 1934)##1934 is 90% of the data,here is the rows we use fall all trainig and val
##This is the ultimate sample data indces!
train <-ALZH.logistic[draw,]
train_x<-train%>%dplyr::select(-Diagnosis)
train_y<-train%>%dplyr::select(Diagnosis)

test <- ALZH.logistic[-draw,]
test_x<-test%>%dplyr::select(-Diagnosis)
test_y <-test$Diagnosis


x <-model.matrix(Diagnosis~.,data=ALZH.logistic)
y <- ALZH.logistic$Diagnosis
```

```
ALZH_logistic <-glm(Diagnosis~.,data=train,family = binomial)
summary(ALZH_logistic)
```

```
##
## Call:
## glm(formula = Diagnosis ~ ., family = binomial, data = train)
##
## Coefficients:
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                 4.868e+00  9.281e-01   5.246 1.56e-07 ***
## Age                        -1.075e-02  7.399e-03  -1.452   0.1464
## Gender1                    -2.646e-02  1.339e-01  -0.198   0.8433
## Ethnicity1                 -2.031e-01  1.741e-01  -1.167   0.2434
## Ethnicity2                  2.548e-01  2.318e-01   1.099   0.2716
## Ethnicity3                 -2.037e-01  2.361e-01  -0.863   0.3882
## EducationLevel1            -2.070e-01  1.815e-01  -1.141   0.2540
## EducationLevel2            -1.131e-01  1.920e-01  -0.589   0.5557
## EducationLevel3            -2.875e-01  2.583e-01  -1.113   0.2658
## BMI                        -4.568e-03  9.238e-03  -0.494   0.6210
## Smoking1                   -1.409e-01  1.500e-01  -0.939   0.3476
## AlcoholConsumption         -7.706e-03  1.157e-02  -0.666   0.5052
## PhysicalActivity           -1.073e-02  2.313e-02  -0.464   0.6427
## DietQuality                 2.592e-02  2.333e-02   1.111   0.2666
## SleepQuality               -5.889e-02  3.802e-02  -1.549   0.1214
## FamilyHistoryAlzheimers1   -6.129e-02  1.555e-01  -0.394   0.6936
## CardiovascularDisease1      1.089e-01  1.825e-01   0.596   0.5509
## Diabetes1                   1.081e-02  1.916e-01   0.056   0.9550
## Depression1                 1.066e-01  1.638e-01   0.651   0.5149
## HeadInjury1                -2.628e-01  2.287e-01  -1.149   0.2506
## Hypertension1               1.636e-01  1.846e-01   0.886   0.3755
## SystolicBP                 -6.674e-05  2.575e-03  -0.026   0.9793
## DiastolicBP                 2.271e-03  3.775e-03   0.602   0.5475
## CholesterolHDL              6.086e-03  2.921e-03   2.084   0.0372 *
## MMSE                       -1.079e-01  8.573e-03 -12.582  < 2e-16 ***
## FunctionalAssessment       -4.412e-01  2.780e-02 -15.869  < 2e-16 ***
## MemoryComplaints1           2.574e+00  1.748e-01  14.727  < 2e-16 ***
```

```
## BehavioralProblems1         2.461e+00  1.923e-01  12.800  < 2e-16 ***
## ADL                        -4.013e-01  2.686e-02 -14.939  < 2e-16 ***
## Confusion1                 -2.260e-01  1.685e-01  -1.341   0.1798
## Disorientation1            -1.468e-01  1.833e-01  -0.801   0.4232
## PersonalityChanges1        -1.557e-01  1.925e-01  -0.809   0.4187
## DifficultyCompletingTasks1  1.337e-01  1.818e-01   0.735   0.4621
## Forgetfulness1             -3.051e-02  1.462e-01  -0.209   0.8347
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 2502.0  on 1933  degrees of freedom
## Residual deviance: 1437.3  on 1900  degrees of freedom
## AIC: 1505.3
##
## Number of Fisher Scoring iterations: 6
```

```
pred_test<-predict(ALZH_logistic,type='response',newdata = test)
glm.pred <- ifelse(pred_test > 0.5, 1, 0)
table(glm.pred, test_y)
```

```
##         test_y
## glm.pred   0   1
##        0 121  19
##        1   9  66
```

```
Recall.regular.glm<-sum(glm.pred == 1 & test_y == 1)/sum(test_y == 1);Recall.regular.glm
```

```
## [1] 0.7764706
```

```
Precision.regular.glm<-sum(glm.pred == 1 & test_y == 1)/sum(glm.pred == 1);Precision.regular.glm
```

```
## [1] 0.88
```

```
F1Score.regular.glm<-2*Precision.regular.glm*Recall.regular.glm/(Precision.regular.glm+Recall.regular.gl
```

```
## [1] 0.825
```

```
Accuracy.regular.glm<-sum(glm.pred == test_y)/length(test_y);Accuracy.regular.glm
```

```
## [1] 0.8697674
```

```
Metric.regular<-data.frame("Recall"=Recall.regular.glm,"Precision"=Precision.regular.glm,"Accuracy"=Accu
```

**MLR with best subset**

```r
ALZH_leanning<-ALZH_noID%>%dplyr::select(-DoctorInCharge)
bestsubset <- regsubsets(Diagnosis~., data = ALZH_leanning)
bestsubsum<-summary(bestsubset)
bestsubsum
```

```
## Subset selection object
## Call: regsubsets.formula(Diagnosis ~ ., data = ALZH_leanning)
## 36 Variables  (and intercept)
##                              Forced in Forced out
## Age                              FALSE      FALSE
## Gender1                          FALSE      FALSE
## Ethnicity1                       FALSE      FALSE
## Ethnicity2                       FALSE      FALSE
## Ethnicity3                       FALSE      FALSE
## EducationLevel1                  FALSE      FALSE
## EducationLevel2                  FALSE      FALSE
## EducationLevel3                  FALSE      FALSE
## BMI                              FALSE      FALSE
## Smoking1                         FALSE      FALSE
## AlcoholConsumption               FALSE      FALSE
## PhysicalActivity                 FALSE      FALSE
## DietQuality                      FALSE      FALSE
## SleepQuality                     FALSE      FALSE
## FamilyHistoryAlzheimers1         FALSE      FALSE
## CardiovascularDisease1           FALSE      FALSE
## Diabetes1                        FALSE      FALSE
## Depression1                      FALSE      FALSE
## HeadInjury1                      FALSE      FALSE
## Hypertension1                    FALSE      FALSE
## SystolicBP                       FALSE      FALSE
## DiastolicBP                      FALSE      FALSE
## CholesterolTotal                 FALSE      FALSE
## CholesterolLDL                   FALSE      FALSE
## CholesterolHDL                   FALSE      FALSE
## CholesterolTriglycerides         FALSE      FALSE
## MMSE                             FALSE      FALSE
## FunctionalAssessment             FALSE      FALSE
## MemoryComplaints1                FALSE      FALSE
## BehavioralProblems1              FALSE      FALSE
## ADL                              FALSE      FALSE
## Confusion1                       FALSE      FALSE
## Disorientation1                  FALSE      FALSE
## PersonalityChanges1              FALSE      FALSE
## DifficultyCompletingTasks1       FALSE      FALSE
## Forgetfulness1                   FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: exhaustive
##          Age Gender1 Ethnicity1 Ethnicity2 Ethnicity3 EducationLevel1
## 1  ( 1 ) " " " "     " "         " "         " "         " "
## 2  ( 1 ) " " " "     " "         " "         " "         " "
## 3  ( 1 ) " " " "     " "         " "         " "         " "
## 4  ( 1 ) " " " "     " "         " "         " "         " "
## 5  ( 1 ) " " " "     " "         " "         " "         " "
```

```
## 6  ( 1 ) " " " " " "     " "         " "         " "         " "
## 7  ( 1 ) "*" " " "     " "         " "         " "         " "
## 8  ( 1 ) "*" " " "     " "         " "         " "         " "
##          EducationLevel2 EducationLevel3 BMI Smoking1 AlcoholConsumption
## 1  ( 1 ) " "             " "             " " " "      " "
## 2  ( 1 ) " "             " "             " " " "      " "
## 3  ( 1 ) " "             " "             " " " "      " "
## 4  ( 1 ) " "             " "             " " " "      " "
## 5  ( 1 ) " "             " "             " " " "      " "
## 6  ( 1 ) " "             " "             " " " "      " "
## 7  ( 1 ) " "             " "             " " " "      " "
## 8  ( 1 ) " "             " "             " " " "      " "
##          PhysicalActivity DietQuality SleepQuality FamilyHistoryAlzheimers1
## 1  ( 1 ) " "               " "         " "          " "
## 2  ( 1 ) " "               " "         " "          " "
## 3  ( 1 ) " "               " "         " "          " "
## 4  ( 1 ) " "               " "         " "          " "
## 5  ( 1 ) " "               " "         " "          " "
## 6  ( 1 ) " "               " "         " "          " "
## 7  ( 1 ) " "               " "         " "          " "
## 8  ( 1 ) " "               " "         "*"          " "
##          CardiovascularDisease1 Diabetes1 Depression1 HeadInjury1 Hypertension1
## 1  ( 1 ) " "                    " "       " "         " "          " "
## 2  ( 1 ) " "                    " "       " "         " "          " "
## 3  ( 1 ) " "                    " "       " "         " "          " "
## 4  ( 1 ) " "                    " "       " "         " "          " "
## 5  ( 1 ) " "                    " "       " "         " "          " "
## 6  ( 1 ) " "                    " "       " "         " "          " "
## 7  ( 1 ) " "                    " "       " "         " "          " "
## 8  ( 1 ) " "                    " "       " "         " "          " "
##          SystolicBP DiastolicBP CholesterolTotal CholesterolLDL CholesterolHDL
## 1  ( 1 ) " "        " "         " "              " "            " "
## 2  ( 1 ) " "        " "         " "              " "            " "
## 3  ( 1 ) " "        " "         " "              " "            " "
## 4  ( 1 ) " "        " "         " "              " "            " "
## 5  ( 1 ) " "        " "         " "              " "            " "
## 6  ( 1 ) " "        " "         " "              "*"            " "
## 7  ( 1 ) " "        " "         " "              "*"            " "
## 8  ( 1 ) " "        " "         " "              "*"            " "
##          CholesterolTriglycerides MMSE FunctionalAssessment MemoryComplaints1
## 1  ( 1 ) " "                      " "  "*"                   " "
## 2  ( 1 ) " "                      " "  "*"                   " "
## 3  ( 1 ) " "                      " "  "*"                   "*"
## 4  ( 1 ) " "                      " "  "*"                   "*"
## 5  ( 1 ) " "                      "*"  "*"                   "*"
## 6  ( 1 ) " "                      "*"  "*"                   "*"
## 7  ( 1 ) " "                      "*"  "*"                   "*"
## 8  ( 1 ) " "                      "*"  "*"                   "*"
##          BehavioralProblems1 ADL Confusion1 Disorientation1 PersonalityChanges1
## 1  ( 1 ) " "                 " " " "        " "             " "
## 2  ( 1 ) " "                 "*" " "        " "             " "
## 3  ( 1 ) " "                 "*" " "        " "             " "
## 4  ( 1 ) "*"                 "*" " "        " "             " "
## 5  ( 1 ) "*"                 "*" " "        " "             " "
```

```
## 6  ( 1 ) "*"                 "*" " "         " "             " "
## 7  ( 1 ) "*"                 "*" " "         " "             " "
## 8  ( 1 ) "*"                 "*" " "         " "             " "
##          DifficultyCompletingTasks1 Forgetfulness1
## 1  ( 1 ) " "                        " "
## 2  ( 1 ) " "                        " "
## 3  ( 1 ) " "                        " "
## 4  ( 1 ) " "                        " "
## 5  ( 1 ) " "                        " "
## 6  ( 1 ) " "                        " "
## 7  ( 1 ) " "                        " "
## 8  ( 1 ) " "                        " "
```

```
which.min(bestsubsum$cp)
```

```
## [1] 8
```

```
which.min(bestsubsum$bic)
```

```
## [1] 5
```

```
which.min(bestsubsum$adjr2)
```

```
## [1] 1
```

```
knitr::kable(coef(bestsubset,8))
```

| | x |
|---|---|
| (Intercept) | 2.1734842 |
| Age | -0.0015068 |
| SleepQuality | -0.0074936 |
| CholesterolLDL | -0.0003843 |
| MMSE | -0.0130444 |
| FunctionalAssessment | -0.0557346 |
| MemoryComplaints1 | 0.3528825 |
| BehavioralProblems1 | 0.3154456 |
| ADL | -0.0508926 |

```
bestSubset_vars <- names(coef(bestsubset, 8))[-1]
bestSubset_vars
```

```
## [1] "Age"                  "SleepQuality"         "CholesterolLDL"
## [4] "MMSE"                 "FunctionalAssessment" "MemoryComplaints1"
## [7] "BehavioralProblems1"  "ADL"
```

```
bestSubset_STR<-paste(bestSubset_vars,collapse = ",")
```

**A MLR with best subset**

```
set.with.BestsubsetVar<-train%>%dplyr::select(Diagnosis,Age,SleepQuality,CholesterolHDL,MMSE,FunctionalA
MLR_bestsubset<-glm(Diagnosis~.,data=set.with.BestsubsetVar,family="binomial")
pred.bestsubset<-predict(MLR_bestsubset,newdata = test,type = "response",family="binomial")
class.bestsubset<-ifelse(pred.bestsubset>0.5,1,0)
table(class.bestsubset,test_y)
```

```
##                  test_y
## class.bestsubset   0   1
##                0 119  20
##                1  11  65
```

```
Recall.mlr.bestSub<-sum(class.bestsubset==1&test_y==1)/sum(test_y==1);Recall.mlr.bestSub
```

```
## [1] 0.7647059
```

```
Precision.mlr.bestSub<-sum(class.bestsubset == 1 & test_y == 1)/sum(class.bestsubset == 1);Precision.mli
```

```
## [1] 0.8552632
```

```
F1Score.mlr.bestSub<-2*Precision.mlr.bestSub*Recall.mlr.bestSub/(Precision.mlr.bestSub+Recall.mlr.bestSu
```

```
## [1] 0.8074534
```

```
Accuracy.mlr.bestSub<-sum(class.bestsubset == test_y)/length(test_y);Accuracy.mlr.bestSub
```

```
## [1] 0.855814
```

```
Metric.mlr.bestSub<-data.frame("Recall"= Recall.mlr.bestSub,"Precision"=Precision.mlr.bestSub,"F1 score
```

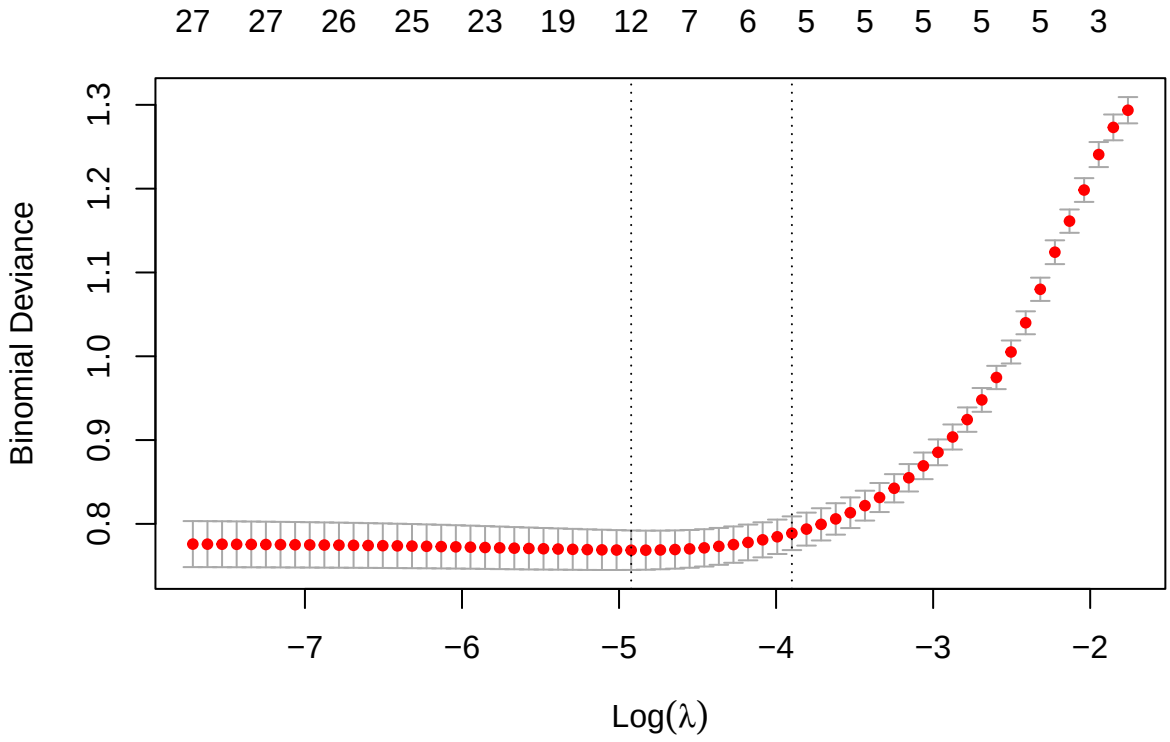
**lasso**

```
##subject to fix
library(glmnet)
grid <- 10^seq(10,-2, length = 100)
train_y.lasso<-train_y%>%mutate(Diagnosis=as.factor(Diagnosis))
train_x_lasso<-as.matrix(train_x)
lasso.mod<-glmnet(train_x_lasso,train_y.lasso$Diagnosis,alpha = 1,lambda = grid,family = "binomial")

summary(lasso.mod)
```

```
##            Length Class     Mode
## a0          100   -none-    numeric
## beta       2900   dgCMatrix S4
## df          100   -none-    numeric
## dim           2   -none-    numeric
## lambda      100   -none-    numeric
## dev.ratio   100   -none-    numeric
```

```
## nulldev       1   -none-    numeric
## npasses       1   -none-    numeric
## jerr          1   -none-    numeric
## offset        1   -none-    logical
## classnames    2   -none-    character
## call          6   -none-    call
## nobs          1   -none-    numeric
```

```
cv.out <-cv.glmnet(train_x_lasso, train_y.lasso$Diagnosis, alpha = 1,family="binomial",nfolds = 10)
plot(cv.out)
```




```
best_lambda <- cv.out$lambda.min;best_lambda
```

```
## [1] 0.007279412
```

```
train_y<-as.matrix(train_y)
lasso.final<-glmnet(train_x_lasso,train_y.lasso$Diagnosis,alpha = 1,lambda = best_lambda,family = "binor
lasso.pred <- predict(lasso.final, s = best_lambda, newx = as.matrix(test_x))
lasso.pred.class<-ifelse(lasso.pred > 0.5,1,0)
table(prediction=lasso.pred.class,actual=test_y)
```

```
##           actual
## prediction   0   1
##          0 126  34
##          1   4  51
```

```
Recall.lasso<-sum(lasso.pred.class == 1 & test_y == 1)/sum(test_y == 1);Recall.lasso
```

```
## [1] 0.6
```

```
Precision.lasso<-sum(lasso.pred.class == 1 & test_y == 1)/sum(lasso.pred.class == 1);Precision.lasso
```

```
## [1] 0.9272727
```

```
F1Score.lasso<-2*Precision.lasso*Recall.lasso/(Precision.lasso+Recall.lasso);F1Score.lasso
```

```
## [1] 0.7285714
```

```
Accuracy.lasso<-sum(lasso.pred.class == test_y)/length(test_y);Accuracy.lasso
```

```
## [1] 0.8232558
```

```
Metric.lasso<-data.frame("Recall"=Recall.lasso,"Precision"=Precision.lasso,"Accuracy"=Accuracy.lasso,"F
```

```
ALZH_noID_noCholest<-
  ALZH_noID%>%
  dplyr::select(-CholesterolTotal,-CholesterolHDL,-CholesterolLDL,-CholesterolTriglycerides)
```

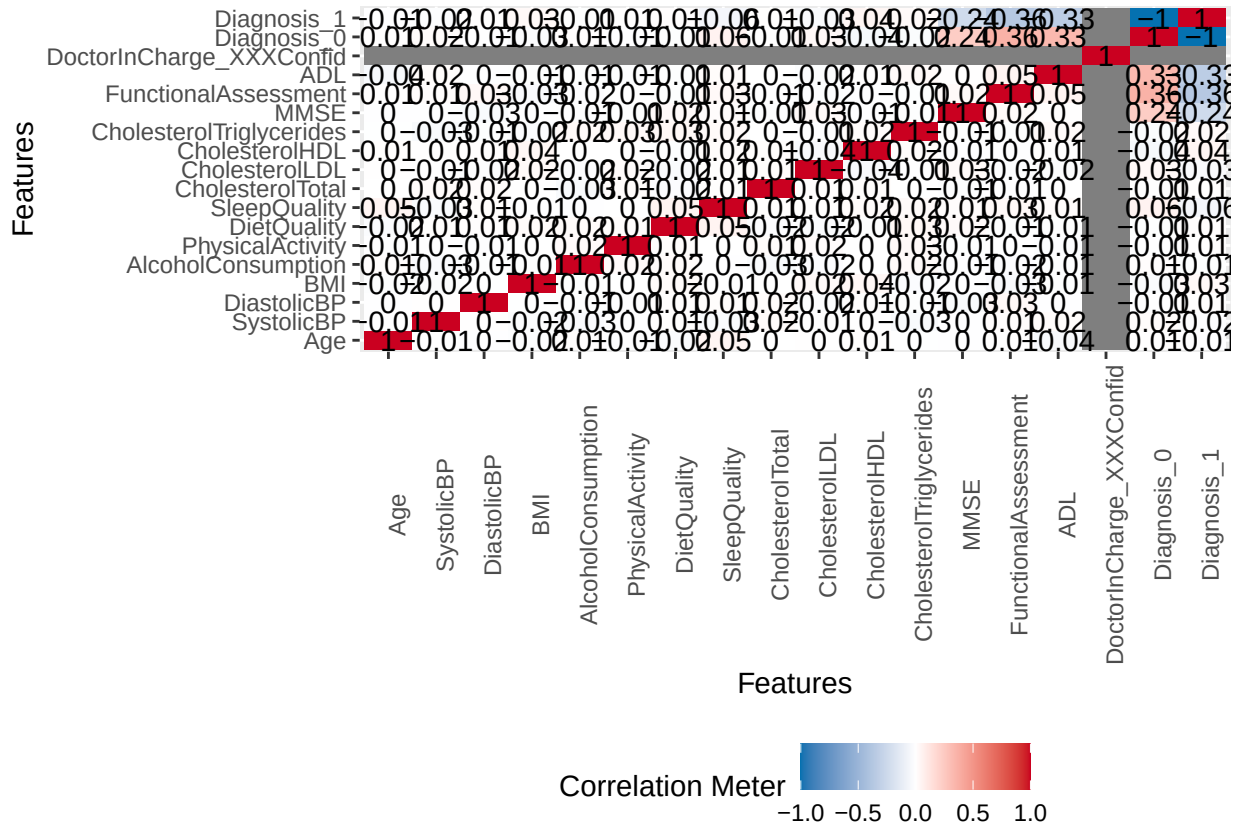
**KNN**

```
ALZH_IntOnly<-ALZH_noID[,sapply(ALZH.gbm,is.integer)]
ALZH_double<-ALZH_noID[,sapply(ALZH.gbm,is.double)]
ALZH_NumOnly<-cbind(ALZH_IntOnly,ALZH_double)
ALZH_fct<-ALZH_noID[,sapply(ALZH.gbm,is.factor)]
```

```
plot_correlation(ALZH_NumOnly)
```

```
## Warning in cor(x = structure(list(Age = c(73L, 89L, 73L, 74L, 89L, 86L, : the
## standard deviation is zero
```

```
## Warning: Removed 34 rows containing missing values or values outside the scale range
## (`geom_text()`).
```




```
#RFE.featureSet<-ALZH_NumOnly[draw,]%>%dplyr::select(-Diagnosis,DoctorInCharge)
#RFE.featureSet<-as.data.frame(RFE.featureSet)
#RFE.response<-ALZH_NumOnly[draw,]%>%dplyr::select(Diagnosis)

RFE.featureSet <- ALZH_NumOnly[draw,-which(names(ALZH_NumOnly) == "Diagnosis")]
RFE.featureSet<-RFE.featureSet[,-which(names(RFE.featureSet) == "DoctorInCharge")]
RFE.featureSet<-RFE.featureSet%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglycerides))
RFE.response <- ALZH_NumOnly[draw, "Diagnosis"]

set.seed(12345)
control<-rfeControl(functions = rfFuncs, method = "cv", number = 10)
RFE.result<-rfe(RFE.featureSet,RFE.response, sizes = c(1:15), rfeControl = control)
print(RFE.result)
```

**Feature Selection for kNN**

```
##
## Recursive feature selection
##
## Outer resampling method: Cross-Validated (10 fold)
##
## Resampling performance over subset size:
##
```

```
##  Variables Accuracy  Kappa AccuracySD KappaSD Selected
##          1   0.6257 0.1754    0.03259 0.07033
##          2   0.7384 0.4200    0.02731 0.05662
##          3   0.8082 0.5522    0.02179 0.05236
##          4   0.8180 0.5737    0.02604 0.06161
##          5   0.8221 0.5819    0.02253 0.05103
##          6   0.8206 0.5757    0.02336 0.05581
##          7   0.8216 0.5787    0.02289 0.05282
##          8   0.8263 0.5876    0.02226 0.05202
##          9   0.8268 0.5886    0.01838 0.04473
##         10   0.8293 0.5934    0.02156 0.05172
##         11   0.8273 0.5885    0.01896 0.04517
##         12   0.8304 0.5936    0.01932 0.04743        *
##
## The top 5 variables (out of 12):
##    FunctionalAssessment, MMSE, ADL, SleepQuality, DietQuality
```

```
#alzh_secondKNN and the later alzh.gbm.forTuning are the same
alzh_secondKNN<-ALZH_NumOnly[draw,]%>%
dplyr::select(FunctionalAssessment, MMSE, ADL, DietQuality, SleepQuality,Diagnosis)%>%
mutate(Diagnosis=as.factor(Diagnosis))
alzh_secondKNN.test<-ALZH.gbm[-draw,]%>%dplyr::select(FunctionalAssessment, MMSE, ADL, DietQuality, Sle
mutate(Diagnosis=as.factor(Diagnosis))
```

```
set.seed(12345)
k_list<-seq(1,20,by=1)
nk<-length(k_list);nk
```

```
## [1] 20
```

```
Perf.Metric.knn<-data.frame(k=rep(0,nk),Recall=rep(0,length(k_list)),Precision=rep(0,length(k_list)),F1
Accuracy=rep(0,length(k_list)))

set.seed(12345)
n<-nrow(alzh_secondKNN)
pool<-rep(1:10,ceiling(n/10))
fold<-sample(pool,n,replace = FALSE)

for(k in 1:nk){
  Perf.Metric.knn$k[k]<-k

  recall.sum<-0
  precision.sum<-0
  f1_score.sum<-0
  accuracy.sum<-0


  for(i in 1:10){
    #Find data in each fold
    infold<-which(fold == i)

    #Create training and testing sets
    Train<-alzh_secondKNN[-infold,]
```

```
    Test<-alzh_secondKNN[infold,]
    #Run kNN
    k_preds<-knn(Train%>%select(-Diagnosis),Test%>%select(-Diagnosis),k=k,cl=Train$Diagnosis)

    Recall<-sum(k_preds == 1 & Test$Diagnosis == 1)/sum(Test$Diagnosis == 1);recall.sum<-recall.sum+Reca
    Precision<-sum(k_preds == 1 & Test$Diagnosis == 1)/sum(k_preds == 1);precision.sum<-precision.sum+Pr
    F1_Score<-2*Precision*Recall/(Precision+Recall);f1_score.sum<-f1_score.sum+F1_Score
    Accuracy<-sum(k_preds == Test$Diagnosis)/length(Test$Diagnosis);accuracy.sum<-accuracy.sum+Accuracy

  }

    Perf.Metric.knn$Recall[k]<-recall.sum/10
    Perf.Metric.knn$Precision[k]<-precision.sum/10
    Perf.Metric.knn$F1_Score[k]<-f1_score.sum/10
    Perf.Metric.knn$Accuracy[k]<-accuracy.sum/10

}

Perf.Metric.knn$k[which.max(Perf.Metric.knn$Recall)]
```

```
## [1] 1
```

```
Perf.Metric.knn
```

```
##     k    Recall Precision  F1_Score  Accuracy
## 1   1 0.6403017 0.6298578 0.6338582 0.7440575
## 2   2 0.6329861 0.6525068 0.6414886 0.7539131
## 3   3 0.6295043 0.7049775 0.6642345 0.7787034
## 4   4 0.6311181 0.7129507 0.6680106 0.7827976
## 5   5 0.6083041 0.7309030 0.6624085 0.7843520
## 6   6 0.6062049 0.7484180 0.6678650 0.7900329
## 7   7 0.6059796 0.7604216 0.6726508 0.7946586
## 8   8 0.5963425 0.7485469 0.6621445 0.7889617
## 9   9 0.5943695 0.7772002 0.6719153 0.7993487
## 10 10 0.6100336 0.7785780 0.6820490 0.8029758
## 11 11 0.6004353 0.7807016 0.6772721 0.8019073
## 12 12 0.5978152 0.7877733 0.6782483 0.8024362
## 13 13 0.5912956 0.7864132 0.6735401 0.8008844
## 14 14 0.5978156 0.7955327 0.6807846 0.8055450
## 15 15 0.5918308 0.7970315 0.6776401 0.8045195
## 16 16 0.5927360 0.7979270 0.6783759 0.8055639
## 17 17 0.5902186 0.7992625 0.6774772 0.8050323
## 18 18 0.5964732 0.7960977 0.6803138 0.8055558
## 19 19 0.6023228 0.7998812 0.6856613 0.8091855
## 20 20 0.5931489 0.7914241 0.6756385 0.8035020
```

```
knn.final<-knn(train = alzh_secondKNN%>%select(-Diagnosis),test = alzh_secondKNN.test%>%select(-Diagnosi
table(knn.final,alzh_secondKNN.test$Diagnosis)
```

```
##
## knn.final   0   1
##         0 101  30
##         1  29  55
```

```
Recall.knn.final<-sum(knn.final == 1 & alzh_secondKNN.test$Diagnosis == 1)/sum(alzh_secondKNN.test$Diagn
```

```
## [1] 0.6470588
```

```
Precision.knn.final<-sum(knn.final == 1 & alzh_secondKNN.test$Diagnosis == 1)/sum(knn.final == 1);Precis
```

```
## [1] 0.6547619
```

```
F1Score.knn.final<-2*Precision.knn.final*Recall.knn.final/(Precision.knn.final+Recall.knn.final);F1Score
```

```
## [1] 0.6508876
```

```
Accuracy.knn.final<-sum(knn.final == alzh_secondKNN.test$Diagnosis)/length(alzh_secondKNN.test$Diagnosis
```

```
## [1] 0.7255814
```

```
Metric.knn<-data.frame("Recall"= Recall.knn.final,"Precision"=Precision.knn.final,"Accuracy"=Accuracy.kn
```

### gbm

```
set.seed(12345)
ALZH.boosting<-ALZH.gbm%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglycerides))
boosting.try <- gbm(Diagnosis ~ ., data = ALZH.boosting[draw,], distribution = "bernoulli", n.trees = 5
```

```
yhat.gbm<-predict(boosting.try,newdata = ALZH.gbm[-draw,],n.trees = 5000,interaction.depth = 4,shrinkage
pred_gbm_class <- ifelse(yhat.gbm > 0.5, 1, 0)
knitr::kable(table("Prediction"=pred_gbm_class,"Actual"=ALZH.gbm[-draw,]$Diagnosis))
```

| | 0 | 1 |
|---|---|---|
| 0 | 125 | 5 |
| 1 | 5 | 80 |

```
set.seed(12345)
lambda_val <- seq(0.01, 0.05, by = 0.01)
result_container <- data.frame(Lambda = lambda_val, Recall = rep(0, length(lambda_val)), Precision = rep
ALZH.boosting.forTunine<-ALZH.gbm[draw,]
ALZH.boosting.realTest<-ALZH.gbm[-draw,]
```

### Tune Together with 10 fold cv

This one is correct!!

```
ALZH.gbm.forTuning<-ALZH.gbm[draw,]
ALZH.gbm.realTest<-ALZH.gbm[-draw,]
```

```r
set.seed(12345)
lambda_val <- seq(0.01, 0.03, by = 0.01)
ntree_val <- c(1000, 2000, 3000)

ALZH.gbm.forGrid<-ALZH.gbm.forTuning%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglyceride
ALZH.gbm.forGrid$Diagnosis <- factor(ALZH.gbm.forGrid$Diagnosis, levels = c(0, 1), labels = c("No", "Yes
ALZH.gbm.realTest<-ALZH.gbm[-draw,]%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglycerides


### Grid Creation
train.control<-trainControl(method="cv",number=10,summaryFunction=twoClassSummary,classProbs=TRUE,savePr
grid<-expand.grid(shrinkage=lambda_val,
n.trees=ntree_val,
interaction.depth=4,n.minobsinnode=10)##default is 10


set.seed(12345)
Boosting_alzh_grid <- train(
  Diagnosis ~ .,
  data = ALZH.gbm.forGrid,
  method = "gbm",
  trControl = train.control,
  tuneGrid = grid,
  distribution = "bernoulli",
  metric = "ROC",
  verbose=TRUE,
  train.fraction = 0.9
)
```

```
## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter 'train.fraction' is deprecated, please specify
## 'nTrain' instead.
```

```
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2866          1.2502     0.0100    0.0051
##      2        1.2778          1.2411     0.0100    0.0042
##      3        1.2682          1.2318     0.0100    0.0049
##      4        1.2582          1.2221     0.0100    0.0045
##      5        1.2492          1.2134     0.0100    0.0041
##      6        1.2406          1.2047     0.0100    0.0042
##      7        1.2313          1.1954     0.0100    0.0045
##      8        1.2223          1.1866     0.0100    0.0046
##      9        1.2137          1.1775     0.0100    0.0039
##     10        1.2053          1.1692     0.0100    0.0041
##     20        1.1270          1.0902     0.0100    0.0034
##     40        1.0052          0.9675     0.0100    0.0026
##     60        0.9118          0.8734     0.0100    0.0020
##     80        0.8375          0.7970     0.0100    0.0016
##    100        0.7756          0.7379     0.0100    0.0013
##    120        0.7235          0.6860     0.0100    0.0010
##    140        0.6804          0.6423     0.0100    0.0008
##    160        0.6443          0.6059     0.0100    0.0008
##    180        0.6139          0.5760     0.0100    0.0005
```

```
##    200        0.5858          0.5477     0.0100    0.0006
##    220        0.5634          0.5254     0.0100    0.0004
##    240        0.5431          0.5053     0.0100    0.0003
##    260        0.5264          0.4885     0.0100    0.0002
##    280        0.5106          0.4723     0.0100    0.0002
##    300        0.4973          0.4589     0.0100    0.0003
##    320        0.4857          0.4477     0.0100    0.0001
##    340        0.4760          0.4403     0.0100    0.0002
##    360        0.4670          0.4346     0.0100    0.0001
##    380        0.4589          0.4284     0.0100    0.0000
##    400        0.4511          0.4227     0.0100    0.0001
##    420        0.4448          0.4182     0.0100    0.0001
##    440        0.4381          0.4131     0.0100    0.0001
##    460        0.4322          0.4105     0.0100   -0.0001
##    480        0.4265          0.4069     0.0100    0.0001
##    500        0.4212          0.4043     0.0100    0.0000
##    520        0.4155          0.3999     0.0100   -0.0000
##    540        0.4100          0.3975     0.0100    0.0000
##    560        0.4053          0.3960     0.0100   -0.0000
##    580        0.4005          0.3934     0.0100   -0.0001
##    600        0.3958          0.3908     0.0100    0.0000
##    620        0.3913          0.3895     0.0100    0.0000
##    640        0.3873          0.3887     0.0100   -0.0000
##    660        0.3830          0.3876     0.0100   -0.0001
##    680        0.3793          0.3885     0.0100   -0.0000
##    700        0.3752          0.3874     0.0100   -0.0000
##    720        0.3711          0.3864     0.0100   -0.0000
##    740        0.3674          0.3863     0.0100   -0.0000
##    760        0.3635          0.3854     0.0100   -0.0001
##    780        0.3602          0.3837     0.0100   -0.0001
##    800        0.3568          0.3824     0.0100   -0.0000
##    820        0.3535          0.3825     0.0100   -0.0000
##    840        0.3504          0.3813     0.0100   -0.0000
##    860        0.3472          0.3807     0.0100   -0.0000
##    880        0.3439          0.3809     0.0100   -0.0001
##    900        0.3407          0.3802     0.0100   -0.0000
##    920        0.3379          0.3807     0.0100   -0.0001
##    940        0.3346          0.3807     0.0100   -0.0001
##    960        0.3311          0.3802     0.0100   -0.0001
##    980        0.3285          0.3815     0.0100   -0.0000
##   1000        0.3257          0.3816     0.0100   -0.0000
##   1020        0.3231          0.3812     0.0100   -0.0000
##   1040        0.3204          0.3816     0.0100   -0.0000
##   1060        0.3175          0.3805     0.0100   -0.0000
##   1080        0.3151          0.3814     0.0100   -0.0000
##   1100        0.3124          0.3811     0.0100   -0.0001
##   1120        0.3099          0.3804     0.0100   -0.0001
##   1140        0.3071          0.3809     0.0100   -0.0001
##   1160        0.3042          0.3812     0.0100   -0.0001
##   1180        0.3021          0.3820     0.0100   -0.0000
##   1200        0.2995          0.3827     0.0100   -0.0000
##   1220        0.2969          0.3829     0.0100   -0.0000
##   1240        0.2945          0.3830     0.0100   -0.0001
##   1260        0.2919          0.3838     0.0100   -0.0000
```

```
##   1280        0.2898          0.3832     0.0100   -0.0001
##   1300        0.2873          0.3839     0.0100   -0.0000
##   1320        0.2851          0.3844     0.0100   -0.0000
##   1340        0.2827          0.3848     0.0100   -0.0001
##   1360        0.2805          0.3848     0.0100   -0.0000
##   1380        0.2780          0.3855     0.0100   -0.0001
##   1400        0.2757          0.3865     0.0100   -0.0000
##   1420        0.2738          0.3855     0.0100   -0.0000
##   1440        0.2717          0.3859     0.0100   -0.0000
##   1460        0.2696          0.3868     0.0100   -0.0001
##   1480        0.2674          0.3872     0.0100   -0.0000
##   1500        0.2652          0.3877     0.0100   -0.0000
##   1520        0.2631          0.3888     0.0100   -0.0000
##   1540        0.2610          0.3896     0.0100   -0.0000
##   1560        0.2591          0.3905     0.0100   -0.0000
##   1580        0.2570          0.3921     0.0100   -0.0000
##   1600        0.2551          0.3912     0.0100   -0.0001
##   1620        0.2532          0.3907     0.0100   -0.0001
##   1640        0.2509          0.3920     0.0100    0.0000
##   1660        0.2492          0.3917     0.0100   -0.0000
##   1680        0.2470          0.3921     0.0100   -0.0000
##   1700        0.2452          0.3931     0.0100   -0.0000
##   1720        0.2429          0.3928     0.0100   -0.0000
##   1740        0.2407          0.3923     0.0100   -0.0000
##   1760        0.2389          0.3928     0.0100   -0.0000
##   1780        0.2372          0.3939     0.0100   -0.0000
##   1800        0.2353          0.3937     0.0100   -0.0000
##   1820        0.2337          0.3941     0.0100   -0.0000
##   1840        0.2320          0.3936     0.0100   -0.0000
##   1860        0.2304          0.3944     0.0100   -0.0000
##   1880        0.2287          0.3951     0.0100   -0.0000
##   1900        0.2270          0.3950     0.0100   -0.0000
##   1920        0.2253          0.3951     0.0100   -0.0000
##   1940        0.2238          0.3946     0.0100   -0.0000
##   1960        0.2222          0.3945     0.0100   -0.0000
##   1980        0.2207          0.3951     0.0100   -0.0000
##   2000        0.2188          0.3954     0.0100   -0.0000
##   2020        0.2174          0.3948     0.0100   -0.0000
##   2040        0.2158          0.3951     0.0100   -0.0000
##   2060        0.2145          0.3939     0.0100   -0.0001
##   2080        0.2128          0.3944     0.0100   -0.0000
##   2100        0.2113          0.3958     0.0100   -0.0000
##   2120        0.2098          0.3963     0.0100   -0.0001
##   2140        0.2083          0.3959     0.0100   -0.0000
##   2160        0.2069          0.3958     0.0100   -0.0000
##   2180        0.2054          0.3964     0.0100   -0.0000
##   2200        0.2039          0.3956     0.0100   -0.0000
##   2220        0.2024          0.3962     0.0100   -0.0000
##   2240        0.2010          0.3958     0.0100   -0.0000
##   2260        0.1994          0.3959     0.0100   -0.0000
##   2280        0.1979          0.3953     0.0100   -0.0000
##   2300        0.1965          0.3949     0.0100   -0.0001
##   2320        0.1951          0.3945     0.0100   -0.0000
##   2340        0.1934          0.3950     0.0100   -0.0000
```

```
##   2360        0.1922           0.3955     0.0100   -0.0000
##   2380        0.1909           0.3955     0.0100   -0.0000
##   2400        0.1897           0.3948     0.0100   -0.0000
##   2420        0.1883           0.3943     0.0100   -0.0000
##   2440        0.1872           0.3946     0.0100   -0.0000
##   2460        0.1859           0.3937     0.0100   -0.0000
##   2480        0.1845           0.3939     0.0100   -0.0001
##   2500        0.1831           0.3942     0.0100   -0.0000
##   2520        0.1818           0.3938     0.0100   -0.0000
##   2540        0.1806           0.3937     0.0100   -0.0000
##   2560        0.1793           0.3950     0.0100   -0.0000
##   2580        0.1782           0.3967     0.0100   -0.0000
##   2600        0.1769           0.3971     0.0100   -0.0000
##   2620        0.1758           0.3976     0.0100   -0.0000
##   2640        0.1745           0.3974     0.0100   -0.0000
##   2660        0.1735           0.3972     0.0100   -0.0000
##   2680        0.1724           0.3970     0.0100   -0.0000
##   2700        0.1713           0.3970     0.0100   -0.0000
##   2720        0.1700           0.3964     0.0100   -0.0000
##   2740        0.1689           0.3965     0.0100   -0.0000
##   2760        0.1678           0.3963     0.0100   -0.0001
##   2780        0.1665           0.3970     0.0100    0.0000
##   2800        0.1655           0.3967     0.0100   -0.0000
##   2820        0.1642           0.3977     0.0100   -0.0000
##   2840        0.1632           0.3978     0.0100   -0.0000
##   2860        0.1620           0.3976     0.0100   -0.0000
##   2880        0.1608           0.3977     0.0100   -0.0000
##   2900        0.1598           0.3983     0.0100   -0.0000
##   2920        0.1587           0.3978     0.0100   -0.0000
##   2940        0.1577           0.3989     0.0100   -0.0000
##   2960        0.1565           0.3981     0.0100   -0.0001
##   2980        0.1555           0.3980     0.0100   -0.0000
##   3000        0.1544           0.3974     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2762          1.2403     0.0200    0.0106
##      2        1.2572          1.2213     0.0200    0.0091
##      3        1.2384          1.2028     0.0200    0.0094
##      4        1.2215          1.1859     0.0200    0.0081
##      5        1.2041          1.1683     0.0200    0.0090
##      6        1.1869          1.1508     0.0200    0.0079
##      7        1.1708          1.1360     0.0200    0.0073
##      8        1.1558          1.1205     0.0200    0.0073
##      9        1.1410          1.1051     0.0200    0.0070
##     10        1.1268          1.0904     0.0200    0.0066
##     20        1.0059          0.9668     0.0200    0.0052
##     40        0.8381          0.7979     0.0200    0.0029
##     60        0.7275          0.6895     0.0200    0.0021
##     80        0.6469          0.6107     0.0200    0.0016
##    100        0.5892          0.5519     0.0200    0.0011
```

```
##    120        0.5459          0.5080     0.0200    0.0007
##    140        0.5122          0.4737     0.0200    0.0007
##    160        0.4900          0.4537     0.0200    0.0005
##    180        0.4705          0.4365     0.0200    0.0002
##    200        0.4540          0.4249     0.0200    0.0003
##    220        0.4407          0.4159     0.0200    0.0000
##    240        0.4293          0.4086     0.0200   -0.0000
##    260        0.4182          0.4026     0.0200    0.0001
##    280        0.4088          0.3960     0.0200    0.0002
##    300        0.3991          0.3944     0.0200    0.0001
##    320        0.3905          0.3945     0.0200   -0.0002
##    340        0.3826          0.3915     0.0200   -0.0001
##    360        0.3754          0.3881     0.0200   -0.0002
##    380        0.3692          0.3857     0.0200   -0.0001
##    400        0.3616          0.3833     0.0200   -0.0000
##    420        0.3552          0.3832     0.0200    0.0001
##    440        0.3487          0.3808     0.0200   -0.0002
##    460        0.3422          0.3797     0.0200    0.0001
##    480        0.3360          0.3780     0.0200   -0.0001
##    500        0.3303          0.3755     0.0200   -0.0001
##    520        0.3248          0.3770     0.0200   -0.0000
##    540        0.3196          0.3783     0.0200   -0.0002
##    560        0.3139          0.3788     0.0200   -0.0001
##    580        0.3086          0.3827     0.0200   -0.0001
##    600        0.3033          0.3821     0.0200   -0.0001
##    620        0.2988          0.3833     0.0200   -0.0002
##    640        0.2940          0.3826     0.0200   -0.0000
##    660        0.2896          0.3853     0.0200   -0.0001
##    680        0.2847          0.3857     0.0200    0.0000
##    700        0.2802          0.3838     0.0200   -0.0000
##    720        0.2763          0.3827     0.0200   -0.0001
##    740        0.2720          0.3834     0.0200   -0.0002
##    760        0.2679          0.3879     0.0200   -0.0001
##    780        0.2636          0.3886     0.0200   -0.0002
##    800        0.2600          0.3873     0.0200   -0.0001
##    820        0.2563          0.3895     0.0200   -0.0001
##    840        0.2525          0.3893     0.0200   -0.0001
##    860        0.2484          0.3882     0.0200   -0.0001
##    880        0.2449          0.3888     0.0200   -0.0001
##    900        0.2408          0.3908     0.0200   -0.0000
##    920        0.2369          0.3926     0.0200   -0.0001
##    940        0.2340          0.3915     0.0200   -0.0001
##    960        0.2309          0.3918     0.0200   -0.0001
##    980        0.2275          0.3922     0.0200   -0.0001
##   1000        0.2243          0.3955     0.0200   -0.0001
##   1020        0.2212          0.3956     0.0200   -0.0001
##   1040        0.2180          0.3948     0.0200   -0.0001
##   1060        0.2151          0.3959     0.0200   -0.0001
##   1080        0.2124          0.3969     0.0200   -0.0001
##   1100        0.2093          0.3947     0.0200   -0.0001
##   1120        0.2066          0.3940     0.0200   -0.0000
##   1140        0.2039          0.3951     0.0200   -0.0001
##   1160        0.2007          0.3957     0.0200   -0.0001
##   1180        0.1979          0.3969     0.0200   -0.0000
```

```
##   1200        0.1947          0.3962     0.0200   -0.0001
##   1220        0.1916          0.3967     0.0200   -0.0000
##   1240        0.1890          0.3969     0.0200   -0.0001
##   1260        0.1865          0.3983     0.0200   -0.0001
##   1280        0.1840          0.3975     0.0200   -0.0001
##   1300        0.1815          0.3975     0.0200   -0.0001
##   1320        0.1784          0.3951     0.0200   -0.0001
##   1340        0.1758          0.3958     0.0200   -0.0000
##   1360        0.1732          0.3953     0.0200   -0.0001
##   1380        0.1707          0.3941     0.0200   -0.0000
##   1400        0.1684          0.3948     0.0200   -0.0001
##   1420        0.1661          0.3958     0.0200   -0.0000
##   1440        0.1637          0.3958     0.0200   -0.0000
##   1460        0.1614          0.3949     0.0200   -0.0000
##   1480        0.1591          0.3950     0.0200   -0.0001
##   1500        0.1575          0.3964     0.0200   -0.0001
##   1520        0.1554          0.3949     0.0200   -0.0001
##   1540        0.1532          0.3935     0.0200   -0.0000
##   1560        0.1514          0.3941     0.0200   -0.0001
##   1580        0.1494          0.3938     0.0200   -0.0001
##   1600        0.1476          0.3950     0.0200   -0.0000
##   1620        0.1457          0.3953     0.0200   -0.0001
##   1640        0.1439          0.3947     0.0200   -0.0001
##   1660        0.1421          0.3952     0.0200   -0.0000
##   1680        0.1403          0.3965     0.0200   -0.0001
##   1700        0.1385          0.3973     0.0200   -0.0001
##   1720        0.1367          0.3977     0.0200   -0.0001
##   1740        0.1351          0.4000     0.0200   -0.0000
##   1760        0.1334          0.3997     0.0200   -0.0001
##   1780        0.1317          0.3993     0.0200   -0.0000
##   1800        0.1298          0.3994     0.0200   -0.0001
##   1820        0.1284          0.3995     0.0200   -0.0000
##   1840        0.1269          0.3980     0.0200   -0.0000
##   1860        0.1253          0.3974     0.0200    0.0000
##   1880        0.1239          0.3973     0.0200   -0.0000
##   1900        0.1223          0.3973     0.0200   -0.0000
##   1920        0.1206          0.3962     0.0200   -0.0001
##   1940        0.1192          0.3981     0.0200   -0.0000
##   1960        0.1178          0.3979     0.0200   -0.0001
##   1980        0.1161          0.3984     0.0200   -0.0000
##   2000        0.1147          0.3977     0.0200   -0.0000
##   2020        0.1133          0.4009     0.0200   -0.0000
##   2040        0.1119          0.4020     0.0200   -0.0000
##   2060        0.1104          0.4017     0.0200   -0.0000
##   2080        0.1091          0.4017     0.0200   -0.0001
##   2100        0.1080          0.4020     0.0200   -0.0000
##   2120        0.1067          0.4005     0.0200   -0.0000
##   2140        0.1052          0.4019     0.0200   -0.0000
##   2160        0.1040          0.4015     0.0200   -0.0000
##   2180        0.1026          0.4007     0.0200    0.0000
##   2200        0.1014          0.4015     0.0200   -0.0000
##   2220        0.1002          0.4015     0.0200   -0.0000
##   2240        0.0989          0.3999     0.0200    0.0000
##   2260        0.0975          0.4001     0.0200   -0.0000
```

```
##   2280        0.0963          0.4006     0.0200   -0.0000
##   2300        0.0952          0.4008     0.0200   -0.0000
##   2320        0.0940          0.4009     0.0200   -0.0000
##   2340        0.0929          0.4004     0.0200   -0.0000
##   2360        0.0918          0.3983     0.0200   -0.0000
##   2380        0.0908          0.3991     0.0200   -0.0000
##   2400        0.0896          0.3989     0.0200   -0.0000
##   2420        0.0887          0.4000     0.0200   -0.0000
##   2440        0.0877          0.3971     0.0200   -0.0000
##   2460        0.0868          0.3974     0.0200   -0.0000
##   2480        0.0858          0.3981     0.0200   -0.0000
##   2500        0.0848          0.3985     0.0200   -0.0000
##   2520        0.0838          0.3978     0.0200   -0.0000
##   2540        0.0828          0.3985     0.0200   -0.0000
##   2560        0.0818          0.3984     0.0200   -0.0000
##   2580        0.0808          0.3988     0.0200   -0.0000
##   2600        0.0799          0.3977     0.0200   -0.0000
##   2620        0.0789          0.3969     0.0200   -0.0000
##   2640        0.0781          0.3969     0.0200   -0.0000
##   2660        0.0772          0.3977     0.0200   -0.0000
##   2680        0.0764          0.3984     0.0200   -0.0000
##   2700        0.0756          0.3979     0.0200   -0.0000
##   2720        0.0748          0.3984     0.0200   -0.0000
##   2740        0.0741          0.3977     0.0200   -0.0000
##   2760        0.0733          0.3992     0.0200   -0.0000
##   2780        0.0725          0.3999     0.0200   -0.0000
##   2800        0.0717          0.4013     0.0200   -0.0000
##   2820        0.0709          0.4008     0.0200   -0.0000
##   2840        0.0701          0.3990     0.0200   -0.0000
##   2860        0.0692          0.3980     0.0200   -0.0000
##   2880        0.0685          0.3986     0.0200   -0.0000
##   2900        0.0677          0.3985     0.0200   -0.0000
##   2920        0.0668          0.3993     0.0200   -0.0000
##   2940        0.0662          0.3990     0.0200   -0.0000
##   2960        0.0655          0.3974     0.0200   -0.0000
##   2980        0.0647          0.3964     0.0200   -0.0000
##   3000        0.0640          0.3983     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2658          1.2293     0.0300    0.0154
##      2        1.2373          1.2013     0.0300    0.0143
##      3        1.2091          1.1731     0.0300    0.0133
##      4        1.1839          1.1474     0.0300    0.0126
##      5        1.1600          1.1232     0.0300    0.0111
##      6        1.1364          1.0989     0.0300    0.0114
##      7        1.1139          1.0756     0.0300    0.0106
##      8        1.0932          1.0541     0.0300    0.0095
##      9        1.0737          1.0357     0.0300    0.0092
##     10        1.0548          1.0165     0.0300    0.0091
##     20        0.9094          0.8683     0.0300    0.0055
```

```
##    40        0.7216          0.6840     0.0300    0.0030
##    60        0.6096          0.5673     0.0300    0.0018
##    80        0.5409          0.5028     0.0300    0.0015
##   100        0.4965          0.4600     0.0300    0.0004
##   120        0.4671          0.4323     0.0300    0.0001
##   140        0.4453          0.4159     0.0300    0.0002
##   160        0.4271          0.4067     0.0300    0.0001
##   180        0.4112          0.3994     0.0300    0.0000
##   200        0.3968          0.3931     0.0300    0.0001
##   220        0.3841          0.3894     0.0300    0.0000
##   240        0.3714          0.3898     0.0300    0.0000
##   260        0.3603          0.3922     0.0300   -0.0001
##   280        0.3506          0.3890     0.0300   -0.0000
##   300        0.3405          0.3895     0.0300   -0.0001
##   320        0.3316          0.3907     0.0300    0.0001
##   340        0.3223          0.3900     0.0300   -0.0001
##   360        0.3137          0.3899     0.0300   -0.0004
##   380        0.3051          0.3882     0.0300   -0.0002
##   400        0.2971          0.3878     0.0300   -0.0001
##   420        0.2898          0.3874     0.0300    0.0000
##   440        0.2834          0.3888     0.0300   -0.0001
##   460        0.2761          0.3871     0.0300   -0.0002
##   480        0.2696          0.3872     0.0300   -0.0001
##   500        0.2620          0.3893     0.0300   -0.0001
##   520        0.2557          0.3855     0.0300   -0.0002
##   540        0.2498          0.3844     0.0300   -0.0001
##   560        0.2445          0.3832     0.0300   -0.0001
##   580        0.2382          0.3823     0.0300   -0.0001
##   600        0.2331          0.3834     0.0300   -0.0001
##   620        0.2273          0.3824     0.0300   -0.0003
##   640        0.2226          0.3841     0.0300   -0.0001
##   660        0.2180          0.3824     0.0300   -0.0001
##   680        0.2133          0.3817     0.0300   -0.0002
##   700        0.2079          0.3821     0.0300   -0.0001
##   720        0.2035          0.3792     0.0300   -0.0000
##   740        0.1987          0.3825     0.0300   -0.0001
##   760        0.1944          0.3850     0.0300    0.0001
##   780        0.1903          0.3813     0.0300   -0.0001
##   800        0.1866          0.3823     0.0300   -0.0001
##   820        0.1826          0.3840     0.0300   -0.0001
##   840        0.1791          0.3853     0.0300   -0.0001
##   860        0.1752          0.3852     0.0300   -0.0001
##   880        0.1718          0.3849     0.0300   -0.0001
##   900        0.1687          0.3842     0.0300   -0.0001
##   920        0.1652          0.3845     0.0300   -0.0001
##   940        0.1612          0.3850     0.0300   -0.0001
##   960        0.1578          0.3831     0.0300   -0.0001
##   980        0.1547          0.3828     0.0300   -0.0001
##  1000        0.1512          0.3823     0.0300   -0.0001
##  1020        0.1486          0.3816     0.0300   -0.0001
##  1040        0.1456          0.3809     0.0300   -0.0001
##  1060        0.1426          0.3841     0.0300   -0.0000
##  1080        0.1401          0.3853     0.0300   -0.0000
##  1100        0.1373          0.3843     0.0300   -0.0000
```

```
##   1120        0.1345          0.3830     0.0300   -0.0000
##   1140        0.1320          0.3813     0.0300   -0.0000
##   1160        0.1296          0.3802     0.0300   -0.0001
##   1180        0.1273          0.3800     0.0300   -0.0000
##   1200        0.1247          0.3815     0.0300   -0.0001
##   1220        0.1221          0.3836     0.0300   -0.0000
##   1240        0.1194          0.3809     0.0300   -0.0001
##   1260        0.1173          0.3830     0.0300    0.0000
##   1280        0.1151          0.3824     0.0300   -0.0001
##   1300        0.1130          0.3814     0.0300   -0.0001
##   1320        0.1107          0.3821     0.0300   -0.0001
##   1340        0.1087          0.3841     0.0300   -0.0000
##   1360        0.1071          0.3845     0.0300   -0.0001
##   1380        0.1051          0.3843     0.0300   -0.0001
##   1400        0.1031          0.3859     0.0300   -0.0000
##   1420        0.1009          0.3833     0.0300   -0.0001
##   1440        0.0991          0.3829     0.0300   -0.0000
##   1460        0.0972          0.3817     0.0300   -0.0000
##   1480        0.0957          0.3829     0.0300   -0.0000
##   1500        0.0939          0.3814     0.0300   -0.0000
##   1520        0.0923          0.3808     0.0300   -0.0000
##   1540        0.0906          0.3790     0.0300   -0.0001
##   1560        0.0891          0.3817     0.0300   -0.0000
##   1580        0.0874          0.3802     0.0300   -0.0001
##   1600        0.0861          0.3812     0.0300   -0.0000
##   1620        0.0845          0.3808     0.0300   -0.0001
##   1640        0.0831          0.3834     0.0300   -0.0001
##   1660        0.0818          0.3860     0.0300   -0.0000
##   1680        0.0804          0.3867     0.0300   -0.0001
##   1700        0.0789          0.3858     0.0300   -0.0000
##   1720        0.0775          0.3852     0.0300   -0.0001
##   1740        0.0761          0.3853     0.0300   -0.0000
##   1760        0.0750          0.3853     0.0300   -0.0000
##   1780        0.0739          0.3870     0.0300   -0.0000
##   1800        0.0728          0.3881     0.0300   -0.0000
##   1820        0.0715          0.3857     0.0300   -0.0000
##   1840        0.0702          0.3860     0.0300   -0.0001
##   1860        0.0691          0.3865     0.0300   -0.0000
##   1880        0.0680          0.3869     0.0300   -0.0000
##   1900        0.0669          0.3864     0.0300   -0.0000
##   1920        0.0658          0.3888     0.0300   -0.0000
##   1940        0.0648          0.3896     0.0300   -0.0000
##   1960        0.0637          0.3898     0.0300   -0.0000
##   1980        0.0627          0.3917     0.0300   -0.0000
##   2000        0.0617          0.3959     0.0300   -0.0000
##   2020        0.0607          0.3973     0.0300   -0.0000
##   2040        0.0597          0.3996     0.0300   -0.0000
##   2060        0.0588          0.4007     0.0300   -0.0000
##   2080        0.0578          0.4022     0.0300   -0.0000
##   2100        0.0569          0.4036     0.0300   -0.0000
##   2120        0.0560          0.4061     0.0300   -0.0000
##   2140        0.0551          0.4064     0.0300   -0.0000
##   2160        0.0541          0.4069     0.0300   -0.0000
##   2180        0.0533          0.4066     0.0300   -0.0000
```

```
##   2200        0.0523          0.4064     0.0300   -0.0000
##   2220        0.0516          0.4106     0.0300   -0.0000
##   2240        0.0508          0.4111     0.0300   -0.0000
##   2260        0.0499          0.4096     0.0300   -0.0000
##   2280        0.0490          0.4065     0.0300    0.0000
##   2300        0.0482          0.4070     0.0300   -0.0000
##   2320        0.0475          0.4081     0.0300   -0.0000
##   2340        0.0467          0.4079     0.0300   -0.0000
##   2360        0.0459          0.4090     0.0300   -0.0000
##   2380        0.0450          0.4081     0.0300   -0.0000
##   2400        0.0443          0.4080     0.0300   -0.0000
##   2420        0.0434          0.4080     0.0300   -0.0000
##   2440        0.0425          0.4073     0.0300   -0.0000
##   2460        0.0417          0.4092     0.0300   -0.0000
##   2480        0.0412          0.4092     0.0300   -0.0000
##   2500        0.0404          0.4069     0.0300   -0.0000
##   2520        0.0398          0.4068     0.0300   -0.0000
##   2540        0.0392          0.4052     0.0300   -0.0000
##   2560        0.0385          0.4027     0.0300   -0.0000
##   2580        0.0379          0.4018     0.0300   -0.0000
##   2600        0.0374          0.4056     0.0300   -0.0000
##   2620        0.0368          0.4065     0.0300   -0.0000
##   2640        0.0363          0.4079     0.0300   -0.0000
##   2660        0.0358          0.4090     0.0300   -0.0000
##   2680        0.0353          0.4090     0.0300   -0.0000
##   2700        0.0348          0.4084     0.0300   -0.0000
##   2720        0.0342          0.4094     0.0300   -0.0000
##   2740        0.0335          0.4097     0.0300   -0.0000
##   2760        0.0331          0.4095     0.0300   -0.0000
##   2780        0.0326          0.4117     0.0300   -0.0000
##   2800        0.0321          0.4118     0.0300   -0.0000
##   2820        0.0316          0.4127     0.0300   -0.0000
##   2840        0.0311          0.4145     0.0300   -0.0000
##   2860        0.0306          0.4128     0.0300   -0.0000
##   2880        0.0301          0.4127     0.0300   -0.0000
##   2900        0.0296          0.4120     0.0300   -0.0000
##   2920        0.0292          0.4129     0.0300   -0.0000
##   2940        0.0288          0.4127     0.0300   -0.0000
##   2960        0.0283          0.4120     0.0300   -0.0000
##   2980        0.0278          0.4115     0.0300   -0.0000
##   3000        0.0274          0.4136     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2853          1.2682     0.0100    0.0053
##      2        1.2750          1.2572     0.0100    0.0049
##      3        1.2651          1.2468     0.0100    0.0049
##      4        1.2551          1.2362     0.0100    0.0048
##      5        1.2455          1.2267     0.0100    0.0044
##      6        1.2364          1.2173     0.0100    0.0041
##      7        1.2271          1.2076     0.0100    0.0046
```

```
##      8        1.2187          1.1990     0.0100    0.0044
##      9        1.2110          1.1913     0.0100    0.0035
##     10        1.2024          1.1823     0.0100    0.0044
##     20        1.1261          1.1032     0.0100    0.0035
##     40        1.0066          0.9789     0.0100    0.0026
##     60        0.9145          0.8832     0.0100    0.0019
##     80        0.8412          0.8077     0.0100    0.0016
##    100        0.7809          0.7473     0.0100    0.0014
##    120        0.7296          0.6928     0.0100    0.0011
##    140        0.6856          0.6482     0.0100    0.0008
##    160        0.6495          0.6109     0.0100    0.0007
##    180        0.6188          0.5801     0.0100    0.0006
##    200        0.5917          0.5533     0.0100    0.0005
##    220        0.5692          0.5296     0.0100    0.0004
##    240        0.5494          0.5080     0.0100    0.0004
##    260        0.5326          0.4929     0.0100    0.0004
##    280        0.5179          0.4789     0.0100    0.0003
##    300        0.5050          0.4663     0.0100    0.0003
##    320        0.4937          0.4570     0.0100    0.0002
##    340        0.4837          0.4476     0.0100    0.0002
##    360        0.4744          0.4392     0.0100    0.0000
##    380        0.4663          0.4339     0.0100   -0.0000
##    400        0.4587          0.4277     0.0100    0.0001
##    420        0.4509          0.4221     0.0100    0.0000
##    440        0.4446          0.4177     0.0100    0.0000
##    460        0.4381          0.4120     0.0100    0.0001
##    480        0.4318          0.4091     0.0100    0.0001
##    500        0.4266          0.4063     0.0100    0.0000
##    520        0.4210          0.4022     0.0100   -0.0000
##    540        0.4163          0.3991     0.0100   -0.0000
##    560        0.4113          0.3969     0.0100   -0.0001
##    580        0.4070          0.3959     0.0100   -0.0000
##    600        0.4028          0.3942     0.0100   -0.0000
##    620        0.3975          0.3927     0.0100   -0.0001
##    640        0.3936          0.3923     0.0100    0.0000
##    660        0.3893          0.3905     0.0100    0.0000
##    680        0.3854          0.3886     0.0100   -0.0000
##    700        0.3814          0.3873     0.0100   -0.0000
##    720        0.3777          0.3854     0.0100    0.0000
##    740        0.3743          0.3858     0.0100   -0.0000
##    760        0.3710          0.3856     0.0100   -0.0001
##    780        0.3677          0.3839     0.0100   -0.0001
##    800        0.3642          0.3824     0.0100   -0.0000
##    820        0.3610          0.3824     0.0100    0.0000
##    840        0.3572          0.3815     0.0100    0.0001
##    860        0.3537          0.3800     0.0100    0.0000
##    880        0.3501          0.3792     0.0100    0.0000
##    900        0.3471          0.3808     0.0100   -0.0000
##    920        0.3442          0.3814     0.0100   -0.0001
##    940        0.3415          0.3805     0.0100   -0.0000
##    960        0.3387          0.3798     0.0100   -0.0001
##    980        0.3359          0.3799     0.0100   -0.0001
##   1000        0.3332          0.3793     0.0100   -0.0001
##   1020        0.3300          0.3799     0.0100   -0.0000
```

```
##   1040        0.3272          0.3781     0.0100   -0.0001
##   1060        0.3242          0.3779     0.0100   -0.0000
##   1080        0.3214          0.3770     0.0100   -0.0000
##   1100        0.3183          0.3767     0.0100   -0.0000
##   1120        0.3157          0.3777     0.0100   -0.0000
##   1140        0.3131          0.3771     0.0100   -0.0000
##   1160        0.3101          0.3761     0.0100   -0.0000
##   1180        0.3080          0.3764     0.0100   -0.0001
##   1200        0.3056          0.3769     0.0100   -0.0000
##   1220        0.3033          0.3775     0.0100   -0.0000
##   1240        0.3004          0.3779     0.0100   -0.0001
##   1260        0.2982          0.3766     0.0100   -0.0000
##   1280        0.2955          0.3753     0.0100   -0.0001
##   1300        0.2934          0.3752     0.0100   -0.0001
##   1320        0.2911          0.3758     0.0100   -0.0001
##   1340        0.2888          0.3758     0.0100   -0.0000
##   1360        0.2865          0.3759     0.0100   -0.0000
##   1380        0.2843          0.3751     0.0100   -0.0000
##   1400        0.2822          0.3747     0.0100   -0.0000
##   1420        0.2798          0.3740     0.0100   -0.0001
##   1440        0.2773          0.3738     0.0100   -0.0000
##   1460        0.2751          0.3751     0.0100   -0.0000
##   1480        0.2730          0.3748     0.0100   -0.0000
##   1500        0.2707          0.3747     0.0100   -0.0000
##   1520        0.2686          0.3756     0.0100   -0.0000
##   1540        0.2665          0.3748     0.0100   -0.0000
##   1560        0.2645          0.3742     0.0100   -0.0001
##   1580        0.2623          0.3745     0.0100   -0.0000
##   1600        0.2604          0.3754     0.0100   -0.0001
##   1620        0.2585          0.3755     0.0100   -0.0000
##   1640        0.2565          0.3752     0.0100   -0.0000
##   1660        0.2546          0.3751     0.0100   -0.0000
##   1680        0.2528          0.3751     0.0100   -0.0000
##   1700        0.2509          0.3753     0.0100   -0.0001
##   1720        0.2490          0.3751     0.0100   -0.0000
##   1740        0.2471          0.3772     0.0100   -0.0000
##   1760        0.2453          0.3768     0.0100   -0.0000
##   1780        0.2436          0.3776     0.0100   -0.0001
##   1800        0.2418          0.3767     0.0100   -0.0000
##   1820        0.2401          0.3765     0.0100   -0.0001
##   1840        0.2383          0.3761     0.0100   -0.0001
##   1860        0.2367          0.3765     0.0100   -0.0000
##   1880        0.2349          0.3768     0.0100   -0.0000
##   1900        0.2329          0.3774     0.0100   -0.0000
##   1920        0.2312          0.3779     0.0100   -0.0000
##   1940        0.2294          0.3790     0.0100   -0.0000
##   1960        0.2278          0.3796     0.0100   -0.0000
##   1980        0.2263          0.3800     0.0100   -0.0001
##   2000        0.2249          0.3801     0.0100   -0.0000
##   2020        0.2232          0.3801     0.0100   -0.0000
##   2040        0.2214          0.3800     0.0100   -0.0000
##   2060        0.2198          0.3798     0.0100   -0.0001
##   2080        0.2183          0.3803     0.0100   -0.0001
##   2100        0.2166          0.3801     0.0100   -0.0001
```

```
##   2120        0.2148          0.3788     0.0100   -0.0000
##   2140        0.2131          0.3795     0.0100   -0.0000
##   2160        0.2116          0.3794     0.0100   -0.0000
##   2180        0.2101          0.3789     0.0100   -0.0000
##   2200        0.2088          0.3786     0.0100   -0.0000
##   2220        0.2072          0.3785     0.0100   -0.0000
##   2240        0.2055          0.3788     0.0100   -0.0000
##   2260        0.2042          0.3798     0.0100   -0.0001
##   2280        0.2029          0.3791     0.0100   -0.0000
##   2300        0.2013          0.3788     0.0100   -0.0000
##   2320        0.2000          0.3796     0.0100    0.0000
##   2340        0.1984          0.3798     0.0100   -0.0000
##   2360        0.1969          0.3788     0.0100   -0.0000
##   2380        0.1954          0.3786     0.0100   -0.0000
##   2400        0.1942          0.3788     0.0100   -0.0000
##   2420        0.1927          0.3784     0.0100   -0.0000
##   2440        0.1914          0.3783     0.0100   -0.0000
##   2460        0.1901          0.3780     0.0100   -0.0000
##   2480        0.1887          0.3781     0.0100   -0.0000
##   2500        0.1876          0.3785     0.0100   -0.0000
##   2520        0.1863          0.3794     0.0100   -0.0001
##   2540        0.1852          0.3796     0.0100   -0.0001
##   2560        0.1839          0.3789     0.0100   -0.0000
##   2580        0.1826          0.3783     0.0100   -0.0000
##   2600        0.1814          0.3789     0.0100   -0.0000
##   2620        0.1803          0.3794     0.0100   -0.0000
##   2640        0.1791          0.3798     0.0100   -0.0000
##   2660        0.1778          0.3791     0.0100   -0.0000
##   2680        0.1767          0.3795     0.0100   -0.0000
##   2700        0.1756          0.3790     0.0100   -0.0000
##   2720        0.1744          0.3784     0.0100   -0.0000
##   2740        0.1730          0.3777     0.0100   -0.0000
##   2760        0.1718          0.3776     0.0100   -0.0000
##   2780        0.1707          0.3778     0.0100   -0.0000
##   2800        0.1695          0.3770     0.0100   -0.0000
##   2820        0.1683          0.3756     0.0100   -0.0000
##   2840        0.1673          0.3760     0.0100   -0.0000
##   2860        0.1662          0.3769     0.0100   -0.0000
##   2880        0.1652          0.3764     0.0100   -0.0000
##   2900        0.1641          0.3764     0.0100   -0.0000
##   2920        0.1629          0.3761     0.0100   -0.0000
##   2940        0.1619          0.3759     0.0100   -0.0000
##   2960        0.1608          0.3758     0.0100   -0.0000
##   2980        0.1597          0.3755     0.0100   -0.0000
##   3000        0.1587          0.3749     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2745          1.2568     0.0200    0.0103
##      2        1.2553          1.2376     0.0200    0.0097
##      3        1.2373          1.2195     0.0200    0.0089
```

```
##      4        1.2188          1.2008     0.0200    0.0088
##      5        1.2018          1.1836     0.0200    0.0086
##      6        1.1848          1.1656     0.0200    0.0082
##      7        1.1689          1.1487     0.0200    0.0082
##      8        1.1538          1.1326     0.0200    0.0077
##      9        1.1379          1.1159     0.0200    0.0071
##     10        1.1238          1.1013     0.0200    0.0067
##     20        1.0047          0.9774     0.0200    0.0053
##     40        0.8394          0.8068     0.0200    0.0031
##     60        0.7251          0.6882     0.0200    0.0020
##     80        0.6459          0.6055     0.0200    0.0015
##    100        0.5883          0.5481     0.0200    0.0014
##    120        0.5467          0.5060     0.0200    0.0006
##    140        0.5148          0.4734     0.0200    0.0004
##    160        0.4906          0.4497     0.0200    0.0001
##    180        0.4711          0.4329     0.0200    0.0002
##    200        0.4537          0.4171     0.0200    0.0001
##    220        0.4413          0.4081     0.0200    0.0002
##    240        0.4290          0.4035     0.0200    0.0000
##    260        0.4176          0.3945     0.0200   -0.0001
##    280        0.4074          0.3898     0.0200    0.0000
##    300        0.3983          0.3860     0.0200    0.0000
##    320        0.3901          0.3813     0.0200   -0.0001
##    340        0.3827          0.3800     0.0200    0.0001
##    360        0.3753          0.3791     0.0200   -0.0001
##    380        0.3684          0.3784     0.0200   -0.0001
##    400        0.3615          0.3789     0.0200    0.0000
##    420        0.3551          0.3777     0.0200   -0.0001
##    440        0.3482          0.3770     0.0200   -0.0000
##    460        0.3413          0.3764     0.0200   -0.0002
##    480        0.3355          0.3779     0.0200   -0.0001
##    500        0.3283          0.3769     0.0200   -0.0002
##    520        0.3232          0.3753     0.0200   -0.0000
##    540        0.3177          0.3764     0.0200   -0.0000
##    560        0.3129          0.3740     0.0200   -0.0001
##    580        0.3077          0.3722     0.0200   -0.0001
##    600        0.3034          0.3729     0.0200   -0.0001
##    620        0.2977          0.3732     0.0200   -0.0001
##    640        0.2934          0.3753     0.0200   -0.0000
##    660        0.2886          0.3785     0.0200   -0.0000
##    680        0.2843          0.3775     0.0200   -0.0001
##    700        0.2804          0.3774     0.0200   -0.0001
##    720        0.2759          0.3770     0.0200   -0.0000
##    740        0.2720          0.3753     0.0200   -0.0001
##    760        0.2677          0.3732     0.0200   -0.0001
##    780        0.2638          0.3706     0.0200   -0.0001
##    800        0.2603          0.3696     0.0200   -0.0001
##    820        0.2562          0.3702     0.0200   -0.0001
##    840        0.2528          0.3718     0.0200   -0.0001
##    860        0.2492          0.3723     0.0200   -0.0002
##    880        0.2450          0.3737     0.0200   -0.0000
##    900        0.2410          0.3742     0.0200   -0.0001
##    920        0.2377          0.3742     0.0200   -0.0001
##    940        0.2341          0.3713     0.0200   -0.0001
```

```
##    960         0.2306          0.3712     0.0200   -0.0001
##    980         0.2270          0.3732     0.0200   -0.0000
##   1000         0.2238          0.3730     0.0200   -0.0000
##   1020         0.2207          0.3700     0.0200   -0.0002
##   1040         0.2178          0.3691     0.0200   -0.0001
##   1060         0.2145          0.3703     0.0200   -0.0001
##   1080         0.2109          0.3700     0.0200   -0.0000
##   1100         0.2080          0.3711     0.0200   -0.0000
##   1120         0.2050          0.3704     0.0200   -0.0001
##   1140         0.2023          0.3694     0.0200   -0.0001
##   1160         0.1995          0.3720     0.0200   -0.0001
##   1180         0.1967          0.3725     0.0200   -0.0001
##   1200         0.1938          0.3717     0.0200   -0.0001
##   1220         0.1908          0.3730     0.0200   -0.0001
##   1240         0.1881          0.3723     0.0200   -0.0001
##   1260         0.1857          0.3717     0.0200   -0.0001
##   1280         0.1830          0.3722     0.0200   -0.0001
##   1300         0.1801          0.3718     0.0200   -0.0001
##   1320         0.1777          0.3724     0.0200   -0.0001
##   1340         0.1752          0.3726     0.0200   -0.0001
##   1360         0.1729          0.3720     0.0200   -0.0000
##   1380         0.1704          0.3717     0.0200   -0.0000
##   1400         0.1680          0.3696     0.0200   -0.0001
##   1420         0.1658          0.3698     0.0200   -0.0000
##   1440         0.1635          0.3688     0.0200   -0.0000
##   1460         0.1616          0.3694     0.0200   -0.0001
##   1480         0.1594          0.3699     0.0200   -0.0001
##   1500         0.1575          0.3695     0.0200   -0.0000
##   1520         0.1556          0.3697     0.0200   -0.0001
##   1540         0.1534          0.3695     0.0200   -0.0001
##   1560         0.1513          0.3682     0.0200   -0.0001
##   1580         0.1494          0.3696     0.0200   -0.0001
##   1600         0.1476          0.3698     0.0200   -0.0000
##   1620         0.1458          0.3708     0.0200   -0.0000
##   1640         0.1440          0.3716     0.0200   -0.0000
##   1660         0.1424          0.3723     0.0200   -0.0000
##   1680         0.1405          0.3704     0.0200   -0.0000
##   1700         0.1387          0.3711     0.0200   -0.0001
##   1720         0.1367          0.3723     0.0200   -0.0000
##   1740         0.1349          0.3718     0.0200   -0.0000
##   1760         0.1333          0.3739     0.0200   -0.0000
##   1780         0.1317          0.3740     0.0200   -0.0000
##   1800         0.1296          0.3729     0.0200   -0.0000
##   1820         0.1283          0.3719     0.0200   -0.0000
##   1840         0.1269          0.3721     0.0200   -0.0000
##   1860         0.1255          0.3730     0.0200   -0.0000
##   1880         0.1241          0.3739     0.0200   -0.0000
##   1900         0.1226          0.3748     0.0200   -0.0001
##   1920         0.1211          0.3752     0.0200   -0.0000
##   1940         0.1197          0.3766     0.0200   -0.0000
##   1960         0.1183          0.3779     0.0200   -0.0000
##   1980         0.1167          0.3764     0.0200   -0.0000
##   2000         0.1153          0.3762     0.0200   -0.0000
##   2020         0.1138          0.3761     0.0200   -0.0000
```

```
##   2040        0.1125          0.3770     0.0200   -0.0001
##   2060        0.1109          0.3772     0.0200   -0.0000
##   2080        0.1095          0.3774     0.0200   -0.0000
##   2100        0.1081          0.3768     0.0200   -0.0000
##   2120        0.1068          0.3779     0.0200   -0.0001
##   2140        0.1056          0.3788     0.0200   -0.0000
##   2160        0.1043          0.3803     0.0200   -0.0000
##   2180        0.1031          0.3817     0.0200   -0.0000
##   2200        0.1019          0.3802     0.0200   -0.0001
##   2220        0.1007          0.3788     0.0200   -0.0000
##   2240        0.0993          0.3769     0.0200   -0.0000
##   2260        0.0981          0.3769     0.0200   -0.0000
##   2280        0.0971          0.3774     0.0200   -0.0000
##   2300        0.0960          0.3782     0.0200   -0.0000
##   2320        0.0948          0.3768     0.0200   -0.0000
##   2340        0.0936          0.3771     0.0200   -0.0000
##   2360        0.0926          0.3767     0.0200   -0.0000
##   2380        0.0916          0.3776     0.0200   -0.0000
##   2400        0.0906          0.3786     0.0200   -0.0000
##   2420        0.0896          0.3780     0.0200   -0.0001
##   2440        0.0882          0.3766     0.0200   -0.0000
##   2460        0.0872          0.3754     0.0200   -0.0000
##   2480        0.0863          0.3768     0.0200   -0.0000
##   2500        0.0851          0.3765     0.0200   -0.0000
##   2520        0.0841          0.3770     0.0200   -0.0000
##   2540        0.0832          0.3788     0.0200   -0.0000
##   2560        0.0823          0.3794     0.0200   -0.0000
##   2580        0.0812          0.3778     0.0200   -0.0000
##   2600        0.0803          0.3776     0.0200   -0.0000
##   2620        0.0795          0.3773     0.0200   -0.0000
##   2640        0.0785          0.3761     0.0200   -0.0000
##   2660        0.0775          0.3749     0.0200   -0.0000
##   2680        0.0767          0.3736     0.0200   -0.0000
##   2700        0.0758          0.3743     0.0200   -0.0000
##   2720        0.0749          0.3749     0.0200   -0.0000
##   2740        0.0740          0.3754     0.0200   -0.0000
##   2760        0.0732          0.3773     0.0200   -0.0000
##   2780        0.0724          0.3764     0.0200   -0.0000
##   2800        0.0715          0.3755     0.0200    0.0000
##   2820        0.0706          0.3740     0.0200   -0.0000
##   2840        0.0698          0.3727     0.0200   -0.0000
##   2860        0.0691          0.3724     0.0200   -0.0000
##   2880        0.0684          0.3734     0.0200   -0.0000
##   2900        0.0676          0.3738     0.0200   -0.0000
##   2920        0.0667          0.3725     0.0200   -0.0000
##   2940        0.0660          0.3725     0.0200   -0.0000
##   2960        0.0652          0.3744     0.0200    0.0000
##   2980        0.0645          0.3751     0.0200   -0.0000
##   3000        0.0639          0.3758     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.
```

```
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2647          1.2465     0.0300    0.0159
##      2        1.2364          1.2167     0.0300    0.0139
##      3        1.2088          1.1879     0.0300    0.0132
##      4        1.1836          1.1612     0.0300    0.0122
##      5        1.1609          1.1383     0.0300    0.0122
##      6        1.1380          1.1153     0.0300    0.0109
##      7        1.1159          1.0916     0.0300    0.0104
##      8        1.0967          1.0722     0.0300    0.0091
##      9        1.0774          1.0522     0.0300    0.0092
##     10        1.0586          1.0319     0.0300    0.0085
##     20        0.9116          0.8806     0.0300    0.0055
##     40        0.7272          0.6915     0.0300    0.0034
##     60        0.6181          0.5813     0.0300    0.0020
##     80        0.5498          0.5110     0.0300    0.0010
##    100        0.5052          0.4633     0.0300    0.0007
##    120        0.4729          0.4317     0.0300    0.0005
##    140        0.4488          0.4119     0.0300   -0.0000
##    160        0.4319          0.4002     0.0300    0.0001
##    180        0.4163          0.3965     0.0300    0.0000
##    200        0.4020          0.3896     0.0300    0.0000
##    220        0.3895          0.3850     0.0300   -0.0001
##    240        0.3778          0.3843     0.0300   -0.0000
##    260        0.3678          0.3786     0.0300   -0.0000
##    280        0.3566          0.3782     0.0300    0.0001
##    300        0.3480          0.3780     0.0300   -0.0000
##    320        0.3387          0.3803     0.0300   -0.0001
##    340        0.3306          0.3794     0.0300   -0.0001
##    360        0.3229          0.3748     0.0300   -0.0001
##    380        0.3146          0.3741     0.0300   -0.0001
##    400        0.3068          0.3711     0.0300   -0.0003
##    420        0.2984          0.3733     0.0300   -0.0001
##    440        0.2916          0.3791     0.0300   -0.0001
##    460        0.2855          0.3800     0.0300   -0.0002
##    480        0.2793          0.3808     0.0300   -0.0001
##    500        0.2731          0.3818     0.0300   -0.0002
##    520        0.2666          0.3771     0.0300   -0.0000
##    540        0.2602          0.3776     0.0300   -0.0001
##    560        0.2551          0.3786     0.0300   -0.0001
##    580        0.2499          0.3808     0.0300   -0.0002
##    600        0.2440          0.3784     0.0300   -0.0002
##    620        0.2389          0.3776     0.0300   -0.0001
##    640        0.2338          0.3763     0.0300   -0.0001
##    660        0.2284          0.3777     0.0300   -0.0001
##    680        0.2233          0.3762     0.0300   -0.0002
##    700        0.2182          0.3783     0.0300   -0.0001
##    720        0.2137          0.3775     0.0300   -0.0002
##    740        0.2095          0.3765     0.0300   -0.0001
##    760        0.2055          0.3780     0.0300   -0.0001
##    780        0.2011          0.3838     0.0300   -0.0001
##    800        0.1966          0.3804     0.0300   -0.0002
##    820        0.1928          0.3804     0.0300   -0.0000
##    840        0.1886          0.3796     0.0300   -0.0001
##    860        0.1849          0.3801     0.0300   -0.0001
```

```
##    880         0.1813          0.3806     0.0300   -0.0001
##    900         0.1778          0.3818     0.0300   -0.0000
##    920         0.1744          0.3827     0.0300   -0.0001
##    940         0.1707          0.3819     0.0300   -0.0001
##    960         0.1671          0.3831     0.0300    0.0000
##    980         0.1640          0.3819     0.0300   -0.0001
##   1000         0.1604          0.3805     0.0300   -0.0001
##   1020         0.1573          0.3812     0.0300   -0.0000
##   1040         0.1539          0.3830     0.0300   -0.0000
##   1060         0.1510          0.3853     0.0300   -0.0002
##   1080         0.1481          0.3840     0.0300   -0.0001
##   1100         0.1455          0.3809     0.0300   -0.0001
##   1120         0.1431          0.3820     0.0300   -0.0000
##   1140         0.1404          0.3831     0.0300   -0.0001
##   1160         0.1379          0.3850     0.0300   -0.0001
##   1180         0.1353          0.3854     0.0300   -0.0000
##   1200         0.1325          0.3836     0.0300   -0.0001
##   1220         0.1299          0.3837     0.0300   -0.0001
##   1240         0.1271          0.3848     0.0300   -0.0000
##   1260         0.1249          0.3834     0.0300   -0.0001
##   1280         0.1225          0.3832     0.0300   -0.0001
##   1300         0.1204          0.3821     0.0300   -0.0001
##   1320         0.1180          0.3824     0.0300   -0.0001
##   1340         0.1159          0.3822     0.0300   -0.0001
##   1360         0.1141          0.3821     0.0300   -0.0001
##   1380         0.1119          0.3845     0.0300   -0.0001
##   1400         0.1099          0.3855     0.0300   -0.0001
##   1420         0.1079          0.3879     0.0300   -0.0000
##   1440         0.1063          0.3906     0.0300   -0.0001
##   1460         0.1042          0.3912     0.0300   -0.0000
##   1480         0.1025          0.3899     0.0300   -0.0000
##   1500         0.1005          0.3880     0.0300   -0.0000
##   1520         0.0986          0.3860     0.0300   -0.0001
##   1540         0.0968          0.3869     0.0300   -0.0001
##   1560         0.0954          0.3873     0.0300   -0.0000
##   1580         0.0938          0.3861     0.0300   -0.0000
##   1600         0.0924          0.3869     0.0300   -0.0001
##   1620         0.0910          0.3878     0.0300   -0.0000
##   1640         0.0894          0.3887     0.0300   -0.0000
##   1660         0.0876          0.3869     0.0300    0.0000
##   1680         0.0862          0.3861     0.0300   -0.0000
##   1700         0.0849          0.3848     0.0300   -0.0000
##   1720         0.0835          0.3871     0.0300   -0.0000
##   1740         0.0821          0.3884     0.0300   -0.0000
##   1760         0.0806          0.3895     0.0300   -0.0000
##   1780         0.0794          0.3901     0.0300   -0.0000
##   1800         0.0780          0.3898     0.0300   -0.0001
##   1820         0.0766          0.3915     0.0300   -0.0000
##   1840         0.0753          0.3911     0.0300   -0.0000
##   1860         0.0740          0.3900     0.0300   -0.0001
##   1880         0.0728          0.3910     0.0300   -0.0000
##   1900         0.0717          0.3921     0.0300   -0.0000
##   1920         0.0705          0.3937     0.0300   -0.0000
##   1940         0.0693          0.3924     0.0300    0.0000
```

```
##   1960        0.0680          0.3913     0.0300   -0.0000
##   1980        0.0671          0.3930     0.0300   -0.0000
##   2000        0.0658          0.3925     0.0300   -0.0000
##   2020        0.0647          0.3929     0.0300   -0.0000
##   2040        0.0637          0.3912     0.0300   -0.0000
##   2060        0.0625          0.3904     0.0300    0.0000
##   2080        0.0613          0.3884     0.0300   -0.0001
##   2100        0.0604          0.3907     0.0300   -0.0000
##   2120        0.0595          0.3901     0.0300   -0.0000
##   2140        0.0584          0.3928     0.0300   -0.0000
##   2160        0.0575          0.3933     0.0300   -0.0000
##   2180        0.0566          0.3937     0.0300   -0.0000
##   2200        0.0556          0.3924     0.0300   -0.0000
##   2220        0.0547          0.3908     0.0300   -0.0000
##   2240        0.0538          0.3938     0.0300   -0.0000
##   2260        0.0530          0.3945     0.0300   -0.0000
##   2280        0.0521          0.3947     0.0300   -0.0000
##   2300        0.0512          0.3920     0.0300   -0.0000
##   2320        0.0505          0.3933     0.0300   -0.0000
##   2340        0.0496          0.3944     0.0300   -0.0000
##   2360        0.0488          0.3950     0.0300   -0.0000
##   2380        0.0481          0.3944     0.0300   -0.0000
##   2400        0.0473          0.3938     0.0300   -0.0000
##   2420        0.0464          0.3932     0.0300   -0.0000
##   2440        0.0457          0.3935     0.0300   -0.0000
##   2460        0.0449          0.3923     0.0300   -0.0000
##   2480        0.0442          0.3937     0.0300   -0.0000
##   2500        0.0434          0.3949     0.0300   -0.0000
##   2520        0.0427          0.3953     0.0300   -0.0000
##   2540        0.0421          0.3957     0.0300   -0.0000
##   2560        0.0414          0.3954     0.0300   -0.0000
##   2580        0.0408          0.3973     0.0300   -0.0000
##   2600        0.0401          0.3969     0.0300   -0.0000
##   2620        0.0395          0.3971     0.0300   -0.0000
##   2640        0.0389          0.3972     0.0300   -0.0000
##   2660        0.0383          0.3971     0.0300   -0.0000
##   2680        0.0377          0.3969     0.0300   -0.0000
##   2700        0.0371          0.3964     0.0300   -0.0000
##   2720        0.0365          0.3971     0.0300   -0.0000
##   2740        0.0360          0.3973     0.0300   -0.0000
##   2760        0.0354          0.3975     0.0300   -0.0000
##   2780        0.0348          0.3975     0.0300   -0.0000
##   2800        0.0343          0.3977     0.0300   -0.0000
##   2820        0.0337          0.3990     0.0300   -0.0000
##   2840        0.0332          0.3990     0.0300   -0.0000
##   2860        0.0326          0.3968     0.0300   -0.0000
##   2880        0.0321          0.3964     0.0300   -0.0000
##   2900        0.0316          0.3962     0.0300   -0.0000
##   2920        0.0310          0.3955     0.0300   -0.0000
##   2940        0.0305          0.3967     0.0300   -0.0000
##   2960        0.0301          0.3965     0.0300   -0.0000
##   2980        0.0296          0.3980     0.0300   -0.0000
##   3000        0.0292          0.3985     0.0300   -0.0000
```

```
## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter 'train.fraction' is deprecated, please specify
## 'nTrain' instead.
```

```
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2877          1.2432     0.0100    0.0050
##      2        1.2782          1.2338     0.0100    0.0049
##      3        1.2689          1.2245     0.0100    0.0046
##      4        1.2589          1.2143     0.0100    0.0050
##      5        1.2492          1.2048     0.0100    0.0047
##      6        1.2404          1.1964     0.0100    0.0042
##      7        1.2313          1.1874     0.0100    0.0040
##      8        1.2226          1.1783     0.0100    0.0043
##      9        1.2142          1.1698     0.0100    0.0041
##     10        1.2052          1.1609     0.0100    0.0041
##     20        1.1297          1.0853     0.0100    0.0033
##     40        1.0108          0.9655     0.0100    0.0024
##     60        0.9203          0.8731     0.0100    0.0020
##     80        0.8460          0.7998     0.0100    0.0020
##    100        0.7833          0.7378     0.0100    0.0013
##    120        0.7325          0.6898     0.0100    0.0010
##    140        0.6894          0.6485     0.0100    0.0007
##    160        0.6530          0.6126     0.0100    0.0006
##    180        0.6222          0.5834     0.0100    0.0005
##    200        0.5957          0.5579     0.0100    0.0005
##    220        0.5718          0.5323     0.0100    0.0004
##    240        0.5525          0.5135     0.0100    0.0004
##    260        0.5344          0.4960     0.0100    0.0004
##    280        0.5191          0.4811     0.0100    0.0002
##    300        0.5067          0.4695     0.0100    0.0002
##    320        0.4955          0.4581     0.0100    0.0001
##    340        0.4853          0.4493     0.0100    0.0002
##    360        0.4757          0.4399     0.0100    0.0001
##    380        0.4678          0.4327     0.0100    0.0001
##    400        0.4595          0.4256     0.0100   -0.0000
##    420        0.4519          0.4188     0.0100    0.0002
##    440        0.4454          0.4157     0.0100    0.0001
##    460        0.4390          0.4111     0.0100    0.0000
##    480        0.4331          0.4078     0.0100    0.0000
##    500        0.4273          0.4042     0.0100   -0.0000
##    520        0.4222          0.4018     0.0100   -0.0000
##    540        0.4173          0.4000     0.0100   -0.0000
##    560        0.4123          0.3974     0.0100   -0.0000
##    580        0.4076          0.3951     0.0100    0.0000
##    600        0.4032          0.3943     0.0100   -0.0000
##    620        0.3989          0.3930     0.0100   -0.0000
##    640        0.3945          0.3922     0.0100   -0.0000
##    660        0.3904          0.3901     0.0100   -0.0001
##    680        0.3863          0.3887     0.0100   -0.0000
##    700        0.3821          0.3866     0.0100   -0.0000
##    720        0.3787          0.3851     0.0100   -0.0001
##    740        0.3752          0.3847     0.0100   -0.0001
##    760        0.3717          0.3836     0.0100   -0.0000
##    780        0.3683          0.3825     0.0100    0.0000
```

```
##    800         0.3647          0.3821     0.0100   -0.0000
##    820         0.3614          0.3798     0.0100   -0.0001
##    840         0.3583          0.3785     0.0100   -0.0000
##    860         0.3545          0.3779     0.0100   -0.0001
##    880         0.3511          0.3768     0.0100    0.0000
##    900         0.3479          0.3756     0.0100   -0.0000
##    920         0.3447          0.3754     0.0100   -0.0000
##    940         0.3419          0.3754     0.0100   -0.0000
##    960         0.3387          0.3764     0.0100   -0.0001
##    980         0.3357          0.3747     0.0100   -0.0001
##   1000         0.3328          0.3751     0.0100   -0.0000
##   1020         0.3297          0.3735     0.0100   -0.0000
##   1040         0.3265          0.3734     0.0100   -0.0000
##   1060         0.3232          0.3732     0.0100   -0.0001
##   1080         0.3203          0.3734     0.0100   -0.0000
##   1100         0.3172          0.3739     0.0100   -0.0001
##   1120         0.3147          0.3741     0.0100   -0.0000
##   1140         0.3119          0.3728     0.0100   -0.0001
##   1160         0.3093          0.3728     0.0100   -0.0000
##   1180         0.3071          0.3711     0.0100   -0.0001
##   1200         0.3045          0.3697     0.0100   -0.0000
##   1220         0.3015          0.3692     0.0100   -0.0001
##   1240         0.2989          0.3685     0.0100   -0.0000
##   1260         0.2965          0.3682     0.0100   -0.0001
##   1280         0.2942          0.3678     0.0100   -0.0000
##   1300         0.2915          0.3683     0.0100   -0.0001
##   1320         0.2888          0.3681     0.0100   -0.0000
##   1340         0.2869          0.3667     0.0100   -0.0001
##   1360         0.2847          0.3663     0.0100   -0.0000
##   1380         0.2823          0.3665     0.0100   -0.0000
##   1400         0.2800          0.3650     0.0100   -0.0001
##   1420         0.2775          0.3649     0.0100   -0.0000
##   1440         0.2752          0.3647     0.0100   -0.0000
##   1460         0.2729          0.3644     0.0100   -0.0001
##   1480         0.2706          0.3643     0.0100   -0.0000
##   1500         0.2685          0.3665     0.0100   -0.0000
##   1520         0.2662          0.3673     0.0100   -0.0000
##   1540         0.2641          0.3662     0.0100   -0.0000
##   1560         0.2620          0.3664     0.0100   -0.0001
##   1580         0.2598          0.3646     0.0100   -0.0000
##   1600         0.2579          0.3650     0.0100   -0.0000
##   1620         0.2561          0.3659     0.0100   -0.0000
##   1640         0.2539          0.3651     0.0100   -0.0000
##   1660         0.2518          0.3648     0.0100    0.0001
##   1680         0.2499          0.3633     0.0100    0.0000
##   1700         0.2482          0.3629     0.0100   -0.0000
##   1720         0.2464          0.3635     0.0100   -0.0000
##   1740         0.2446          0.3637     0.0100   -0.0000
##   1760         0.2427          0.3630     0.0100   -0.0000
##   1780         0.2407          0.3624     0.0100   -0.0000
##   1800         0.2388          0.3623     0.0100   -0.0000
##   1820         0.2370          0.3623     0.0100   -0.0001
##   1840         0.2352          0.3628     0.0100   -0.0000
##   1860         0.2335          0.3627     0.0100   -0.0000
```

```
##   1880        0.2319          0.3628     0.0100   -0.0000
##   1900        0.2304          0.3637     0.0100   -0.0001
##   1920        0.2283          0.3624     0.0100   -0.0000
##   1940        0.2265          0.3624     0.0100    0.0000
##   1960        0.2245          0.3629     0.0100   -0.0000
##   1980        0.2227          0.3624     0.0100   -0.0001
##   2000        0.2210          0.3617     0.0100   -0.0001
##   2020        0.2192          0.3611     0.0100   -0.0000
##   2040        0.2177          0.3613     0.0100   -0.0000
##   2060        0.2159          0.3605     0.0100   -0.0000
##   2080        0.2143          0.3609     0.0100   -0.0000
##   2100        0.2124          0.3609     0.0100   -0.0000
##   2120        0.2106          0.3607     0.0100   -0.0000
##   2140        0.2093          0.3610     0.0100   -0.0000
##   2160        0.2076          0.3602     0.0100   -0.0000
##   2180        0.2060          0.3604     0.0100   -0.0000
##   2200        0.2044          0.3609     0.0100   -0.0000
##   2220        0.2029          0.3618     0.0100   -0.0000
##   2240        0.2014          0.3613     0.0100   -0.0000
##   2260        0.1998          0.3614     0.0100   -0.0000
##   2280        0.1981          0.3618     0.0100   -0.0000
##   2300        0.1967          0.3615     0.0100   -0.0000
##   2320        0.1954          0.3607     0.0100   -0.0000
##   2340        0.1939          0.3603     0.0100   -0.0000
##   2360        0.1925          0.3603     0.0100   -0.0001
##   2380        0.1912          0.3599     0.0100   -0.0000
##   2400        0.1896          0.3601     0.0100   -0.0000
##   2420        0.1883          0.3594     0.0100   -0.0000
##   2440        0.1869          0.3590     0.0100   -0.0000
##   2460        0.1855          0.3586     0.0100    0.0000
##   2480        0.1841          0.3594     0.0100   -0.0000
##   2500        0.1828          0.3591     0.0100   -0.0001
##   2520        0.1817          0.3593     0.0100   -0.0000
##   2540        0.1805          0.3598     0.0100   -0.0000
##   2560        0.1793          0.3592     0.0100   -0.0000
##   2580        0.1781          0.3598     0.0100   -0.0000
##   2600        0.1768          0.3596     0.0100   -0.0000
##   2620        0.1754          0.3595     0.0100   -0.0000
##   2640        0.1741          0.3600     0.0100   -0.0000
##   2660        0.1730          0.3604     0.0100   -0.0000
##   2680        0.1718          0.3602     0.0100   -0.0000
##   2700        0.1706          0.3602     0.0100   -0.0000
##   2720        0.1695          0.3598     0.0100   -0.0000
##   2740        0.1683          0.3595     0.0100   -0.0000
##   2760        0.1671          0.3583     0.0100   -0.0000
##   2780        0.1659          0.3588     0.0100   -0.0000
##   2800        0.1649          0.3585     0.0100   -0.0000
##   2820        0.1637          0.3597     0.0100   -0.0000
##   2840        0.1626          0.3595     0.0100   -0.0000
##   2860        0.1615          0.3597     0.0100   -0.0000
##   2880        0.1605          0.3604     0.0100   -0.0000
##   2900        0.1594          0.3598     0.0100   -0.0000
##   2920        0.1584          0.3594     0.0100   -0.0000
##   2940        0.1573          0.3592     0.0100   -0.0000
```

```
##   2960        0.1563          0.3603     0.0100   -0.0000
##   2980        0.1551          0.3609     0.0100   -0.0000
##   3000        0.1541          0.3615     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2787          1.2344     0.0200    0.0083
##      2        1.2587          1.2146     0.0200    0.0097
##      3        1.2402          1.1956     0.0200    0.0083
##      4        1.2225          1.1779     0.0200    0.0082
##      5        1.2057          1.1606     0.0200    0.0084
##      6        1.1893          1.1432     0.0200    0.0082
##      7        1.1743          1.1279     0.0200    0.0078
##      8        1.1582          1.1119     0.0200    0.0079
##      9        1.1438          1.0973     0.0200    0.0068
##     10        1.1288          1.0822     0.0200    0.0073
##     20        1.0095          0.9603     0.0200    0.0050
##     40        0.8460          0.7965     0.0200    0.0032
##     60        0.7328          0.6844     0.0200    0.0023
##     80        0.6539          0.6086     0.0200    0.0017
##    100        0.5966          0.5516     0.0200    0.0012
##    120        0.5555          0.5127     0.0200    0.0008
##    140        0.5217          0.4781     0.0200    0.0006
##    160        0.4975          0.4558     0.0200    0.0004
##    180        0.4779          0.4380     0.0200    0.0003
##    200        0.4623          0.4244     0.0200    0.0001
##    220        0.4477          0.4160     0.0200    0.0002
##    240        0.4353          0.4079     0.0200    0.0001
##    260        0.4236          0.4020     0.0200    0.0001
##    280        0.4136          0.3956     0.0200   -0.0001
##    300        0.4048          0.3908     0.0200   -0.0001
##    320        0.3960          0.3885     0.0200   -0.0000
##    340        0.3883          0.3883     0.0200   -0.0001
##    360        0.3803          0.3847     0.0200   -0.0001
##    380        0.3720          0.3819     0.0200   -0.0001
##    400        0.3650          0.3780     0.0200   -0.0000
##    420        0.3583          0.3761     0.0200   -0.0002
##    440        0.3524          0.3751     0.0200   -0.0001
##    460        0.3463          0.3768     0.0200   -0.0000
##    480        0.3398          0.3764     0.0200   -0.0001
##    500        0.3341          0.3756     0.0200   -0.0002
##    520        0.3287          0.3762     0.0200   -0.0000
##    540        0.3237          0.3739     0.0200   -0.0000
##    560        0.3178          0.3730     0.0200   -0.0001
##    580        0.3120          0.3721     0.0200   -0.0000
##    600        0.3065          0.3694     0.0200   -0.0002
##    620        0.3019          0.3678     0.0200   -0.0001
##    640        0.2967          0.3658     0.0200   -0.0002
##    660        0.2920          0.3627     0.0200   -0.0000
##    680        0.2875          0.3608     0.0200   -0.0001
##    700        0.2824          0.3607     0.0200   -0.0001
```

```
##    720        0.2779          0.3603     0.0200    0.0000
##    740        0.2729          0.3618     0.0200   -0.0001
##    760        0.2681          0.3625     0.0200   -0.0000
##    780        0.2639          0.3599     0.0200   -0.0000
##    800        0.2595          0.3618     0.0200   -0.0000
##    820        0.2559          0.3616     0.0200   -0.0001
##    840        0.2519          0.3623     0.0200   -0.0001
##    860        0.2481          0.3630     0.0200   -0.0002
##    880        0.2440          0.3636     0.0200   -0.0000
##    900        0.2401          0.3627     0.0200   -0.0001
##    920        0.2366          0.3635     0.0200   -0.0001
##    940        0.2332          0.3633     0.0200   -0.0001
##    960        0.2291          0.3639     0.0200   -0.0001
##    980        0.2256          0.3649     0.0200   -0.0000
##   1000        0.2221          0.3636     0.0200   -0.0000
##   1020        0.2185          0.3640     0.0200   -0.0001
##   1040        0.2153          0.3628     0.0200    0.0000
##   1060        0.2123          0.3616     0.0200   -0.0001
##   1080        0.2091          0.3618     0.0200   -0.0001
##   1100        0.2066          0.3613     0.0200   -0.0001
##   1120        0.2036          0.3598     0.0200   -0.0000
##   1140        0.2008          0.3609     0.0200   -0.0001
##   1160        0.1979          0.3620     0.0200   -0.0001
##   1180        0.1953          0.3625     0.0200   -0.0001
##   1200        0.1926          0.3603     0.0200   -0.0000
##   1220        0.1903          0.3615     0.0200   -0.0001
##   1240        0.1878          0.3605     0.0200   -0.0000
##   1260        0.1846          0.3579     0.0200   -0.0000
##   1280        0.1818          0.3584     0.0200   -0.0001
##   1300        0.1793          0.3582     0.0200   -0.0001
##   1320        0.1768          0.3582     0.0200   -0.0001
##   1340        0.1745          0.3577     0.0200   -0.0000
##   1360        0.1722          0.3569     0.0200   -0.0001
##   1380        0.1700          0.3570     0.0200   -0.0000
##   1400        0.1675          0.3548     0.0200   -0.0001
##   1420        0.1650          0.3560     0.0200   -0.0000
##   1440        0.1625          0.3557     0.0200   -0.0001
##   1460        0.1604          0.3567     0.0200   -0.0000
##   1480        0.1581          0.3591     0.0200   -0.0001
##   1500        0.1560          0.3581     0.0200   -0.0001
##   1520        0.1542          0.3604     0.0200   -0.0001
##   1540        0.1520          0.3598     0.0200   -0.0000
##   1560        0.1499          0.3593     0.0200   -0.0000
##   1580        0.1481          0.3587     0.0200   -0.0001
##   1600        0.1463          0.3597     0.0200   -0.0000
##   1620        0.1447          0.3610     0.0200   -0.0000
##   1640        0.1428          0.3609     0.0200   -0.0001
##   1660        0.1409          0.3619     0.0200    0.0000
##   1680        0.1387          0.3608     0.0200   -0.0000
##   1700        0.1370          0.3609     0.0200   -0.0000
##   1720        0.1352          0.3597     0.0200   -0.0001
##   1740        0.1336          0.3606     0.0200   -0.0001
##   1760        0.1316          0.3601     0.0200   -0.0000
##   1780        0.1298          0.3585     0.0200   -0.0000
```

```
##   1800        0.1281          0.3594     0.0200   -0.0001
##   1820        0.1265          0.3584     0.0200    0.0000
##   1840        0.1247          0.3582     0.0200   -0.0000
##   1860        0.1230          0.3578     0.0200   -0.0001
##   1880        0.1215          0.3584     0.0200   -0.0000
##   1900        0.1197          0.3571     0.0200    0.0000
##   1920        0.1182          0.3562     0.0200   -0.0001
##   1940        0.1165          0.3547     0.0200   -0.0000
##   1960        0.1151          0.3532     0.0200   -0.0000
##   1980        0.1136          0.3522     0.0200   -0.0000
##   2000        0.1121          0.3530     0.0200   -0.0001
##   2020        0.1110          0.3534     0.0200   -0.0001
##   2040        0.1097          0.3540     0.0200   -0.0000
##   2060        0.1086          0.3559     0.0200   -0.0000
##   2080        0.1073          0.3559     0.0200   -0.0000
##   2100        0.1061          0.3556     0.0200   -0.0001
##   2120        0.1047          0.3546     0.0200    0.0000
##   2140        0.1035          0.3552     0.0200   -0.0001
##   2160        0.1020          0.3537     0.0200   -0.0000
##   2180        0.1007          0.3548     0.0200   -0.0000
##   2200        0.0995          0.3562     0.0200   -0.0001
##   2220        0.0983          0.3566     0.0200   -0.0000
##   2240        0.0973          0.3567     0.0200   -0.0001
##   2260        0.0961          0.3563     0.0200   -0.0000
##   2280        0.0949          0.3555     0.0200   -0.0000
##   2300        0.0939          0.3548     0.0200   -0.0000
##   2320        0.0926          0.3555     0.0200   -0.0000
##   2340        0.0916          0.3559     0.0200   -0.0000
##   2360        0.0906          0.3555     0.0200   -0.0000
##   2380        0.0896          0.3557     0.0200   -0.0000
##   2400        0.0884          0.3557     0.0200   -0.0000
##   2420        0.0873          0.3558     0.0200   -0.0000
##   2440        0.0862          0.3564     0.0200   -0.0000
##   2460        0.0854          0.3556     0.0200   -0.0000
##   2480        0.0844          0.3562     0.0200   -0.0000
##   2500        0.0835          0.3564     0.0200   -0.0000
##   2520        0.0824          0.3537     0.0200   -0.0000
##   2540        0.0813          0.3527     0.0200   -0.0000
##   2560        0.0805          0.3531     0.0200   -0.0000
##   2580        0.0794          0.3536     0.0200   -0.0001
##   2600        0.0785          0.3529     0.0200   -0.0000
##   2620        0.0777          0.3534     0.0200   -0.0000
##   2640        0.0769          0.3525     0.0200   -0.0000
##   2660        0.0760          0.3530     0.0200   -0.0000
##   2680        0.0751          0.3530     0.0200   -0.0000
##   2700        0.0743          0.3531     0.0200   -0.0000
##   2720        0.0734          0.3519     0.0200   -0.0000
##   2740        0.0726          0.3511     0.0200   -0.0000
##   2760        0.0718          0.3517     0.0200   -0.0000
##   2780        0.0710          0.3509     0.0200   -0.0000
##   2800        0.0701          0.3515     0.0200   -0.0000
##   2820        0.0693          0.3510     0.0200   -0.0000
##   2840        0.0685          0.3514     0.0200   -0.0000
##   2860        0.0678          0.3519     0.0200   -0.0000
```

```
##   2880        0.0670           0.3528     0.0200   -0.0000
##   2900        0.0661           0.3527     0.0200   -0.0000
##   2920        0.0653           0.3527     0.0200   -0.0000
##   2940        0.0647           0.3531     0.0200   -0.0000
##   2960        0.0640           0.3531     0.0200   -0.0000
##   2980        0.0633           0.3540     0.0200   -0.0000
##   3000        0.0627           0.3539     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2686          1.2250     0.0300    0.0148
##      2        1.2399          1.1955     0.0300    0.0129
##      3        1.2134          1.1704     0.0300    0.0126
##      4        1.1880          1.1443     0.0300    0.0130
##      5        1.1652          1.1210     0.0300    0.0110
##      6        1.1436          1.1002     0.0300    0.0105
##      7        1.1228          1.0793     0.0300    0.0095
##      8        1.1025          1.0579     0.0300    0.0100
##      9        1.0841          1.0403     0.0300    0.0091
##     10        1.0655          1.0227     0.0300    0.0089
##     20        0.9141          0.8694     0.0300    0.0071
##     40        0.7286          0.6856     0.0300    0.0029
##     60        0.6163          0.5741     0.0300    0.0020
##     80        0.5473          0.5040     0.0300    0.0008
##    100        0.5039          0.4618     0.0300    0.0009
##    120        0.4729          0.4345     0.0300    0.0002
##    140        0.4484          0.4136     0.0300    0.0002
##    160        0.4296          0.3996     0.0300    0.0001
##    180        0.4139          0.3908     0.0300   -0.0000
##    200        0.4001          0.3887     0.0300   -0.0001
##    220        0.3871          0.3803     0.0300   -0.0001
##    240        0.3745          0.3715     0.0300    0.0000
##    260        0.3631          0.3674     0.0300   -0.0002
##    280        0.3538          0.3672     0.0300   -0.0001
##    300        0.3438          0.3655     0.0300   -0.0001
##    320        0.3349          0.3654     0.0300   -0.0000
##    340        0.3257          0.3624     0.0300   -0.0001
##    360        0.3176          0.3618     0.0300   -0.0000
##    380        0.3106          0.3609     0.0300   -0.0002
##    400        0.3024          0.3582     0.0300   -0.0001
##    420        0.2951          0.3580     0.0300   -0.0000
##    440        0.2876          0.3541     0.0300   -0.0000
##    460        0.2805          0.3547     0.0300   -0.0001
##    480        0.2743          0.3541     0.0300   -0.0002
##    500        0.2674          0.3583     0.0300   -0.0001
##    520        0.2609          0.3601     0.0300   -0.0002
##    540        0.2543          0.3585     0.0300   -0.0001
##    560        0.2492          0.3580     0.0300   -0.0001
##    580        0.2432          0.3575     0.0300   -0.0002
##    600        0.2366          0.3587     0.0300   -0.0002
##    620        0.2315          0.3596     0.0300   -0.0002
```

```
##    640         0.2257          0.3601     0.0300   -0.0001
##    660         0.2203          0.3575     0.0300   -0.0001
##    680         0.2157          0.3587     0.0300   -0.0001
##    700         0.2112          0.3595     0.0300   -0.0001
##    720         0.2065          0.3606     0.0300   -0.0000
##    740         0.2024          0.3616     0.0300   -0.0001
##    760         0.1979          0.3592     0.0300    0.0000
##    780         0.1933          0.3586     0.0300   -0.0001
##    800         0.1886          0.3585     0.0300   -0.0002
##    820         0.1846          0.3588     0.0300   -0.0001
##    840         0.1809          0.3604     0.0300   -0.0000
##    860         0.1775          0.3633     0.0300   -0.0001
##    880         0.1736          0.3645     0.0300   -0.0002
##    900         0.1700          0.3641     0.0300   -0.0001
##    920         0.1664          0.3606     0.0300   -0.0001
##    940         0.1628          0.3609     0.0300   -0.0001
##    960         0.1595          0.3605     0.0300   -0.0001
##    980         0.1562          0.3591     0.0300   -0.0001
##   1000         0.1531          0.3586     0.0300   -0.0001
##   1020         0.1503          0.3584     0.0300   -0.0001
##   1040         0.1471          0.3610     0.0300   -0.0001
##   1060         0.1440          0.3616     0.0300   -0.0000
##   1080         0.1409          0.3613     0.0300   -0.0001
##   1100         0.1376          0.3623     0.0300   -0.0000
##   1120         0.1346          0.3626     0.0300   -0.0000
##   1140         0.1321          0.3629     0.0300   -0.0001
##   1160         0.1296          0.3633     0.0300   -0.0000
##   1180         0.1272          0.3622     0.0300   -0.0000
##   1200         0.1249          0.3633     0.0300   -0.0001
##   1220         0.1225          0.3665     0.0300   -0.0000
##   1240         0.1202          0.3658     0.0300   -0.0001
##   1260         0.1178          0.3651     0.0300   -0.0000
##   1280         0.1155          0.3671     0.0300   -0.0001
##   1300         0.1135          0.3687     0.0300   -0.0001
##   1320         0.1112          0.3677     0.0300   -0.0000
##   1340         0.1091          0.3676     0.0300   -0.0001
##   1360         0.1071          0.3678     0.0300   -0.0001
##   1380         0.1055          0.3689     0.0300   -0.0001
##   1400         0.1039          0.3677     0.0300   -0.0001
##   1420         0.1019          0.3656     0.0300   -0.0000
##   1440         0.1003          0.3666     0.0300   -0.0000
##   1460         0.0986          0.3664     0.0300   -0.0001
##   1480         0.0969          0.3643     0.0300   -0.0000
##   1500         0.0952          0.3631     0.0300   -0.0001
##   1520         0.0934          0.3625     0.0300   -0.0000
##   1540         0.0920          0.3625     0.0300   -0.0001
##   1560         0.0903          0.3606     0.0300   -0.0000
##   1580         0.0886          0.3594     0.0300   -0.0000
##   1600         0.0870          0.3590     0.0300   -0.0000
##   1620         0.0854          0.3582     0.0300   -0.0001
##   1640         0.0841          0.3592     0.0300   -0.0000
##   1660         0.0824          0.3584     0.0300   -0.0001
##   1680         0.0810          0.3598     0.0300   -0.0000
##   1700         0.0797          0.3594     0.0300   -0.0000
```

```
##   1720        0.0783          0.3608     0.0300   -0.0001
##   1740        0.0770          0.3608     0.0300   -0.0000
##   1760        0.0756          0.3594     0.0300    0.0000
##   1780        0.0743          0.3616     0.0300   -0.0001
##   1800        0.0729          0.3605     0.0300   -0.0000
##   1820        0.0717          0.3587     0.0300   -0.0001
##   1840        0.0704          0.3571     0.0300   -0.0000
##   1860        0.0691          0.3571     0.0300   -0.0000
##   1880        0.0679          0.3574     0.0300   -0.0000
##   1900        0.0669          0.3587     0.0300   -0.0000
##   1920        0.0659          0.3594     0.0300   -0.0000
##   1940        0.0649          0.3585     0.0300   -0.0001
##   1960        0.0637          0.3599     0.0300   -0.0000
##   1980        0.0625          0.3602     0.0300    0.0000
##   2000        0.0616          0.3603     0.0300   -0.0000
##   2020        0.0607          0.3591     0.0300   -0.0000
##   2040        0.0598          0.3595     0.0300   -0.0000
##   2060        0.0588          0.3587     0.0300   -0.0000
##   2080        0.0578          0.3600     0.0300   -0.0000
##   2100        0.0569          0.3629     0.0300   -0.0001
##   2120        0.0560          0.3635     0.0300   -0.0000
##   2140        0.0550          0.3614     0.0300   -0.0000
##   2160        0.0541          0.3617     0.0300   -0.0000
##   2180        0.0533          0.3632     0.0300   -0.0000
##   2200        0.0525          0.3612     0.0300   -0.0000
##   2220        0.0516          0.3618     0.0300   -0.0000
##   2240        0.0508          0.3612     0.0300   -0.0000
##   2260        0.0499          0.3614     0.0300   -0.0000
##   2280        0.0491          0.3631     0.0300   -0.0000
##   2300        0.0483          0.3617     0.0300   -0.0000
##   2320        0.0475          0.3634     0.0300   -0.0000
##   2340        0.0467          0.3632     0.0300   -0.0000
##   2360        0.0460          0.3621     0.0300   -0.0000
##   2380        0.0452          0.3609     0.0300   -0.0000
##   2400        0.0444          0.3592     0.0300   -0.0000
##   2420        0.0438          0.3593     0.0300   -0.0000
##   2440        0.0430          0.3620     0.0300    0.0000
##   2460        0.0423          0.3621     0.0300   -0.0000
##   2480        0.0416          0.3626     0.0300   -0.0000
##   2500        0.0410          0.3629     0.0300   -0.0000
##   2520        0.0402          0.3628     0.0300   -0.0000
##   2540        0.0395          0.3649     0.0300   -0.0000
##   2560        0.0388          0.3659     0.0300   -0.0000
##   2580        0.0381          0.3646     0.0300   -0.0000
##   2600        0.0375          0.3642     0.0300   -0.0000
##   2620        0.0369          0.3660     0.0300    0.0000
##   2640        0.0363          0.3667     0.0300   -0.0000
##   2660        0.0357          0.3651     0.0300   -0.0000
##   2680        0.0350          0.3653     0.0300   -0.0000
##   2700        0.0345          0.3646     0.0300   -0.0000
##   2720        0.0339          0.3644     0.0300   -0.0000
##   2740        0.0333          0.3628     0.0300   -0.0000
##   2760        0.0329          0.3642     0.0300   -0.0000
##   2780        0.0324          0.3639     0.0300   -0.0000
```

```
##   2800        0.0319          0.3644     0.0300   -0.0000
##   2820        0.0315          0.3648     0.0300   -0.0000
##   2840        0.0309          0.3643     0.0300   -0.0000
##   2860        0.0304          0.3643     0.0300   -0.0000
##   2880        0.0299          0.3643     0.0300   -0.0000
##   2900        0.0293          0.3633     0.0300   -0.0000
##   2920        0.0288          0.3607     0.0300   -0.0000
##   2940        0.0284          0.3608     0.0300   -0.0000
##   2960        0.0279          0.3616     0.0300   -0.0000
##   2980        0.0275          0.3629     0.0300   -0.0000
##   3000        0.0270          0.3637     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2837          1.2828     0.0100    0.0050
##      2        1.2736          1.2724     0.0100    0.0049
##      3        1.2648          1.2629     0.0100    0.0045
##      4        1.2551          1.2527     0.0100    0.0048
##      5        1.2459          1.2434     0.0100    0.0045
##      6        1.2369          1.2345     0.0100    0.0043
##      7        1.2282          1.2258     0.0100    0.0042
##      8        1.2197          1.2174     0.0100    0.0044
##      9        1.2122          1.2095     0.0100    0.0037
##     10        1.2040          1.2014     0.0100    0.0041
##     20        1.1307          1.1257     0.0100    0.0030
##     40        1.0154          1.0051     0.0100    0.0023
##     60        0.9248          0.9040     0.0100    0.0021
##     80        0.8521          0.8240     0.0100    0.0017
##    100        0.7933          0.7579     0.0100    0.0012
##    120        0.7424          0.7027     0.0100    0.0011
##    140        0.6991          0.6545     0.0100    0.0009
##    160        0.6616          0.6117     0.0100    0.0009
##    180        0.6306          0.5775     0.0100    0.0007
##    200        0.6031          0.5466     0.0100    0.0007
##    220        0.5798          0.5202     0.0100    0.0004
##    240        0.5600          0.4972     0.0100    0.0004
##    260        0.5436          0.4796     0.0100    0.0003
##    280        0.5287          0.4641     0.0100    0.0002
##    300        0.5150          0.4484     0.0100    0.0003
##    320        0.5039          0.4366     0.0100    0.0002
##    340        0.4934          0.4250     0.0100    0.0001
##    360        0.4848          0.4179     0.0100    0.0001
##    380        0.4766          0.4103     0.0100    0.0001
##    400        0.4686          0.4027     0.0100    0.0001
##    420        0.4611          0.3960     0.0100    0.0001
##    440        0.4549          0.3913     0.0100    0.0001
##    460        0.4488          0.3853     0.0100    0.0000
##    480        0.4427          0.3813     0.0100    0.0001
##    500        0.4370          0.3760     0.0100   -0.0001
##    520        0.4315          0.3733     0.0100    0.0000
##    540        0.4261          0.3713     0.0100    0.0000
```

```
##    560         0.4212          0.3685     0.0100   -0.0000
##    580         0.4163          0.3661     0.0100   -0.0000
##    600         0.4116          0.3635     0.0100    0.0000
##    620         0.4069          0.3606     0.0100    0.0000
##    640         0.4024          0.3586     0.0100   -0.0001
##    660         0.3979          0.3565     0.0100   -0.0001
##    680         0.3941          0.3563     0.0100   -0.0001
##    700         0.3904          0.3542     0.0100   -0.0000
##    720         0.3864          0.3532     0.0100    0.0001
##    740         0.3824          0.3534     0.0100   -0.0001
##    760         0.3788          0.3522     0.0100   -0.0001
##    780         0.3751          0.3507     0.0100   -0.0000
##    800         0.3715          0.3484     0.0100    0.0000
##    820         0.3678          0.3479     0.0100   -0.0000
##    840         0.3644          0.3471     0.0100   -0.0001
##    860         0.3606          0.3461     0.0100   -0.0001
##    880         0.3573          0.3461     0.0100   -0.0000
##    900         0.3540          0.3460     0.0100   -0.0001
##    920         0.3507          0.3451     0.0100   -0.0001
##    940         0.3475          0.3449     0.0100   -0.0000
##    960         0.3445          0.3445     0.0100   -0.0000
##    980         0.3412          0.3429     0.0100   -0.0000
##   1000         0.3380          0.3424     0.0100   -0.0000
##   1020         0.3350          0.3430     0.0100    0.0000
##   1040         0.3319          0.3436     0.0100   -0.0001
##   1060         0.3289          0.3429     0.0100   -0.0001
##   1080         0.3257          0.3415     0.0100    0.0000
##   1100         0.3227          0.3421     0.0100   -0.0000
##   1120         0.3200          0.3406     0.0100   -0.0001
##   1140         0.3175          0.3400     0.0100   -0.0001
##   1160         0.3149          0.3399     0.0100   -0.0001
##   1180         0.3123          0.3399     0.0100   -0.0001
##   1200         0.3098          0.3397     0.0100   -0.0001
##   1220         0.3073          0.3400     0.0100   -0.0001
##   1240         0.3045          0.3400     0.0100   -0.0000
##   1260         0.3018          0.3393     0.0100   -0.0000
##   1280         0.2996          0.3385     0.0100   -0.0001
##   1300         0.2972          0.3380     0.0100   -0.0001
##   1320         0.2946          0.3378     0.0100   -0.0000
##   1340         0.2923          0.3384     0.0100   -0.0001
##   1360         0.2898          0.3392     0.0100   -0.0000
##   1380         0.2874          0.3400     0.0100    0.0000
##   1400         0.2846          0.3394     0.0100   -0.0000
##   1420         0.2828          0.3388     0.0100   -0.0001
##   1440         0.2808          0.3389     0.0100   -0.0001
##   1460         0.2785          0.3386     0.0100   -0.0000
##   1480         0.2762          0.3374     0.0100   -0.0000
##   1500         0.2739          0.3371     0.0100   -0.0000
##   1520         0.2716          0.3364     0.0100   -0.0001
##   1540         0.2695          0.3354     0.0100   -0.0000
##   1560         0.2671          0.3349     0.0100   -0.0000
##   1580         0.2648          0.3353     0.0100   -0.0000
##   1600         0.2628          0.3352     0.0100    0.0000
##   1620         0.2609          0.3358     0.0100   -0.0001
```

```
##   1640        0.2589          0.3360     0.0100   -0.0000
##   1660        0.2570          0.3360     0.0100   -0.0000
##   1680        0.2550          0.3354     0.0100   -0.0000
##   1700        0.2531          0.3347     0.0100   -0.0001
##   1720        0.2513          0.3341     0.0100   -0.0000
##   1740        0.2494          0.3345     0.0100   -0.0000
##   1760        0.2477          0.3342     0.0100   -0.0000
##   1780        0.2461          0.3336     0.0100   -0.0000
##   1800        0.2439          0.3340     0.0100   -0.0000
##   1820        0.2422          0.3338     0.0100   -0.0001
##   1840        0.2402          0.3331     0.0100   -0.0000
##   1860        0.2384          0.3330     0.0100   -0.0000
##   1880        0.2363          0.3340     0.0100   -0.0000
##   1900        0.2348          0.3337     0.0100   -0.0000
##   1920        0.2330          0.3339     0.0100   -0.0000
##   1940        0.2312          0.3342     0.0100    0.0000
##   1960        0.2296          0.3335     0.0100   -0.0000
##   1980        0.2278          0.3328     0.0100   -0.0000
##   2000        0.2263          0.3330     0.0100    0.0000
##   2020        0.2244          0.3336     0.0100   -0.0000
##   2040        0.2226          0.3335     0.0100   -0.0000
##   2060        0.2208          0.3327     0.0100   -0.0000
##   2080        0.2190          0.3337     0.0100   -0.0000
##   2100        0.2175          0.3342     0.0100   -0.0000
##   2120        0.2159          0.3346     0.0100    0.0000
##   2140        0.2146          0.3342     0.0100   -0.0000
##   2160        0.2131          0.3346     0.0100    0.0000
##   2180        0.2116          0.3344     0.0100   -0.0000
##   2200        0.2102          0.3344     0.0100   -0.0000
##   2220        0.2087          0.3349     0.0100   -0.0000
##   2240        0.2074          0.3348     0.0100   -0.0000
##   2260        0.2058          0.3346     0.0100   -0.0000
##   2280        0.2043          0.3334     0.0100   -0.0000
##   2300        0.2027          0.3341     0.0100   -0.0000
##   2320        0.2013          0.3338     0.0100   -0.0000
##   2340        0.1997          0.3338     0.0100   -0.0000
##   2360        0.1983          0.3338     0.0100   -0.0000
##   2380        0.1969          0.3338     0.0100   -0.0001
##   2400        0.1955          0.3337     0.0100   -0.0000
##   2420        0.1941          0.3338     0.0100   -0.0000
##   2440        0.1926          0.3336     0.0100   -0.0000
##   2460        0.1914          0.3339     0.0100   -0.0000
##   2480        0.1900          0.3337     0.0100   -0.0000
##   2500        0.1887          0.3336     0.0100   -0.0000
##   2520        0.1874          0.3332     0.0100   -0.0000
##   2540        0.1861          0.3342     0.0100   -0.0000
##   2560        0.1849          0.3333     0.0100   -0.0000
##   2580        0.1836          0.3320     0.0100   -0.0000
##   2600        0.1824          0.3336     0.0100   -0.0000
##   2620        0.1811          0.3334     0.0100   -0.0000
##   2640        0.1797          0.3336     0.0100   -0.0000
##   2660        0.1784          0.3328     0.0100   -0.0000
##   2680        0.1770          0.3322     0.0100   -0.0000
##   2700        0.1759          0.3326     0.0100   -0.0000
```

```
##   2720        0.1747           0.3336     0.0100   -0.0000
##   2740        0.1735           0.3342     0.0100   -0.0000
##   2760        0.1723           0.3333     0.0100   -0.0000
##   2780        0.1712           0.3338     0.0100   -0.0000
##   2800        0.1701           0.3340     0.0100   -0.0000
##   2820        0.1688           0.3329     0.0100   -0.0000
##   2840        0.1676           0.3326     0.0100    0.0000
##   2860        0.1665           0.3331     0.0100   -0.0000
##   2880        0.1654           0.3338     0.0100   -0.0000
##   2900        0.1641           0.3344     0.0100   -0.0000
##   2920        0.1632           0.3351     0.0100   -0.0000
##   2940        0.1622           0.3350     0.0100   -0.0000
##   2960        0.1610           0.3344     0.0100   -0.0000
##   2980        0.1598           0.3345     0.0100   -0.0000
##   3000        0.1587           0.3352     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2732          1.2721     0.0200    0.0100
##      2        1.2547          1.2528     0.0200    0.0088
##      3        1.2363          1.2338     0.0200    0.0090
##      4        1.2183          1.2156     0.0200    0.0084
##      5        1.2033          1.2006     0.0200    0.0072
##      6        1.1871          1.1846     0.0200    0.0076
##      7        1.1726          1.1694     0.0200    0.0070
##      8        1.1575          1.1534     0.0200    0.0071
##      9        1.1432          1.1382     0.0200    0.0066
##     10        1.1285          1.1215     0.0200    0.0073
##     20        1.0117          0.9988     0.0200    0.0050
##     40        0.8465          0.8155     0.0200    0.0033
##     60        0.7351          0.6896     0.0200    0.0021
##     80        0.6587          0.6012     0.0200    0.0014
##    100        0.6015          0.5389     0.0200    0.0009
##    120        0.5584          0.4871     0.0200    0.0007
##    140        0.5263          0.4529     0.0200    0.0002
##    160        0.5020          0.4285     0.0200    0.0003
##    180        0.4841          0.4099     0.0200    0.0005
##    200        0.4675          0.3965     0.0200    0.0001
##    220        0.4541          0.3867     0.0200   -0.0000
##    240        0.4416          0.3787     0.0200   -0.0000
##    260        0.4300          0.3715     0.0200   -0.0001
##    280        0.4204          0.3701     0.0200    0.0000
##    300        0.4107          0.3665     0.0200    0.0000
##    320        0.4018          0.3595     0.0200    0.0000
##    340        0.3929          0.3560     0.0200    0.0001
##    360        0.3856          0.3539     0.0200   -0.0000
##    380        0.3785          0.3515     0.0200   -0.0002
##    400        0.3721          0.3472     0.0200   -0.0000
##    420        0.3650          0.3481     0.0200   -0.0000
##    440        0.3584          0.3479     0.0200   -0.0000
##    460        0.3519          0.3430     0.0200   -0.0000
```

```
##    480         0.3450          0.3440     0.0200   -0.0002
##    500         0.3388          0.3450     0.0200   -0.0002
##    520         0.3332          0.3448     0.0200    0.0000
##    540         0.3274          0.3440     0.0200   -0.0001
##    560         0.3214          0.3423     0.0200   -0.0001
##    580         0.3154          0.3427     0.0200   -0.0000
##    600         0.3097          0.3427     0.0200   -0.0001
##    620         0.3047          0.3436     0.0200   -0.0002
##    640         0.2999          0.3429     0.0200   -0.0001
##    660         0.2950          0.3413     0.0200   -0.0001
##    680         0.2905          0.3396     0.0200   -0.0002
##    700         0.2859          0.3398     0.0200   -0.0001
##    720         0.2816          0.3380     0.0200   -0.0001
##    740         0.2771          0.3364     0.0200   -0.0001
##    760         0.2730          0.3368     0.0200   -0.0001
##    780         0.2688          0.3365     0.0200   -0.0001
##    800         0.2647          0.3369     0.0200   -0.0001
##    820         0.2610          0.3354     0.0200   -0.0001
##    840         0.2569          0.3362     0.0200   -0.0001
##    860         0.2527          0.3350     0.0200   -0.0000
##    880         0.2489          0.3352     0.0200   -0.0001
##    900         0.2454          0.3349     0.0200   -0.0001
##    920         0.2420          0.3361     0.0200   -0.0000
##    940         0.2384          0.3363     0.0200   -0.0001
##    960         0.2345          0.3366     0.0200   -0.0000
##    980         0.2308          0.3352     0.0200   -0.0002
##   1000         0.2276          0.3355     0.0200   -0.0001
##   1020         0.2243          0.3356     0.0200   -0.0001
##   1040         0.2209          0.3358     0.0200   -0.0001
##   1060         0.2178          0.3371     0.0200   -0.0002
##   1080         0.2146          0.3378     0.0200   -0.0000
##   1100         0.2118          0.3378     0.0200   -0.0001
##   1120         0.2087          0.3373     0.0200   -0.0000
##   1140         0.2056          0.3354     0.0200   -0.0001
##   1160         0.2028          0.3357     0.0200   -0.0001
##   1180         0.2000          0.3349     0.0200   -0.0000
##   1200         0.1974          0.3333     0.0200   -0.0001
##   1220         0.1944          0.3320     0.0200   -0.0000
##   1240         0.1916          0.3323     0.0200    0.0000
##   1260         0.1889          0.3318     0.0200   -0.0001
##   1280         0.1861          0.3317     0.0200   -0.0000
##   1300         0.1832          0.3297     0.0200   -0.0001
##   1320         0.1805          0.3283     0.0200   -0.0001
##   1340         0.1780          0.3286     0.0200   -0.0000
##   1360         0.1756          0.3294     0.0200   -0.0000
##   1380         0.1735          0.3296     0.0200   -0.0001
##   1400         0.1711          0.3298     0.0200   -0.0001
##   1420         0.1689          0.3304     0.0200   -0.0001
##   1440         0.1664          0.3303     0.0200   -0.0000
##   1460         0.1642          0.3315     0.0200   -0.0001
##   1480         0.1620          0.3308     0.0200   -0.0001
##   1500         0.1596          0.3295     0.0200   -0.0000
##   1520         0.1575          0.3297     0.0200   -0.0000
##   1540         0.1555          0.3302     0.0200   -0.0001
```

```
##   1560        0.1533          0.3283     0.0200    0.0000
##   1580        0.1515          0.3290     0.0200   -0.0000
##   1600        0.1493          0.3287     0.0200   -0.0001
##   1620        0.1471          0.3281     0.0200   -0.0000
##   1640        0.1452          0.3285     0.0200   -0.0000
##   1660        0.1433          0.3292     0.0200   -0.0001
##   1680        0.1414          0.3281     0.0200   -0.0000
##   1700        0.1395          0.3267     0.0200   -0.0000
##   1720        0.1375          0.3269     0.0200   -0.0000
##   1740        0.1358          0.3268     0.0200   -0.0001
##   1760        0.1339          0.3258     0.0200    0.0000
##   1780        0.1327          0.3249     0.0200   -0.0001
##   1800        0.1310          0.3252     0.0200   -0.0000
##   1820        0.1295          0.3248     0.0200   -0.0000
##   1840        0.1279          0.3241     0.0200   -0.0001
##   1860        0.1264          0.3234     0.0200   -0.0000
##   1880        0.1246          0.3229     0.0200   -0.0000
##   1900        0.1231          0.3241     0.0200   -0.0000
##   1920        0.1216          0.3232     0.0200   -0.0001
##   1940        0.1203          0.3242     0.0200   -0.0000
##   1960        0.1189          0.3242     0.0200   -0.0000
##   1980        0.1174          0.3223     0.0200   -0.0000
##   2000        0.1159          0.3227     0.0200   -0.0000
##   2020        0.1145          0.3233     0.0200   -0.0000
##   2040        0.1132          0.3226     0.0200   -0.0001
##   2060        0.1119          0.3226     0.0200   -0.0000
##   2080        0.1104          0.3225     0.0200   -0.0000
##   2100        0.1093          0.3222     0.0200   -0.0000
##   2120        0.1080          0.3229     0.0200   -0.0000
##   2140        0.1066          0.3234     0.0200   -0.0000
##   2160        0.1055          0.3245     0.0200   -0.0001
##   2180        0.1041          0.3247     0.0200   -0.0001
##   2200        0.1027          0.3231     0.0200   -0.0000
##   2220        0.1014          0.3227     0.0200   -0.0000
##   2240        0.1003          0.3229     0.0200   -0.0000
##   2260        0.0992          0.3228     0.0200   -0.0000
##   2280        0.0982          0.3218     0.0200   -0.0000
##   2300        0.0970          0.3216     0.0200   -0.0000
##   2320        0.0958          0.3202     0.0200   -0.0000
##   2340        0.0947          0.3209     0.0200   -0.0000
##   2360        0.0936          0.3208     0.0200   -0.0000
##   2380        0.0924          0.3211     0.0200   -0.0000
##   2400        0.0913          0.3209     0.0200   -0.0000
##   2420        0.0903          0.3212     0.0200   -0.0000
##   2440        0.0892          0.3198     0.0200   -0.0001
##   2460        0.0882          0.3207     0.0200   -0.0000
##   2480        0.0872          0.3216     0.0200   -0.0000
##   2500        0.0862          0.3219     0.0200   -0.0000
##   2520        0.0852          0.3220     0.0200   -0.0000
##   2540        0.0843          0.3223     0.0200   -0.0000
##   2560        0.0834          0.3221     0.0200   -0.0000
##   2580        0.0823          0.3207     0.0200    0.0000
##   2600        0.0813          0.3195     0.0200   -0.0000
##   2620        0.0803          0.3197     0.0200   -0.0000
```

```
##   2640        0.0794          0.3201     0.0200   -0.0000
##   2660        0.0786          0.3191     0.0200   -0.0000
##   2680        0.0778          0.3189     0.0200   -0.0000
##   2700        0.0769          0.3191     0.0200   -0.0000
##   2720        0.0759          0.3185     0.0200   -0.0000
##   2740        0.0749          0.3180     0.0200   -0.0000
##   2760        0.0740          0.3188     0.0200   -0.0000
##   2780        0.0732          0.3178     0.0200   -0.0000
##   2800        0.0723          0.3177     0.0200   -0.0000
##   2820        0.0715          0.3190     0.0200   -0.0000
##   2840        0.0707          0.3184     0.0200   -0.0000
##   2860        0.0698          0.3188     0.0200   -0.0000
##   2880        0.0689          0.3170     0.0200   -0.0000
##   2900        0.0682          0.3182     0.0200   -0.0001
##   2920        0.0674          0.3180     0.0200   -0.0000
##   2940        0.0667          0.3177     0.0200   -0.0000
##   2960        0.0660          0.3186     0.0200   -0.0000
##   2980        0.0653          0.3179     0.0200   -0.0000
##   3000        0.0646          0.3181     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2655          1.2626     0.0300    0.0133
##      2        1.2373          1.2331     0.0300    0.0133
##      3        1.2102          1.2065     0.0300    0.0129
##      4        1.1854          1.1813     0.0300    0.0120
##      5        1.1626          1.1584     0.0300    0.0113
##      6        1.1406          1.1361     0.0300    0.0105
##      7        1.1206          1.1161     0.0300    0.0093
##      8        1.1019          1.0960     0.0300    0.0088
##      9        1.0835          1.0778     0.0300    0.0087
##     10        1.0658          1.0576     0.0300    0.0087
##     20        0.9236          0.8997     0.0300    0.0061
##     40        0.7380          0.6951     0.0300    0.0033
##     60        0.6289          0.5721     0.0300    0.0020
##     80        0.5588          0.4894     0.0300    0.0009
##    100        0.5131          0.4424     0.0300    0.0010
##    120        0.4822          0.4112     0.0300    0.0003
##    140        0.4598          0.3940     0.0300   -0.0000
##    160        0.4401          0.3776     0.0300   -0.0000
##    180        0.4240          0.3679     0.0300   -0.0001
##    200        0.4102          0.3653     0.0300   -0.0001
##    220        0.3967          0.3591     0.0300   -0.0000
##    240        0.3855          0.3582     0.0300   -0.0002
##    260        0.3747          0.3554     0.0300   -0.0002
##    280        0.3633          0.3519     0.0300   -0.0002
##    300        0.3536          0.3472     0.0300   -0.0005
##    320        0.3443          0.3472     0.0300   -0.0002
##    340        0.3350          0.3515     0.0300   -0.0001
##    360        0.3257          0.3494     0.0300   -0.0001
##    380        0.3174          0.3517     0.0300   -0.0001
```

```
##    400        0.3097         0.3486     0.0300   -0.0002
##    420        0.3013         0.3492     0.0300   -0.0001
##    440        0.2938         0.3471     0.0300   -0.0001
##    460        0.2871         0.3445     0.0300   -0.0002
##    480        0.2809         0.3452     0.0300   -0.0000
##    500        0.2738         0.3423     0.0300   -0.0000
##    520        0.2674         0.3408     0.0300   -0.0003
##    540        0.2615         0.3397     0.0300   -0.0001
##    560        0.2549         0.3381     0.0300   -0.0002
##    580        0.2493         0.3353     0.0300   -0.0000
##    600        0.2434         0.3360     0.0300   -0.0002
##    620        0.2377         0.3356     0.0300   -0.0001
##    640        0.2323         0.3354     0.0300   -0.0001
##    660        0.2271         0.3340     0.0300   -0.0000
##    680        0.2226         0.3347     0.0300   -0.0001
##    700        0.2171         0.3348     0.0300   -0.0002
##    720        0.2123         0.3367     0.0300   -0.0001
##    740        0.2079         0.3382     0.0300   -0.0000
##    760        0.2034         0.3358     0.0300   -0.0001
##    780        0.1994         0.3341     0.0300   -0.0002
##    800        0.1954         0.3350     0.0300   -0.0001
##    820        0.1912         0.3375     0.0300   -0.0001
##    840        0.1869         0.3372     0.0300   -0.0001
##    860        0.1828         0.3387     0.0300   -0.0001
##    880        0.1792         0.3374     0.0300   -0.0001
##    900        0.1755         0.3357     0.0300   -0.0001
##    920        0.1722         0.3361     0.0300   -0.0001
##    940        0.1685         0.3355     0.0300   -0.0000
##    960        0.1649         0.3349     0.0300   -0.0001
##    980        0.1613         0.3328     0.0300   -0.0000
##   1000        0.1582         0.3326     0.0300   -0.0001
##   1020        0.1551         0.3317     0.0300   -0.0001
##   1040        0.1518         0.3309     0.0300   -0.0000
##   1060        0.1482         0.3316     0.0300   -0.0001
##   1080        0.1455         0.3331     0.0300   -0.0001
##   1100        0.1427         0.3319     0.0300   -0.0000
##   1120        0.1397         0.3307     0.0300   -0.0000
##   1140        0.1370         0.3311     0.0300   -0.0001
##   1160        0.1345         0.3304     0.0300   -0.0001
##   1180        0.1316         0.3319     0.0300   -0.0000
##   1200        0.1290         0.3316     0.0300   -0.0000
##   1220        0.1268         0.3325     0.0300   -0.0000
##   1240        0.1243         0.3297     0.0300   -0.0000
##   1260        0.1222         0.3307     0.0300   -0.0001
##   1280        0.1196         0.3312     0.0300    0.0000
##   1300        0.1175         0.3303     0.0300   -0.0001
##   1320        0.1152         0.3290     0.0300   -0.0001
##   1340        0.1131         0.3280     0.0300   -0.0001
##   1360        0.1112         0.3277     0.0300   -0.0001
##   1380        0.1092         0.3281     0.0300   -0.0000
##   1400        0.1075         0.3283     0.0300   -0.0000
##   1420        0.1055         0.3286     0.0300   -0.0000
##   1440        0.1037         0.3296     0.0300   -0.0000
##   1460        0.1015         0.3292     0.0300   -0.0001
```

```
##   1480        0.0994          0.3275     0.0300   -0.0000
##   1500        0.0973          0.3279     0.0300   -0.0000
##   1520        0.0956          0.3273     0.0300   -0.0000
##   1540        0.0939          0.3288     0.0300   -0.0000
##   1560        0.0921          0.3300     0.0300   -0.0001
##   1580        0.0903          0.3293     0.0300   -0.0000
##   1600        0.0890          0.3312     0.0300   -0.0001
##   1620        0.0873          0.3323     0.0300   -0.0000
##   1640        0.0857          0.3320     0.0300   -0.0000
##   1660        0.0841          0.3330     0.0300   -0.0000
##   1680        0.0827          0.3328     0.0300   -0.0001
##   1700        0.0811          0.3327     0.0300   -0.0000
##   1720        0.0798          0.3329     0.0300   -0.0000
##   1740        0.0787          0.3328     0.0300   -0.0001
##   1760        0.0772          0.3337     0.0300   -0.0000
##   1780        0.0758          0.3354     0.0300   -0.0000
##   1800        0.0746          0.3353     0.0300   -0.0000
##   1820        0.0733          0.3342     0.0300   -0.0000
##   1840        0.0720          0.3321     0.0300   -0.0000
##   1860        0.0706          0.3327     0.0300   -0.0000
##   1880        0.0693          0.3322     0.0300   -0.0001
##   1900        0.0681          0.3343     0.0300   -0.0001
##   1920        0.0672          0.3338     0.0300   -0.0000
##   1940        0.0660          0.3325     0.0300   -0.0000
##   1960        0.0650          0.3318     0.0300   -0.0001
##   1980        0.0638          0.3316     0.0300   -0.0000
##   2000        0.0625          0.3323     0.0300   -0.0000
##   2020        0.0615          0.3310     0.0300   -0.0000
##   2040        0.0606          0.3316     0.0300   -0.0001
##   2060        0.0595          0.3304     0.0300   -0.0000
##   2080        0.0586          0.3300     0.0300   -0.0000
##   2100        0.0577          0.3291     0.0300   -0.0000
##   2120        0.0568          0.3289     0.0300   -0.0000
##   2140        0.0558          0.3284     0.0300   -0.0000
##   2160        0.0548          0.3265     0.0300   -0.0000
##   2180        0.0540          0.3271     0.0300   -0.0000
##   2200        0.0531          0.3274     0.0300   -0.0000
##   2220        0.0522          0.3288     0.0300    0.0000
##   2240        0.0513          0.3302     0.0300   -0.0000
##   2260        0.0504          0.3302     0.0300   -0.0000
##   2280        0.0496          0.3307     0.0300   -0.0000
##   2300        0.0489          0.3287     0.0300   -0.0000
##   2320        0.0482          0.3294     0.0300   -0.0000
##   2340        0.0474          0.3301     0.0300   -0.0000
##   2360        0.0467          0.3304     0.0300   -0.0000
##   2380        0.0459          0.3310     0.0300   -0.0000
##   2400        0.0451          0.3301     0.0300   -0.0000
##   2420        0.0444          0.3304     0.0300   -0.0000
##   2440        0.0437          0.3284     0.0300   -0.0000
##   2460        0.0429          0.3297     0.0300   -0.0000
##   2480        0.0422          0.3299     0.0300   -0.0000
##   2500        0.0415          0.3296     0.0300   -0.0000
##   2520        0.0407          0.3283     0.0300   -0.0000
##   2540        0.0401          0.3277     0.0300    0.0000
```

```
##   2560        0.0395           0.3260     0.0300    0.0000
##   2580        0.0388           0.3249     0.0300   -0.0000
##   2600        0.0382           0.3241     0.0300   -0.0000
##   2620        0.0377           0.3246     0.0300   -0.0000
##   2640        0.0371           0.3237     0.0300   -0.0000
##   2660        0.0366           0.3236     0.0300   -0.0000
##   2680        0.0360           0.3254     0.0300   -0.0000
##   2700        0.0354           0.3266     0.0300   -0.0000
##   2720        0.0347           0.3261     0.0300    0.0000
##   2740        0.0342           0.3279     0.0300   -0.0000
##   2760        0.0336           0.3277     0.0300   -0.0000
##   2780        0.0332           0.3283     0.0300   -0.0000
##   2800        0.0327           0.3287     0.0300   -0.0000
##   2820        0.0322           0.3290     0.0300   -0.0000
##   2840        0.0316           0.3296     0.0300   -0.0000
##   2860        0.0311           0.3298     0.0300   -0.0000
##   2880        0.0306           0.3295     0.0300   -0.0000
##   2900        0.0302           0.3280     0.0300   -0.0000
##   2920        0.0297           0.3268     0.0300   -0.0000
##   2940        0.0293           0.3284     0.0300   -0.0000
##   2960        0.0289           0.3293     0.0300   -0.0000
##   2980        0.0285           0.3289     0.0300   -0.0000
##   3000        0.0280           0.3300     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2865          1.2620     0.0100    0.0048
##      2        1.2763          1.2515     0.0100    0.0050
##      3        1.2665          1.2416     0.0100    0.0049
##      4        1.2576          1.2330     0.0100    0.0042
##      5        1.2487          1.2244     0.0100    0.0045
##      6        1.2392          1.2147     0.0100    0.0046
##      7        1.2301          1.2059     0.0100    0.0045
##      8        1.2210          1.1966     0.0100    0.0042
##      9        1.2126          1.1881     0.0100    0.0040
##     10        1.2048          1.1799     0.0100    0.0035
##     20        1.1317          1.1063     0.0100    0.0035
##     40        1.0135          0.9873     0.0100    0.0025
##     60        0.9221          0.8930     0.0100    0.0019
##     80        0.8463          0.8176     0.0100    0.0017
##    100        0.7840          0.7566     0.0100    0.0011
##    120        0.7317          0.7031     0.0100    0.0011
##    140        0.6879          0.6606     0.0100    0.0008
##    160        0.6498          0.6227     0.0100    0.0008
##    180        0.6186          0.5913     0.0100    0.0007
##    200        0.5912          0.5634     0.0100    0.0005
##    220        0.5679          0.5401     0.0100    0.0005
##    240        0.5474          0.5183     0.0100    0.0003
##    260        0.5290          0.4984     0.0100    0.0002
##    280        0.5138          0.4831     0.0100    0.0003
##    300        0.5004          0.4697     0.0100    0.0002
```

```
##    320        0.4891          0.4591     0.0100    0.0001
##    340        0.4786          0.4498     0.0100    0.0001
##    360        0.4698          0.4421     0.0100    0.0001
##    380        0.4619          0.4358     0.0100    0.0000
##    400        0.4536          0.4320     0.0100    0.0001
##    420        0.4465          0.4260     0.0100    0.0001
##    440        0.4396          0.4216     0.0100    0.0001
##    460        0.4329          0.4181     0.0100    0.0000
##    480        0.4274          0.4143     0.0100    0.0000
##    500        0.4211          0.4118     0.0100    0.0001
##    520        0.4160          0.4106     0.0100    0.0000
##    540        0.4109          0.4072     0.0100    0.0001
##    560        0.4057          0.4055     0.0100   -0.0000
##    580        0.4007          0.4027     0.0100    0.0000
##    600        0.3962          0.4007     0.0100   -0.0000
##    620        0.3915          0.3983     0.0100   -0.0001
##    640        0.3875          0.3981     0.0100    0.0000
##    660        0.3835          0.3984     0.0100   -0.0001
##    680        0.3793          0.3981     0.0100    0.0000
##    700        0.3755          0.3987     0.0100   -0.0001
##    720        0.3717          0.3984     0.0100    0.0000
##    740        0.3682          0.3976     0.0100    0.0000
##    760        0.3644          0.3969     0.0100   -0.0000
##    780        0.3612          0.3951     0.0100   -0.0001
##    800        0.3579          0.3932     0.0100   -0.0001
##    820        0.3544          0.3939     0.0100   -0.0000
##    840        0.3512          0.3929     0.0100    0.0000
##    860        0.3479          0.3916     0.0100   -0.0000
##    880        0.3449          0.3919     0.0100   -0.0001
##    900        0.3417          0.3920     0.0100   -0.0000
##    920        0.3385          0.3919     0.0100   -0.0001
##    940        0.3355          0.3923     0.0100   -0.0001
##    960        0.3326          0.3920     0.0100   -0.0000
##    980        0.3299          0.3918     0.0100   -0.0000
##   1000        0.3272          0.3912     0.0100   -0.0000
##   1020        0.3245          0.3906     0.0100   -0.0000
##   1040        0.3220          0.3904     0.0100   -0.0000
##   1060        0.3187          0.3887     0.0100    0.0000
##   1080        0.3162          0.3886     0.0100   -0.0000
##   1100        0.3134          0.3892     0.0100   -0.0000
##   1120        0.3106          0.3890     0.0100    0.0000
##   1140        0.3081          0.3886     0.0100   -0.0001
##   1160        0.3052          0.3881     0.0100   -0.0000
##   1180        0.3024          0.3878     0.0100   -0.0001
##   1200        0.2999          0.3869     0.0100   -0.0001
##   1220        0.2973          0.3854     0.0100   -0.0000
##   1240        0.2946          0.3851     0.0100   -0.0000
##   1260        0.2922          0.3855     0.0100   -0.0001
##   1280        0.2899          0.3862     0.0100   -0.0001
##   1300        0.2878          0.3866     0.0100   -0.0001
##   1320        0.2856          0.3847     0.0100   -0.0001
##   1340        0.2833          0.3841     0.0100   -0.0000
##   1360        0.2809          0.3834     0.0100   -0.0000
##   1380        0.2785          0.3836     0.0100   -0.0001
```

```
##   1400        0.2763          0.3842     0.0100   -0.0000
##   1420        0.2741          0.3852     0.0100   -0.0001
##   1440        0.2718          0.3862     0.0100   -0.0000
##   1460        0.2696          0.3860     0.0100    0.0000
##   1480        0.2674          0.3864     0.0100   -0.0001
##   1500        0.2654          0.3844     0.0100   -0.0001
##   1520        0.2635          0.3846     0.0100   -0.0000
##   1540        0.2616          0.3848     0.0100   -0.0001
##   1560        0.2596          0.3847     0.0100   -0.0001
##   1580        0.2577          0.3852     0.0100   -0.0001
##   1600        0.2554          0.3841     0.0100   -0.0001
##   1620        0.2534          0.3843     0.0100   -0.0000
##   1640        0.2515          0.3840     0.0100   -0.0000
##   1660        0.2495          0.3855     0.0100   -0.0000
##   1680        0.2476          0.3861     0.0100   -0.0001
##   1700        0.2454          0.3878     0.0100   -0.0000
##   1720        0.2433          0.3873     0.0100   -0.0000
##   1740        0.2414          0.3873     0.0100   -0.0000
##   1760        0.2396          0.3887     0.0100   -0.0001
##   1780        0.2377          0.3886     0.0100   -0.0001
##   1800        0.2358          0.3883     0.0100   -0.0000
##   1820        0.2339          0.3877     0.0100   -0.0000
##   1840        0.2322          0.3879     0.0100    0.0000
##   1860        0.2305          0.3886     0.0100    0.0000
##   1880        0.2286          0.3881     0.0100   -0.0000
##   1900        0.2266          0.3882     0.0100   -0.0000
##   1920        0.2247          0.3873     0.0100   -0.0000
##   1940        0.2230          0.3870     0.0100   -0.0000
##   1960        0.2215          0.3864     0.0100   -0.0000
##   1980        0.2199          0.3856     0.0100    0.0000
##   2000        0.2183          0.3856     0.0100   -0.0000
##   2020        0.2166          0.3859     0.0100   -0.0001
##   2040        0.2147          0.3862     0.0100   -0.0000
##   2060        0.2128          0.3866     0.0100   -0.0000
##   2080        0.2113          0.3877     0.0100   -0.0000
##   2100        0.2096          0.3882     0.0100   -0.0000
##   2120        0.2078          0.3889     0.0100   -0.0000
##   2140        0.2063          0.3887     0.0100   -0.0000
##   2160        0.2050          0.3891     0.0100   -0.0001
##   2180        0.2036          0.3888     0.0100   -0.0000
##   2200        0.2022          0.3887     0.0100   -0.0000
##   2220        0.2007          0.3899     0.0100   -0.0001
##   2240        0.1991          0.3895     0.0100   -0.0000
##   2260        0.1976          0.3887     0.0100   -0.0000
##   2280        0.1962          0.3887     0.0100   -0.0000
##   2300        0.1947          0.3889     0.0100   -0.0000
##   2320        0.1933          0.3894     0.0100   -0.0001
##   2340        0.1920          0.3892     0.0100   -0.0000
##   2360        0.1906          0.3880     0.0100   -0.0000
##   2380        0.1892          0.3873     0.0100   -0.0000
##   2400        0.1879          0.3880     0.0100   -0.0000
##   2420        0.1865          0.3878     0.0100   -0.0000
##   2440        0.1851          0.3880     0.0100   -0.0000
##   2460        0.1837          0.3880     0.0100   -0.0000
```

```
##   2480        0.1826          0.3881     0.0100   -0.0000
##   2500        0.1814          0.3878     0.0100   -0.0001
##   2520        0.1801          0.3875     0.0100   -0.0000
##   2540        0.1787          0.3866     0.0100   -0.0000
##   2560        0.1773          0.3866     0.0100   -0.0000
##   2580        0.1762          0.3872     0.0100   -0.0000
##   2600        0.1748          0.3867     0.0100   -0.0000
##   2620        0.1735          0.3869     0.0100   -0.0001
##   2640        0.1723          0.3865     0.0100   -0.0000
##   2660        0.1710          0.3868     0.0100   -0.0000
##   2680        0.1697          0.3864     0.0100   -0.0000
##   2700        0.1685          0.3866     0.0100   -0.0001
##   2720        0.1670          0.3860     0.0100   -0.0000
##   2740        0.1659          0.3869     0.0100   -0.0000
##   2760        0.1648          0.3876     0.0100   -0.0000
##   2780        0.1637          0.3880     0.0100   -0.0000
##   2800        0.1625          0.3877     0.0100   -0.0000
##   2820        0.1615          0.3883     0.0100   -0.0000
##   2840        0.1603          0.3879     0.0100   -0.0000
##   2860        0.1590          0.3866     0.0100   -0.0000
##   2880        0.1579          0.3863     0.0100   -0.0000
##   2900        0.1570          0.3864     0.0100   -0.0000
##   2920        0.1560          0.3871     0.0100   -0.0000
##   2940        0.1550          0.3875     0.0100   -0.0000
##   2960        0.1539          0.3883     0.0100   -0.0000
##   2980        0.1529          0.3884     0.0100   -0.0000
##   3000        0.1518          0.3871     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2767          1.2523     0.0200    0.0099
##      2        1.2572          1.2334     0.0200    0.0096
##      3        1.2382          1.2147     0.0200    0.0090
##      4        1.2209          1.1979     0.0200    0.0090
##      5        1.2043          1.1818     0.0200    0.0086
##      6        1.1880          1.1658     0.0200    0.0080
##      7        1.1729          1.1512     0.0200    0.0080
##      8        1.1584          1.1362     0.0200    0.0065
##      9        1.1434          1.1209     0.0200    0.0071
##     10        1.1292          1.1072     0.0200    0.0066
##     20        1.0126          0.9899     0.0200    0.0046
##     40        0.8480          0.8239     0.0200    0.0035
##     60        0.7321          0.7092     0.0200    0.0020
##     80        0.6508          0.6265     0.0200    0.0015
##    100        0.5905          0.5636     0.0200    0.0011
##    120        0.5456          0.5152     0.0200    0.0008
##    140        0.5104          0.4791     0.0200    0.0004
##    160        0.4862          0.4594     0.0200    0.0004
##    180        0.4667          0.4389     0.0200    0.0003
##    200        0.4499          0.4245     0.0200    0.0000
##    220        0.4368          0.4194     0.0200    0.0001
```

```
##    240         0.4229          0.4086     0.0200    0.0001
##    260         0.4116          0.3998     0.0200   -0.0001
##    280         0.4014          0.3953     0.0200    0.0001
##    300         0.3927          0.3904     0.0200    0.0001
##    320         0.3838          0.3888     0.0200    0.0000
##    340         0.3761          0.3854     0.0200   -0.0000
##    360         0.3677          0.3854     0.0200   -0.0001
##    380         0.3607          0.3864     0.0200   -0.0001
##    400         0.3542          0.3867     0.0200   -0.0002
##    420         0.3473          0.3876     0.0200   -0.0001
##    440         0.3412          0.3877     0.0200   -0.0000
##    460         0.3350          0.3890     0.0200    0.0001
##    480         0.3280          0.3881     0.0200    0.0000
##    500         0.3221          0.3879     0.0200    0.0001
##    520         0.3169          0.3876     0.0200   -0.0002
##    540         0.3115          0.3856     0.0200   -0.0000
##    560         0.3065          0.3867     0.0200   -0.0001
##    580         0.3008          0.3857     0.0200   -0.0001
##    600         0.2958          0.3864     0.0200   -0.0001
##    620         0.2910          0.3862     0.0200   -0.0000
##    640         0.2857          0.3861     0.0200   -0.0000
##    660         0.2810          0.3853     0.0200   -0.0001
##    680         0.2770          0.3835     0.0200   -0.0001
##    700         0.2722          0.3826     0.0200   -0.0001
##    720         0.2680          0.3822     0.0200   -0.0001
##    740         0.2642          0.3811     0.0200   -0.0001
##    760         0.2603          0.3791     0.0200   -0.0001
##    780         0.2562          0.3791     0.0200   -0.0000
##    800         0.2526          0.3786     0.0200   -0.0001
##    820         0.2489          0.3784     0.0200    0.0000
##    840         0.2457          0.3773     0.0200   -0.0001
##    860         0.2419          0.3777     0.0200   -0.0000
##    880         0.2381          0.3795     0.0200   -0.0000
##    900         0.2343          0.3827     0.0200   -0.0000
##    920         0.2306          0.3845     0.0200   -0.0002
##    940         0.2268          0.3834     0.0200   -0.0000
##    960         0.2229          0.3840     0.0200   -0.0001
##    980         0.2198          0.3866     0.0200   -0.0000
##   1000         0.2165          0.3876     0.0200   -0.0001
##   1020         0.2132          0.3885     0.0200    0.0000
##   1040         0.2098          0.3893     0.0200   -0.0001
##   1060         0.2068          0.3910     0.0200   -0.0000
##   1080         0.2036          0.3912     0.0200   -0.0001
##   1100         0.2008          0.3909     0.0200   -0.0001
##   1120         0.1978          0.3926     0.0200   -0.0001
##   1140         0.1946          0.3913     0.0200   -0.0001
##   1160         0.1917          0.3923     0.0200   -0.0001
##   1180         0.1890          0.3936     0.0200   -0.0001
##   1200         0.1860          0.3949     0.0200   -0.0000
##   1220         0.1837          0.3954     0.0200   -0.0001
##   1240         0.1811          0.3954     0.0200   -0.0000
##   1260         0.1786          0.3942     0.0200   -0.0001
##   1280         0.1762          0.3944     0.0200    0.0000
##   1300         0.1735          0.3932     0.0200    0.0000
```

```
##   1320        0.1713          0.3921     0.0200   -0.0001
##   1340        0.1690          0.3945     0.0200   -0.0001
##   1360        0.1666          0.3960     0.0200   -0.0001
##   1380        0.1644          0.3961     0.0200   -0.0001
##   1400        0.1621          0.3940     0.0200   -0.0000
##   1420        0.1601          0.3947     0.0200   -0.0001
##   1440        0.1578          0.3952     0.0200   -0.0001
##   1460        0.1555          0.3930     0.0200   -0.0000
##   1480        0.1534          0.3924     0.0200   -0.0000
##   1500        0.1512          0.3932     0.0200   -0.0001
##   1520        0.1492          0.3935     0.0200   -0.0000
##   1540        0.1473          0.3946     0.0200   -0.0001
##   1560        0.1453          0.3937     0.0200   -0.0001
##   1580        0.1434          0.3941     0.0200   -0.0001
##   1600        0.1415          0.3942     0.0200   -0.0000
##   1620        0.1397          0.3948     0.0200   -0.0000
##   1640        0.1380          0.3923     0.0200   -0.0000
##   1660        0.1362          0.3934     0.0200   -0.0000
##   1680        0.1346          0.3926     0.0200   -0.0001
##   1700        0.1329          0.3932     0.0200   -0.0000
##   1720        0.1314          0.3931     0.0200   -0.0000
##   1740        0.1297          0.3916     0.0200   -0.0000
##   1760        0.1278          0.3917     0.0200   -0.0000
##   1780        0.1262          0.3917     0.0200   -0.0000
##   1800        0.1246          0.3911     0.0200   -0.0000
##   1820        0.1233          0.3892     0.0200   -0.0000
##   1840        0.1217          0.3896     0.0200   -0.0001
##   1860        0.1202          0.3904     0.0200   -0.0000
##   1880        0.1186          0.3920     0.0200   -0.0001
##   1900        0.1171          0.3923     0.0200   -0.0000
##   1920        0.1156          0.3926     0.0200   -0.0001
##   1940        0.1140          0.3928     0.0200   -0.0000
##   1960        0.1127          0.3922     0.0200   -0.0000
##   1980        0.1114          0.3937     0.0200   -0.0000
##   2000        0.1100          0.3942     0.0200   -0.0000
##   2020        0.1087          0.3961     0.0200   -0.0000
##   2040        0.1074          0.3966     0.0200   -0.0000
##   2060        0.1062          0.3968     0.0200   -0.0001
##   2080        0.1048          0.3958     0.0200   -0.0000
##   2100        0.1035          0.3964     0.0200   -0.0000
##   2120        0.1023          0.3961     0.0200   -0.0000
##   2140        0.1010          0.3956     0.0200   -0.0000
##   2160        0.0997          0.3958     0.0200   -0.0000
##   2180        0.0985          0.3965     0.0200   -0.0001
##   2200        0.0974          0.3970     0.0200   -0.0000
##   2220        0.0962          0.3954     0.0200   -0.0000
##   2240        0.0953          0.3953     0.0200   -0.0000
##   2260        0.0940          0.3938     0.0200   -0.0001
##   2280        0.0930          0.3944     0.0200   -0.0000
##   2300        0.0920          0.3952     0.0200   -0.0000
##   2320        0.0909          0.3949     0.0200   -0.0000
##   2340        0.0898          0.3955     0.0200   -0.0000
##   2360        0.0888          0.3944     0.0200   -0.0000
##   2380        0.0878          0.3952     0.0200   -0.0000
```

```
##   2400        0.0868           0.3953     0.0200   -0.0000
##   2420        0.0857           0.3962     0.0200   -0.0000
##   2440        0.0847           0.3962     0.0200   -0.0000
##   2460        0.0835           0.3964     0.0200   -0.0000
##   2480        0.0824           0.3967     0.0200   -0.0000
##   2500        0.0814           0.3967     0.0200    0.0000
##   2520        0.0805           0.3971     0.0200   -0.0000
##   2540        0.0795           0.3975     0.0200   -0.0000
##   2560        0.0785           0.3975     0.0200   -0.0000
##   2580        0.0775           0.3985     0.0200   -0.0000
##   2600        0.0766           0.3979     0.0200   -0.0000
##   2620        0.0759           0.3982     0.0200   -0.0000
##   2640        0.0751           0.3988     0.0200   -0.0000
##   2660        0.0743           0.3991     0.0200   -0.0000
##   2680        0.0733           0.4004     0.0200   -0.0000
##   2700        0.0725           0.4017     0.0200   -0.0000
##   2720        0.0716           0.4020     0.0200   -0.0000
##   2740        0.0710           0.4015     0.0200   -0.0000
##   2760        0.0702           0.4007     0.0200   -0.0000
##   2780        0.0694           0.4004     0.0200   -0.0000
##   2800        0.0687           0.4000     0.0200   -0.0000
##   2820        0.0680           0.4007     0.0200   -0.0000
##   2840        0.0672           0.4012     0.0200   -0.0000
##   2860        0.0662           0.4005     0.0200   -0.0000
##   2880        0.0655           0.4013     0.0200   -0.0000
##   2900        0.0648           0.4012     0.0200   -0.0000
##   2920        0.0641           0.4021     0.0200   -0.0000
##   2940        0.0634           0.4021     0.0200   -0.0000
##   2960        0.0627           0.4025     0.0200   -0.0000
##   2980        0.0619           0.4031     0.0200   -0.0000
##   3000        0.0610           0.4042     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2658          1.2425     0.0300    0.0146
##      2        1.2365          1.2127     0.0300    0.0141
##      3        1.2106          1.1872     0.0300    0.0125
##      4        1.1861          1.1624     0.0300    0.0123
##      5        1.1640          1.1408     0.0300    0.0107
##      6        1.1428          1.1188     0.0300    0.0104
##      7        1.1217          1.0973     0.0300    0.0107
##      8        1.1009          1.0778     0.0300    0.0099
##      9        1.0819          1.0592     0.0300    0.0093
##     10        1.0642          1.0413     0.0300    0.0087
##     20        0.9173          0.8935     0.0300    0.0052
##     40        0.7307          0.7143     0.0300    0.0026
##     60        0.6174          0.5969     0.0300    0.0025
##     80        0.5493          0.5291     0.0300    0.0013
##    100        0.5053          0.4850     0.0300    0.0006
##    120        0.4709          0.4504     0.0300    0.0004
##    140        0.4465          0.4296     0.0300    0.0002
```

```
##    160         0.4275          0.4157     0.0300   -0.0000
##    180         0.4112          0.4074     0.0300   -0.0000
##    200         0.3977          0.4043     0.0300   -0.0001
##    220         0.3847          0.4000     0.0300    0.0000
##    240         0.3722          0.3951     0.0300    0.0000
##    260         0.3605          0.3911     0.0300    0.0000
##    280         0.3508          0.3894     0.0300   -0.0002
##    300         0.3409          0.3863     0.0300   -0.0001
##    320         0.3320          0.3869     0.0300    0.0000
##    340         0.3230          0.3860     0.0300   -0.0002
##    360         0.3150          0.3886     0.0300   -0.0002
##    380         0.3070          0.3887     0.0300   -0.0003
##    400         0.3001          0.3914     0.0300   -0.0002
##    420         0.2922          0.3920     0.0300   -0.0000
##    440         0.2852          0.3871     0.0300   -0.0001
##    460         0.2780          0.3821     0.0300   -0.0002
##    480         0.2707          0.3828     0.0300   -0.0001
##    500         0.2638          0.3817     0.0300   -0.0001
##    520         0.2581          0.3833     0.0300   -0.0002
##    540         0.2520          0.3827     0.0300   -0.0000
##    560         0.2456          0.3794     0.0300   -0.0002
##    580         0.2402          0.3802     0.0300   -0.0002
##    600         0.2346          0.3786     0.0300   -0.0001
##    620         0.2294          0.3793     0.0300   -0.0002
##    640         0.2242          0.3771     0.0300   -0.0001
##    660         0.2187          0.3778     0.0300   -0.0001
##    680         0.2140          0.3770     0.0300   -0.0000
##    700         0.2094          0.3796     0.0300   -0.0001
##    720         0.2047          0.3830     0.0300   -0.0001
##    740         0.2009          0.3816     0.0300   -0.0002
##    760         0.1966          0.3783     0.0300   -0.0000
##    780         0.1927          0.3767     0.0300   -0.0001
##    800         0.1890          0.3727     0.0300   -0.0002
##    820         0.1853          0.3748     0.0300   -0.0002
##    840         0.1814          0.3759     0.0300   -0.0001
##    860         0.1775          0.3748     0.0300   -0.0001
##    880         0.1737          0.3756     0.0300   -0.0001
##    900         0.1696          0.3780     0.0300   -0.0001
##    920         0.1659          0.3790     0.0300   -0.0001
##    940         0.1624          0.3803     0.0300   -0.0000
##    960         0.1590          0.3800     0.0300   -0.0000
##    980         0.1559          0.3795     0.0300   -0.0000
##   1000         0.1528          0.3808     0.0300   -0.0000
##   1020         0.1497          0.3795     0.0300   -0.0001
##   1040         0.1470          0.3802     0.0300   -0.0001
##   1060         0.1439          0.3795     0.0300   -0.0001
##   1080         0.1409          0.3817     0.0300   -0.0001
##   1100         0.1384          0.3835     0.0300   -0.0002
##   1120         0.1359          0.3847     0.0300   -0.0001
##   1140         0.1333          0.3859     0.0300   -0.0001
##   1160         0.1306          0.3864     0.0300   -0.0001
##   1180         0.1282          0.3844     0.0300   -0.0001
##   1200         0.1259          0.3832     0.0300   -0.0001
##   1220         0.1237          0.3825     0.0300   -0.0000
```

```
##   1240        0.1216          0.3807     0.0300   -0.0001
##   1260        0.1191          0.3797     0.0300    0.0000
##   1280        0.1168          0.3812     0.0300   -0.0000
##   1300        0.1145          0.3833     0.0300   -0.0001
##   1320        0.1124          0.3853     0.0300   -0.0001
##   1340        0.1103          0.3838     0.0300   -0.0001
##   1360        0.1080          0.3836     0.0300   -0.0001
##   1380        0.1061          0.3830     0.0300   -0.0001
##   1400        0.1041          0.3850     0.0300   -0.0000
##   1420        0.1020          0.3853     0.0300   -0.0000
##   1440        0.1003          0.3857     0.0300   -0.0000
##   1460        0.0987          0.3849     0.0300   -0.0000
##   1480        0.0970          0.3853     0.0300   -0.0000
##   1500        0.0952          0.3856     0.0300   -0.0001
##   1520        0.0937          0.3875     0.0300   -0.0001
##   1540        0.0921          0.3876     0.0300   -0.0000
##   1560        0.0904          0.3879     0.0300   -0.0000
##   1580        0.0885          0.3895     0.0300    0.0000
##   1600        0.0869          0.3899     0.0300   -0.0001
##   1620        0.0855          0.3904     0.0300   -0.0000
##   1640        0.0840          0.3920     0.0300   -0.0001
##   1660        0.0826          0.3933     0.0300   -0.0000
##   1680        0.0812          0.3939     0.0300   -0.0000
##   1700        0.0798          0.3954     0.0300   -0.0000
##   1720        0.0784          0.3973     0.0300   -0.0001
##   1740        0.0769          0.3975     0.0300   -0.0000
##   1760        0.0756          0.3990     0.0300   -0.0000
##   1780        0.0742          0.3988     0.0300   -0.0000
##   1800        0.0728          0.3975     0.0300   -0.0000
##   1820        0.0716          0.3975     0.0300   -0.0001
##   1840        0.0703          0.3955     0.0300   -0.0001
##   1860        0.0692          0.3975     0.0300   -0.0000
##   1880        0.0680          0.3973     0.0300   -0.0000
##   1900        0.0669          0.3969     0.0300   -0.0001
##   1920        0.0659          0.3960     0.0300   -0.0000
##   1940        0.0647          0.3959     0.0300   -0.0000
##   1960        0.0636          0.3986     0.0300   -0.0000
##   1980        0.0626          0.3988     0.0300   -0.0000
##   2000        0.0615          0.3988     0.0300   -0.0000
##   2020        0.0603          0.3984     0.0300   -0.0000
##   2040        0.0594          0.3997     0.0300   -0.0000
##   2060        0.0583          0.4001     0.0300    0.0000
##   2080        0.0574          0.3991     0.0300   -0.0000
##   2100        0.0565          0.4001     0.0300   -0.0000
##   2120        0.0554          0.4028     0.0300    0.0000
##   2140        0.0543          0.4037     0.0300   -0.0000
##   2160        0.0534          0.4064     0.0300   -0.0000
##   2180        0.0525          0.4053     0.0300    0.0000
##   2200        0.0517          0.4073     0.0300   -0.0000
##   2220        0.0509          0.4083     0.0300   -0.0000
##   2240        0.0500          0.4084     0.0300   -0.0000
##   2260        0.0491          0.4086     0.0300   -0.0000
##   2280        0.0483          0.4089     0.0300   -0.0000
##   2300        0.0475          0.4107     0.0300   -0.0000
```

```
##   2320        0.0468          0.4128     0.0300   -0.0000
##   2340        0.0461          0.4120     0.0300   -0.0000
##   2360        0.0454          0.4126     0.0300   -0.0000
##   2380        0.0445          0.4141     0.0300   -0.0000
##   2400        0.0437          0.4157     0.0300   -0.0000
##   2420        0.0431          0.4160     0.0300   -0.0000
##   2440        0.0425          0.4158     0.0300   -0.0001
##   2460        0.0418          0.4173     0.0300   -0.0000
##   2480        0.0411          0.4151     0.0300   -0.0000
##   2500        0.0405          0.4153     0.0300    0.0000
##   2520        0.0398          0.4150     0.0300   -0.0000
##   2540        0.0392          0.4161     0.0300   -0.0000
##   2560        0.0385          0.4144     0.0300   -0.0000
##   2580        0.0380          0.4138     0.0300   -0.0000
##   2600        0.0374          0.4157     0.0300   -0.0000
##   2620        0.0368          0.4166     0.0300   -0.0000
##   2640        0.0362          0.4160     0.0300   -0.0000
##   2660        0.0356          0.4171     0.0300   -0.0000
##   2680        0.0350          0.4170     0.0300   -0.0000
##   2700        0.0343          0.4180     0.0300   -0.0000
##   2720        0.0338          0.4204     0.0300   -0.0000
##   2740        0.0332          0.4224     0.0300   -0.0000
##   2760        0.0327          0.4232     0.0300   -0.0000
##   2780        0.0322          0.4229     0.0300   -0.0000
##   2800        0.0317          0.4238     0.0300   -0.0000
##   2820        0.0312          0.4242     0.0300   -0.0000
##   2840        0.0307          0.4253     0.0300   -0.0000
##   2860        0.0303          0.4276     0.0300   -0.0000
##   2880        0.0299          0.4295     0.0300   -0.0000
##   2900        0.0294          0.4306     0.0300   -0.0000
##   2920        0.0290          0.4329     0.0300   -0.0000
##   2940        0.0285          0.4345     0.0300   -0.0000
##   2960        0.0281          0.4349     0.0300   -0.0000
##   2980        0.0276          0.4343     0.0300   -0.0000
##   3000        0.0271          0.4353     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2868          1.2579     0.0100    0.0047
##      2        1.2772          1.2483     0.0100    0.0045
##      3        1.2673          1.2382     0.0100    0.0048
##      4        1.2573          1.2279     0.0100    0.0048
##      5        1.2482          1.2184     0.0100    0.0046
##      6        1.2398          1.2096     0.0100    0.0039
##      7        1.2308          1.2000     0.0100    0.0046
##      8        1.2225          1.1915     0.0100    0.0042
##      9        1.2139          1.1830     0.0100    0.0043
##     10        1.2057          1.1745     0.0100    0.0045
##     20        1.1285          1.0941     0.0100    0.0036
##     40        1.0102          0.9699     0.0100    0.0027
##     60        0.9191          0.8743     0.0100    0.0020
```

```
##    80        0.8459          0.7987     0.0100    0.0014
##   100        0.7859          0.7384     0.0100    0.0013
##   120        0.7370          0.6877     0.0100    0.0010
##   140        0.6939          0.6448     0.0100    0.0009
##   160        0.6568          0.6078     0.0100    0.0007
##   180        0.6256          0.5748     0.0100    0.0006
##   200        0.5992          0.5495     0.0100    0.0005
##   220        0.5756          0.5259     0.0100    0.0005
##   240        0.5565          0.5062     0.0100    0.0004
##   260        0.5399          0.4883     0.0100    0.0003
##   280        0.5251          0.4730     0.0100    0.0002
##   300        0.5132          0.4622     0.0100    0.0002
##   320        0.5013          0.4506     0.0100    0.0001
##   340        0.4916          0.4429     0.0100    0.0002
##   360        0.4825          0.4357     0.0100    0.0002
##   380        0.4743          0.4288     0.0100    0.0001
##   400        0.4666          0.4222     0.0100    0.0001
##   420        0.4593          0.4163     0.0100    0.0001
##   440        0.4522          0.4121     0.0100    0.0001
##   460        0.4456          0.4075     0.0100   -0.0000
##   480        0.4401          0.4039     0.0100    0.0001
##   500        0.4347          0.4015     0.0100    0.0000
##   520        0.4297          0.3990     0.0100    0.0000
##   540        0.4246          0.3967     0.0100    0.0000
##   560        0.4198          0.3945     0.0100   -0.0000
##   580        0.4152          0.3927     0.0100   -0.0000
##   600        0.4107          0.3912     0.0100   -0.0000
##   620        0.4064          0.3905     0.0100    0.0000
##   640        0.4020          0.3889     0.0100   -0.0001
##   660        0.3978          0.3869     0.0100   -0.0000
##   680        0.3938          0.3848     0.0100   -0.0000
##   700        0.3898          0.3831     0.0100   -0.0000
##   720        0.3861          0.3817     0.0100    0.0000
##   740        0.3823          0.3813     0.0100   -0.0000
##   760        0.3788          0.3809     0.0100    0.0000
##   780        0.3751          0.3798     0.0100   -0.0000
##   800        0.3719          0.3784     0.0100   -0.0000
##   820        0.3687          0.3784     0.0100   -0.0001
##   840        0.3654          0.3785     0.0100   -0.0001
##   860        0.3617          0.3786     0.0100    0.0000
##   880        0.3585          0.3784     0.0100   -0.0000
##   900        0.3553          0.3775     0.0100    0.0000
##   920        0.3524          0.3774     0.0100   -0.0001
##   940        0.3491          0.3756     0.0100   -0.0000
##   960        0.3460          0.3750     0.0100   -0.0000
##   980        0.3428          0.3748     0.0100   -0.0000
##  1000        0.3399          0.3735     0.0100   -0.0000
##  1020        0.3371          0.3738     0.0100   -0.0000
##  1040        0.3343          0.3733     0.0100    0.0000
##  1060        0.3317          0.3729     0.0100   -0.0000
##  1080        0.3293          0.3734     0.0100   -0.0000
##  1100        0.3261          0.3725     0.0100   -0.0000
##  1120        0.3236          0.3735     0.0100   -0.0000
##  1140        0.3209          0.3736     0.0100   -0.0000
```

```
##   1160        0.3185          0.3742     0.0100   -0.0001
##   1180        0.3161          0.3742     0.0100    0.0000
##   1200        0.3134          0.3738     0.0100   -0.0001
##   1220        0.3109          0.3738     0.0100   -0.0000
##   1240        0.3084          0.3731     0.0100   -0.0001
##   1260        0.3063          0.3739     0.0100   -0.0000
##   1280        0.3039          0.3737     0.0100   -0.0001
##   1300        0.3019          0.3729     0.0100   -0.0001
##   1320        0.2995          0.3735     0.0100   -0.0001
##   1340        0.2974          0.3741     0.0100   -0.0000
##   1360        0.2953          0.3741     0.0100   -0.0000
##   1380        0.2932          0.3737     0.0100   -0.0001
##   1400        0.2911          0.3746     0.0100   -0.0000
##   1420        0.2889          0.3745     0.0100   -0.0001
##   1440        0.2865          0.3742     0.0100   -0.0000
##   1460        0.2843          0.3745     0.0100   -0.0001
##   1480        0.2824          0.3730     0.0100   -0.0001
##   1500        0.2801          0.3724     0.0100   -0.0000
##   1520        0.2782          0.3733     0.0100   -0.0000
##   1540        0.2762          0.3736     0.0100   -0.0000
##   1560        0.2742          0.3731     0.0100   -0.0001
##   1580        0.2717          0.3732     0.0100    0.0000
##   1600        0.2698          0.3737     0.0100   -0.0000
##   1620        0.2678          0.3733     0.0100   -0.0000
##   1640        0.2659          0.3729     0.0100   -0.0001
##   1660        0.2641          0.3744     0.0100   -0.0001
##   1680        0.2623          0.3745     0.0100   -0.0000
##   1700        0.2601          0.3738     0.0100   -0.0001
##   1720        0.2583          0.3742     0.0100   -0.0001
##   1740        0.2568          0.3738     0.0100   -0.0000
##   1760        0.2551          0.3737     0.0100   -0.0001
##   1780        0.2533          0.3743     0.0100   -0.0000
##   1800        0.2514          0.3747     0.0100   -0.0000
##   1820        0.2495          0.3746     0.0100   -0.0000
##   1840        0.2476          0.3747     0.0100   -0.0001
##   1860        0.2456          0.3753     0.0100   -0.0000
##   1880        0.2441          0.3746     0.0100   -0.0000
##   1900        0.2425          0.3745     0.0100   -0.0000
##   1920        0.2405          0.3741     0.0100   -0.0000
##   1940        0.2390          0.3739     0.0100   -0.0001
##   1960        0.2373          0.3738     0.0100   -0.0000
##   1980        0.2357          0.3740     0.0100   -0.0000
##   2000        0.2340          0.3738     0.0100   -0.0000
##   2020        0.2326          0.3748     0.0100   -0.0001
##   2040        0.2310          0.3746     0.0100   -0.0000
##   2060        0.2294          0.3743     0.0100   -0.0000
##   2080        0.2278          0.3751     0.0100   -0.0001
##   2100        0.2264          0.3759     0.0100   -0.0000
##   2120        0.2249          0.3763     0.0100   -0.0000
##   2140        0.2233          0.3767     0.0100   -0.0000
##   2160        0.2217          0.3773     0.0100   -0.0000
##   2180        0.2201          0.3769     0.0100   -0.0000
##   2200        0.2186          0.3776     0.0100   -0.0000
##   2220        0.2170          0.3777     0.0100   -0.0000
```

```
##   2240        0.2155           0.3780     0.0100   -0.0000
##   2260        0.2141           0.3792     0.0100   -0.0000
##   2280        0.2127           0.3786     0.0100   -0.0000
##   2300        0.2112           0.3787     0.0100   -0.0000
##   2320        0.2097           0.3784     0.0100   -0.0000
##   2340        0.2083           0.3788     0.0100   -0.0000
##   2360        0.2069           0.3784     0.0100   -0.0001
##   2380        0.2053           0.3779     0.0100   -0.0000
##   2400        0.2039           0.3781     0.0100   -0.0000
##   2420        0.2025           0.3782     0.0100   -0.0000
##   2440        0.2011           0.3780     0.0100   -0.0001
##   2460        0.1998           0.3782     0.0100   -0.0000
##   2480        0.1984           0.3784     0.0100   -0.0000
##   2500        0.1972           0.3788     0.0100   -0.0001
##   2520        0.1960           0.3787     0.0100   -0.0000
##   2540        0.1946           0.3797     0.0100   -0.0000
##   2560        0.1935           0.3798     0.0100   -0.0000
##   2580        0.1921           0.3797     0.0100   -0.0000
##   2600        0.1906           0.3800     0.0100   -0.0000
##   2620        0.1893           0.3804     0.0100   -0.0000
##   2640        0.1878           0.3790     0.0100   -0.0000
##   2660        0.1864           0.3796     0.0100   -0.0001
##   2680        0.1851           0.3797     0.0100   -0.0000
##   2700        0.1840           0.3807     0.0100   -0.0000
##   2720        0.1825           0.3806     0.0100   -0.0000
##   2740        0.1813           0.3814     0.0100   -0.0000
##   2760        0.1802           0.3809     0.0100   -0.0000
##   2780        0.1790           0.3811     0.0100   -0.0000
##   2800        0.1779           0.3820     0.0100   -0.0000
##   2820        0.1767           0.3827     0.0100   -0.0000
##   2840        0.1755           0.3830     0.0100   -0.0000
##   2860        0.1744           0.3828     0.0100   -0.0000
##   2880        0.1733           0.3836     0.0100   -0.0000
##   2900        0.1722           0.3840     0.0100   -0.0000
##   2920        0.1709           0.3837     0.0100   -0.0000
##   2940        0.1699           0.3842     0.0100   -0.0000
##   2960        0.1688           0.3849     0.0100   -0.0000
##   2980        0.1677           0.3841     0.0100   -0.0001
##   3000        0.1666           0.3839     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2761          1.2459     0.0200    0.0093
##      2        1.2562          1.2255     0.0200    0.0092
##      3        1.2376          1.2068     0.0200    0.0092
##      4        1.2195          1.1885     0.0200    0.0088
##      5        1.2042          1.1718     0.0200    0.0076
##      6        1.1875          1.1543     0.0200    0.0078
##      7        1.1720          1.1385     0.0200    0.0078
##      8        1.1567          1.1212     0.0200    0.0073
##      9        1.1415          1.1058     0.0200    0.0073
```

```
##    10        1.1275          1.0916     0.0200    0.0068
##    20        1.0107          0.9693     0.0200    0.0043
##    40        0.8493          0.8026     0.0200    0.0033
##    60        0.7357          0.6883     0.0200    0.0022
##    80        0.6573          0.6095     0.0200    0.0013
##   100        0.5999          0.5505     0.0200    0.0010
##   120        0.5580          0.5079     0.0200    0.0006
##   140        0.5274          0.4791     0.0200    0.0004
##   160        0.5031          0.4550     0.0200    0.0002
##   180        0.4854          0.4409     0.0200    0.0003
##   200        0.4688          0.4274     0.0200    0.0001
##   220        0.4552          0.4180     0.0200   -0.0001
##   240        0.4433          0.4104     0.0200    0.0001
##   260        0.4323          0.4012     0.0200   -0.0001
##   280        0.4208          0.3923     0.0200    0.0000
##   300        0.4114          0.3873     0.0200    0.0000
##   320        0.4026          0.3856     0.0200   -0.0000
##   340        0.3940          0.3828     0.0200   -0.0001
##   360        0.3868          0.3832     0.0200   -0.0002
##   380        0.3797          0.3814     0.0200   -0.0000
##   400        0.3736          0.3814     0.0200    0.0001
##   420        0.3669          0.3815     0.0200   -0.0002
##   440        0.3607          0.3794     0.0200   -0.0001
##   460        0.3538          0.3781     0.0200    0.0001
##   480        0.3479          0.3764     0.0200   -0.0001
##   500        0.3426          0.3779     0.0200   -0.0000
##   520        0.3366          0.3793     0.0200   -0.0001
##   540        0.3307          0.3796     0.0200   -0.0001
##   560        0.3250          0.3788     0.0200   -0.0001
##   580        0.3200          0.3798     0.0200   -0.0001
##   600        0.3156          0.3820     0.0200   -0.0002
##   620        0.3109          0.3811     0.0200   -0.0001
##   640        0.3060          0.3809     0.0200   -0.0000
##   660        0.3008          0.3803     0.0200   -0.0001
##   680        0.2958          0.3829     0.0200   -0.0001
##   700        0.2913          0.3819     0.0200   -0.0001
##   720        0.2872          0.3816     0.0200   -0.0001
##   740        0.2835          0.3806     0.0200   -0.0002
##   760        0.2793          0.3832     0.0200   -0.0002
##   780        0.2752          0.3819     0.0200   -0.0001
##   800        0.2717          0.3815     0.0200   -0.0001
##   820        0.2679          0.3833     0.0200   -0.0001
##   840        0.2640          0.3835     0.0200   -0.0001
##   860        0.2601          0.3823     0.0200   -0.0001
##   880        0.2566          0.3821     0.0200   -0.0001
##   900        0.2533          0.3823     0.0200   -0.0002
##   920        0.2498          0.3809     0.0200   -0.0001
##   940        0.2464          0.3809     0.0200   -0.0001
##   960        0.2430          0.3806     0.0200   -0.0001
##   980        0.2397          0.3791     0.0200   -0.0000
##  1000        0.2362          0.3807     0.0200   -0.0001
##  1020        0.2328          0.3774     0.0200   -0.0000
##  1040        0.2292          0.3769     0.0200   -0.0001
##  1060        0.2259          0.3774     0.0200   -0.0001
```

```
##   1080        0.2227          0.3752     0.0200   -0.0000
##   1100        0.2194          0.3752     0.0200   -0.0001
##   1120        0.2163          0.3769     0.0200   -0.0001
##   1140        0.2130          0.3779     0.0200   -0.0000
##   1160        0.2099          0.3780     0.0200   -0.0001
##   1180        0.2071          0.3779     0.0200   -0.0001
##   1200        0.2042          0.3782     0.0200   -0.0001
##   1220        0.2015          0.3792     0.0200   -0.0001
##   1240        0.1993          0.3779     0.0200   -0.0001
##   1260        0.1966          0.3756     0.0200   -0.0001
##   1280        0.1941          0.3753     0.0200   -0.0001
##   1300        0.1915          0.3756     0.0200   -0.0000
##   1320        0.1886          0.3747     0.0200   -0.0001
##   1340        0.1863          0.3738     0.0200   -0.0000
##   1360        0.1841          0.3731     0.0200   -0.0001
##   1380        0.1821          0.3719     0.0200   -0.0001
##   1400        0.1793          0.3757     0.0200   -0.0000
##   1420        0.1772          0.3758     0.0200   -0.0001
##   1440        0.1750          0.3759     0.0200   -0.0001
##   1460        0.1728          0.3768     0.0200   -0.0001
##   1480        0.1705          0.3764     0.0200   -0.0001
##   1500        0.1681          0.3755     0.0200   -0.0000
##   1520        0.1657          0.3752     0.0200   -0.0001
##   1540        0.1635          0.3760     0.0200   -0.0001
##   1560        0.1614          0.3753     0.0200   -0.0000
##   1580        0.1593          0.3745     0.0200   -0.0001
##   1600        0.1571          0.3741     0.0200   -0.0000
##   1620        0.1551          0.3755     0.0200   -0.0000
##   1640        0.1530          0.3745     0.0200   -0.0001
##   1660        0.1508          0.3719     0.0200   -0.0000
##   1680        0.1489          0.3740     0.0200   -0.0001
##   1700        0.1471          0.3739     0.0200   -0.0001
##   1720        0.1455          0.3739     0.0200   -0.0001
##   1740        0.1436          0.3733     0.0200   -0.0001
##   1760        0.1420          0.3735     0.0200   -0.0000
##   1780        0.1401          0.3732     0.0200   -0.0000
##   1800        0.1387          0.3744     0.0200   -0.0000
##   1820        0.1372          0.3753     0.0200   -0.0000
##   1840        0.1354          0.3742     0.0200   -0.0000
##   1860        0.1338          0.3747     0.0200   -0.0000
##   1880        0.1322          0.3735     0.0200   -0.0000
##   1900        0.1305          0.3736     0.0200   -0.0001
##   1920        0.1292          0.3731     0.0200   -0.0000
##   1940        0.1276          0.3730     0.0200   -0.0001
##   1960        0.1259          0.3741     0.0200   -0.0000
##   1980        0.1244          0.3736     0.0200   -0.0000
##   2000        0.1227          0.3732     0.0200   -0.0001
##   2020        0.1211          0.3733     0.0200   -0.0000
##   2040        0.1196          0.3735     0.0200   -0.0001
##   2060        0.1181          0.3745     0.0200   -0.0000
##   2080        0.1167          0.3747     0.0200   -0.0001
##   2100        0.1155          0.3762     0.0200   -0.0001
##   2120        0.1142          0.3764     0.0200   -0.0001
##   2140        0.1126          0.3785     0.0200   -0.0000
```

```
##   2160        0.1113          0.3779     0.0200   -0.0000
##   2180        0.1101          0.3774     0.0200   -0.0000
##   2200        0.1088          0.3781     0.0200   -0.0001
##   2220        0.1075          0.3799     0.0200   -0.0000
##   2240        0.1062          0.3823     0.0200   -0.0000
##   2260        0.1050          0.3825     0.0200   -0.0000
##   2280        0.1040          0.3837     0.0200   -0.0000
##   2300        0.1029          0.3839     0.0200   -0.0000
##   2320        0.1016          0.3817     0.0200   -0.0000
##   2340        0.1005          0.3818     0.0200   -0.0001
##   2360        0.0994          0.3816     0.0200   -0.0000
##   2380        0.0983          0.3831     0.0200   -0.0000
##   2400        0.0973          0.3853     0.0200   -0.0000
##   2420        0.0962          0.3847     0.0200   -0.0000
##   2440        0.0950          0.3858     0.0200   -0.0000
##   2460        0.0939          0.3862     0.0200   -0.0000
##   2480        0.0929          0.3865     0.0200   -0.0000
##   2500        0.0918          0.3866     0.0200   -0.0000
##   2520        0.0907          0.3880     0.0200   -0.0000
##   2540        0.0898          0.3866     0.0200   -0.0000
##   2560        0.0888          0.3867     0.0200   -0.0000
##   2580        0.0878          0.3869     0.0200   -0.0001
##   2600        0.0870          0.3869     0.0200   -0.0000
##   2620        0.0862          0.3874     0.0200   -0.0001
##   2640        0.0853          0.3873     0.0200   -0.0000
##   2660        0.0844          0.3870     0.0200   -0.0000
##   2680        0.0835          0.3873     0.0200   -0.0000
##   2700        0.0826          0.3875     0.0200   -0.0000
##   2720        0.0817          0.3871     0.0200   -0.0000
##   2740        0.0809          0.3855     0.0200   -0.0000
##   2760        0.0800          0.3868     0.0200   -0.0000
##   2780        0.0792          0.3867     0.0200   -0.0000
##   2800        0.0785          0.3862     0.0200   -0.0000
##   2820        0.0776          0.3854     0.0200   -0.0000
##   2840        0.0768          0.3852     0.0200   -0.0000
##   2860        0.0760          0.3852     0.0200   -0.0000
##   2880        0.0753          0.3854     0.0200   -0.0000
##   2900        0.0746          0.3856     0.0200   -0.0000
##   2920        0.0738          0.3863     0.0200   -0.0000
##   2940        0.0729          0.3864     0.0200   -0.0000
##   2960        0.0722          0.3866     0.0200   -0.0000
##   2980        0.0714          0.3867     0.0200   -0.0000
##   3000        0.0707          0.3870     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2661          1.2375     0.0300    0.0151
##      2        1.2366          1.2058     0.0300    0.0131
##      3        1.2091          1.1773     0.0300    0.0129
##      4        1.1842          1.1526     0.0300    0.0123
##      5        1.1607          1.1277     0.0300    0.0112
```

```
##      6        1.1390          1.1048     0.0300    0.0108
##      7        1.1183          1.0828     0.0300    0.0101
##      8        1.0986          1.0621     0.0300    0.0087
##      9        1.0804          1.0432     0.0300    0.0088
##     10        1.0607          1.0208     0.0300    0.0091
##     20        0.9169          0.8677     0.0300    0.0057
##     40        0.7307          0.6823     0.0300    0.0029
##     60        0.6222          0.5705     0.0300    0.0018
##     80        0.5543          0.5020     0.0300    0.0013
##    100        0.5096          0.4585     0.0300    0.0004
##    120        0.4794          0.4326     0.0300    0.0004
##    140        0.4569          0.4144     0.0300    0.0003
##    160        0.4398          0.4036     0.0300    0.0000
##    180        0.4237          0.3936     0.0300    0.0001
##    200        0.4094          0.3871     0.0300   -0.0001
##    220        0.3975          0.3864     0.0300   -0.0002
##    240        0.3857          0.3846     0.0300   -0.0001
##    260        0.3759          0.3786     0.0300   -0.0002
##    280        0.3657          0.3766     0.0300   -0.0002
##    300        0.3562          0.3715     0.0300   -0.0000
##    320        0.3467          0.3718     0.0300    0.0001
##    340        0.3387          0.3701     0.0300   -0.0001
##    360        0.3311          0.3704     0.0300   -0.0001
##    380        0.3235          0.3713     0.0300   -0.0001
##    400        0.3169          0.3738     0.0300   -0.0001
##    420        0.3101          0.3754     0.0300   -0.0002
##    440        0.3030          0.3726     0.0300   -0.0001
##    460        0.2964          0.3730     0.0300   -0.0001
##    480        0.2898          0.3685     0.0300   -0.0001
##    500        0.2831          0.3694     0.0300   -0.0002
##    520        0.2773          0.3705     0.0300   -0.0003
##    540        0.2709          0.3687     0.0300   -0.0001
##    560        0.2649          0.3714     0.0300   -0.0002
##    580        0.2590          0.3682     0.0300   -0.0002
##    600        0.2539          0.3721     0.0300   -0.0002
##    620        0.2484          0.3727     0.0300   -0.0001
##    640        0.2434          0.3707     0.0300   -0.0001
##    660        0.2381          0.3716     0.0300   -0.0001
##    680        0.2333          0.3734     0.0300   -0.0001
##    700        0.2287          0.3746     0.0300   -0.0001
##    720        0.2234          0.3733     0.0300   -0.0001
##    740        0.2187          0.3735     0.0300   -0.0001
##    760        0.2141          0.3747     0.0300   -0.0001
##    780        0.2099          0.3758     0.0300   -0.0002
##    800        0.2054          0.3759     0.0300   -0.0001
##    820        0.2014          0.3768     0.0300   -0.0001
##    840        0.1971          0.3785     0.0300   -0.0001
##    860        0.1933          0.3798     0.0300   -0.0001
##    880        0.1889          0.3765     0.0300   -0.0002
##    900        0.1852          0.3753     0.0300   -0.0001
##    920        0.1815          0.3764     0.0300   -0.0001
##    940        0.1783          0.3735     0.0300   -0.0000
##    960        0.1750          0.3728     0.0300   -0.0001
##    980        0.1718          0.3747     0.0300   -0.0001
```

```
##   1000        0.1688          0.3764     0.0300   -0.0001
##   1020        0.1655          0.3745     0.0300   -0.0001
##   1040        0.1623          0.3744     0.0300   -0.0001
##   1060        0.1593          0.3733     0.0300   -0.0001
##   1080        0.1564          0.3723     0.0300   -0.0001
##   1100        0.1533          0.3717     0.0300   -0.0001
##   1120        0.1505          0.3722     0.0300   -0.0001
##   1140        0.1484          0.3713     0.0300   -0.0001
##   1160        0.1459          0.3726     0.0300   -0.0001
##   1180        0.1434          0.3740     0.0300   -0.0000
##   1200        0.1407          0.3740     0.0300   -0.0001
##   1220        0.1379          0.3728     0.0300   -0.0001
##   1240        0.1358          0.3749     0.0300   -0.0001
##   1260        0.1335          0.3793     0.0300   -0.0000
##   1280        0.1306          0.3793     0.0300   -0.0000
##   1300        0.1281          0.3770     0.0300   -0.0000
##   1320        0.1259          0.3789     0.0300   -0.0001
##   1340        0.1234          0.3783     0.0300   -0.0001
##   1360        0.1217          0.3816     0.0300   -0.0001
##   1380        0.1198          0.3844     0.0300   -0.0001
##   1400        0.1177          0.3870     0.0300   -0.0000
##   1420        0.1154          0.3845     0.0300   -0.0001
##   1440        0.1136          0.3863     0.0300   -0.0001
##   1460        0.1114          0.3875     0.0300   -0.0001
##   1480        0.1094          0.3840     0.0300   -0.0000
##   1500        0.1076          0.3850     0.0300   -0.0001
##   1520        0.1060          0.3871     0.0300   -0.0001
##   1540        0.1041          0.3885     0.0300   -0.0000
##   1560        0.1021          0.3859     0.0300   -0.0000
##   1580        0.1005          0.3881     0.0300   -0.0000
##   1600        0.0985          0.3883     0.0300   -0.0000
##   1620        0.0968          0.3898     0.0300   -0.0001
##   1640        0.0950          0.3924     0.0300   -0.0001
##   1660        0.0934          0.3932     0.0300   -0.0000
##   1680        0.0918          0.3925     0.0300   -0.0001
##   1700        0.0900          0.3924     0.0300   -0.0001
##   1720        0.0884          0.3916     0.0300   -0.0001
##   1740        0.0866          0.3895     0.0300   -0.0000
##   1760        0.0853          0.3908     0.0300   -0.0000
##   1780        0.0840          0.3927     0.0300   -0.0000
##   1800        0.0826          0.3928     0.0300   -0.0000
##   1820        0.0811          0.3908     0.0300   -0.0000
##   1840        0.0799          0.3924     0.0300   -0.0001
##   1860        0.0784          0.3941     0.0300   -0.0000
##   1880        0.0773          0.3966     0.0300   -0.0000
##   1900        0.0761          0.3975     0.0300   -0.0000
##   1920        0.0750          0.3957     0.0300   -0.0000
##   1940        0.0738          0.3972     0.0300   -0.0000
##   1960        0.0725          0.3971     0.0300   -0.0000
##   1980        0.0713          0.3983     0.0300   -0.0001
##   2000        0.0702          0.4011     0.0300   -0.0000
##   2020        0.0691          0.4028     0.0300   -0.0000
##   2040        0.0680          0.4016     0.0300   -0.0000
##   2060        0.0669          0.4020     0.0300   -0.0000
```

```
##   2080        0.0659          0.4049     0.0300   -0.0000
##   2100        0.0648          0.4038     0.0300   -0.0001
##   2120        0.0639          0.4058     0.0300   -0.0000
##   2140        0.0628          0.4047     0.0300   -0.0000
##   2160        0.0618          0.4051     0.0300   -0.0000
##   2180        0.0609          0.4078     0.0300   -0.0000
##   2200        0.0601          0.4092     0.0300   -0.0000
##   2220        0.0591          0.4094     0.0300   -0.0000
##   2240        0.0582          0.4099     0.0300   -0.0000
##   2260        0.0574          0.4113     0.0300   -0.0000
##   2280        0.0565          0.4105     0.0300   -0.0000
##   2300        0.0555          0.4120     0.0300   -0.0000
##   2320        0.0545          0.4116     0.0300   -0.0000
##   2340        0.0537          0.4118     0.0300   -0.0000
##   2360        0.0529          0.4137     0.0300   -0.0000
##   2380        0.0520          0.4145     0.0300   -0.0000
##   2400        0.0512          0.4144     0.0300   -0.0000
##   2420        0.0503          0.4154     0.0300   -0.0000
##   2440        0.0496          0.4154     0.0300   -0.0000
##   2460        0.0488          0.4146     0.0300   -0.0000
##   2480        0.0481          0.4121     0.0300   -0.0000
##   2500        0.0474          0.4126     0.0300   -0.0000
##   2520        0.0467          0.4118     0.0300   -0.0000
##   2540        0.0459          0.4104     0.0300   -0.0000
##   2560        0.0451          0.4094     0.0300   -0.0000
##   2580        0.0444          0.4067     0.0300   -0.0000
##   2600        0.0437          0.4072     0.0300   -0.0000
##   2620        0.0430          0.4074     0.0300   -0.0000
##   2640        0.0421          0.4091     0.0300   -0.0000
##   2660        0.0415          0.4079     0.0300   -0.0000
##   2680        0.0408          0.4096     0.0300   -0.0000
##   2700        0.0402          0.4112     0.0300   -0.0000
##   2720        0.0396          0.4136     0.0300   -0.0000
##   2740        0.0390          0.4133     0.0300   -0.0000
##   2760        0.0384          0.4125     0.0300   -0.0000
##   2780        0.0378          0.4127     0.0300   -0.0000
##   2800        0.0371          0.4104     0.0300   -0.0000
##   2820        0.0367          0.4138     0.0300   -0.0000
##   2840        0.0361          0.4144     0.0300   -0.0000
##   2860        0.0356          0.4156     0.0300   -0.0000
##   2880        0.0350          0.4146     0.0300   -0.0000
##   2900        0.0345          0.4146     0.0300   -0.0000
##   2920        0.0340          0.4129     0.0300   -0.0000
##   2940        0.0335          0.4139     0.0300   -0.0000
##   2960        0.0330          0.4163     0.0300   -0.0000
##   2980        0.0325          0.4154     0.0300   -0.0000
##   3000        0.0320          0.4139     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2829          1.2850     0.0100    0.0052
```

```
##       2        1.2728          1.2741     0.0100    0.0047
##       3        1.2630          1.2635     0.0100    0.0046
##       4        1.2535          1.2539     0.0100    0.0048
##       5        1.2444          1.2445     0.0100    0.0041
##       6        1.2354          1.2352     0.0100    0.0045
##       7        1.2265          1.2257     0.0100    0.0042
##       8        1.2180          1.2169     0.0100    0.0043
##       9        1.2104          1.2089     0.0100    0.0037
##      10        1.2021          1.2004     0.0100    0.0039
##      20        1.1271          1.1232     0.0100    0.0036
##      40        1.0067          0.9960     0.0100    0.0025
##      60        0.9146          0.9000     0.0100    0.0019
##      80        0.8409          0.8232     0.0100    0.0016
##     100        0.7792          0.7584     0.0100    0.0012
##     120        0.7293          0.7060     0.0100    0.0011
##     140        0.6856          0.6602     0.0100    0.0008
##     160        0.6487          0.6205     0.0100    0.0008
##     180        0.6163          0.5871     0.0100    0.0007
##     200        0.5887          0.5579     0.0100    0.0005
##     220        0.5648          0.5309     0.0100    0.0005
##     240        0.5451          0.5097     0.0100    0.0004
##     260        0.5274          0.4897     0.0100    0.0003
##     280        0.5123          0.4727     0.0100    0.0002
##     300        0.4993          0.4579     0.0100    0.0003
##     320        0.4880          0.4470     0.0100    0.0003
##     340        0.4772          0.4371     0.0100    0.0002
##     360        0.4682          0.4292     0.0100    0.0001
##     380        0.4595          0.4208     0.0100    0.0001
##     400        0.4521          0.4148     0.0100    0.0001
##     420        0.4454          0.4094     0.0100    0.0000
##     440        0.4384          0.4038     0.0100   -0.0000
##     460        0.4323          0.4006     0.0100    0.0000
##     480        0.4266          0.3970     0.0100   -0.0000
##     500        0.4209          0.3934     0.0100    0.0000
##     520        0.4159          0.3907     0.0100    0.0000
##     540        0.4109          0.3877     0.0100    0.0000
##     560        0.4058          0.3855     0.0100   -0.0000
##     580        0.4007          0.3832     0.0100   -0.0000
##     600        0.3957          0.3807     0.0100   -0.0001
##     620        0.3915          0.3799     0.0100    0.0000
##     640        0.3869          0.3788     0.0100   -0.0000
##     660        0.3831          0.3769     0.0100    0.0000
##     680        0.3787          0.3756     0.0100   -0.0000
##     700        0.3748          0.3726     0.0100    0.0001
##     720        0.3713          0.3710     0.0100   -0.0001
##     740        0.3676          0.3709     0.0100    0.0001
##     760        0.3636          0.3704     0.0100   -0.0000
##     780        0.3601          0.3692     0.0100   -0.0000
##     800        0.3565          0.3688     0.0100   -0.0000
##     820        0.3530          0.3675     0.0100   -0.0000
##     840        0.3497          0.3660     0.0100   -0.0001
##     860        0.3467          0.3656     0.0100   -0.0001
##     880        0.3434          0.3652     0.0100   -0.0001
##     900        0.3399          0.3642     0.0100   -0.0000
```

```
##    920         0.3367          0.3645     0.0100   -0.0000
##    940         0.3334          0.3644     0.0100   -0.0001
##    960         0.3302          0.3637     0.0100   -0.0000
##    980         0.3270          0.3630     0.0100   -0.0001
##   1000         0.3243          0.3642     0.0100   -0.0000
##   1020         0.3214          0.3640     0.0100   -0.0000
##   1040         0.3182          0.3640     0.0100   -0.0000
##   1060         0.3153          0.3641     0.0100   -0.0000
##   1080         0.3124          0.3639     0.0100   -0.0001
##   1100         0.3097          0.3636     0.0100   -0.0000
##   1120         0.3069          0.3640     0.0100   -0.0000
##   1140         0.3042          0.3639     0.0100   -0.0001
##   1160         0.3019          0.3633     0.0100   -0.0000
##   1180         0.2993          0.3631     0.0100   -0.0000
##   1200         0.2968          0.3628     0.0100   -0.0000
##   1220         0.2945          0.3631     0.0100   -0.0001
##   1240         0.2918          0.3634     0.0100   -0.0000
##   1260         0.2893          0.3648     0.0100   -0.0000
##   1280         0.2871          0.3653     0.0100   -0.0001
##   1300         0.2847          0.3654     0.0100   -0.0000
##   1320         0.2822          0.3640     0.0100   -0.0000
##   1340         0.2799          0.3632     0.0100   -0.0000
##   1360         0.2776          0.3632     0.0100   -0.0000
##   1380         0.2752          0.3629     0.0100   -0.0000
##   1400         0.2729          0.3637     0.0100   -0.0000
##   1420         0.2705          0.3645     0.0100   -0.0000
##   1440         0.2680          0.3646     0.0100   -0.0000
##   1460         0.2659          0.3651     0.0100    0.0000
##   1480         0.2636          0.3640     0.0100   -0.0001
##   1500         0.2615          0.3637     0.0100   -0.0000
##   1520         0.2595          0.3640     0.0100   -0.0000
##   1540         0.2576          0.3631     0.0100   -0.0000
##   1560         0.2557          0.3625     0.0100   -0.0000
##   1580         0.2538          0.3621     0.0100   -0.0001
##   1600         0.2516          0.3625     0.0100   -0.0000
##   1620         0.2492          0.3623     0.0100   -0.0000
##   1640         0.2471          0.3626     0.0100   -0.0000
##   1660         0.2453          0.3629     0.0100   -0.0001
##   1680         0.2432          0.3630     0.0100   -0.0000
##   1700         0.2414          0.3625     0.0100   -0.0000
##   1720         0.2396          0.3635     0.0100   -0.0001
##   1740         0.2378          0.3641     0.0100   -0.0000
##   1760         0.2361          0.3643     0.0100   -0.0000
##   1780         0.2343          0.3643     0.0100   -0.0000
##   1800         0.2326          0.3649     0.0100   -0.0001
##   1820         0.2306          0.3652     0.0100   -0.0000
##   1840         0.2289          0.3656     0.0100   -0.0000
##   1860         0.2271          0.3653     0.0100   -0.0000
##   1880         0.2253          0.3649     0.0100   -0.0000
##   1900         0.2234          0.3638     0.0100   -0.0000
##   1920         0.2217          0.3633     0.0100   -0.0000
##   1940         0.2201          0.3641     0.0100   -0.0001
##   1960         0.2187          0.3645     0.0100   -0.0000
##   1980         0.2169          0.3654     0.0100   -0.0000
```

```
##   2000        0.2152          0.3651     0.0100   -0.0000
##   2020        0.2136          0.3637     0.0100   -0.0000
##   2040        0.2122          0.3631     0.0100   -0.0000
##   2060        0.2108          0.3635     0.0100   -0.0000
##   2080        0.2092          0.3629     0.0100   -0.0000
##   2100        0.2077          0.3632     0.0100   -0.0000
##   2120        0.2062          0.3625     0.0100   -0.0000
##   2140        0.2045          0.3628     0.0100   -0.0000
##   2160        0.2029          0.3624     0.0100   -0.0001
##   2180        0.2015          0.3626     0.0100   -0.0000
##   2200        0.2001          0.3628     0.0100   -0.0001
##   2220        0.1985          0.3634     0.0100   -0.0000
##   2240        0.1970          0.3632     0.0100   -0.0000
##   2260        0.1956          0.3636     0.0100   -0.0000
##   2280        0.1941          0.3635     0.0100   -0.0000
##   2300        0.1926          0.3632     0.0100   -0.0000
##   2320        0.1912          0.3634     0.0100   -0.0000
##   2340        0.1898          0.3631     0.0100   -0.0000
##   2360        0.1886          0.3643     0.0100   -0.0000
##   2380        0.1872          0.3649     0.0100   -0.0000
##   2400        0.1859          0.3652     0.0100   -0.0000
##   2420        0.1846          0.3653     0.0100   -0.0000
##   2440        0.1831          0.3646     0.0100   -0.0000
##   2460        0.1819          0.3652     0.0100   -0.0001
##   2480        0.1805          0.3658     0.0100    0.0000
##   2500        0.1792          0.3657     0.0100   -0.0000
##   2520        0.1779          0.3663     0.0100   -0.0000
##   2540        0.1767          0.3663     0.0100   -0.0000
##   2560        0.1755          0.3660     0.0100   -0.0000
##   2580        0.1743          0.3665     0.0100   -0.0000
##   2600        0.1731          0.3663     0.0100   -0.0000
##   2620        0.1717          0.3670     0.0100   -0.0000
##   2640        0.1704          0.3671     0.0100   -0.0000
##   2660        0.1691          0.3665     0.0100   -0.0000
##   2680        0.1678          0.3656     0.0100   -0.0000
##   2700        0.1667          0.3655     0.0100   -0.0000
##   2720        0.1656          0.3661     0.0100   -0.0000
##   2740        0.1644          0.3665     0.0100   -0.0001
##   2760        0.1633          0.3670     0.0100   -0.0000
##   2780        0.1624          0.3669     0.0100   -0.0001
##   2800        0.1612          0.3671     0.0100   -0.0000
##   2820        0.1601          0.3677     0.0100   -0.0000
##   2840        0.1589          0.3682     0.0100   -0.0000
##   2860        0.1578          0.3681     0.0100   -0.0000
##   2880        0.1567          0.3689     0.0100   -0.0001
##   2900        0.1556          0.3684     0.0100   -0.0000
##   2920        0.1546          0.3679     0.0100   -0.0000
##   2940        0.1535          0.3678     0.0100   -0.0000
##   2960        0.1525          0.3685     0.0100   -0.0000
##   2980        0.1516          0.3698     0.0100   -0.0001
##   3000        0.1506          0.3702     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
```

```
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2729          1.2752     0.0200    0.0099
##      2        1.2527          1.2541     0.0200    0.0093
##      3        1.2356          1.2359     0.0200    0.0087
##      4        1.2191          1.2184     0.0200    0.0081
##      5        1.2021          1.2003     0.0200    0.0086
##      6        1.1856          1.1830     0.0200    0.0085
##      7        1.1701          1.1664     0.0200    0.0071
##      8        1.1545          1.1498     0.0200    0.0074
##      9        1.1408          1.1366     0.0200    0.0065
##     10        1.1271          1.1221     0.0200    0.0064
##     20        1.0096          1.0015     0.0200    0.0053
##     40        0.8417          0.8227     0.0200    0.0028
##     60        0.7294          0.7073     0.0200    0.0022
##     80        0.6499          0.6218     0.0200    0.0015
##    100        0.5907          0.5569     0.0200    0.0011
##    120        0.5465          0.5115     0.0200    0.0009
##    140        0.5140          0.4794     0.0200    0.0003
##    160        0.4891          0.4532     0.0200    0.0002
##    180        0.4698          0.4345     0.0200    0.0002
##    200        0.4529          0.4194     0.0200    0.0001
##    220        0.4392          0.4088     0.0200    0.0001
##    240        0.4271          0.4025     0.0200    0.0001
##    260        0.4165          0.3963     0.0200    0.0001
##    280        0.4064          0.3914     0.0200   -0.0000
##    300        0.3975          0.3892     0.0200   -0.0000
##    320        0.3891          0.3857     0.0200   -0.0001
##    340        0.3807          0.3829     0.0200    0.0000
##    360        0.3739          0.3809     0.0200   -0.0001
##    380        0.3663          0.3805     0.0200   -0.0002
##    400        0.3593          0.3783     0.0200    0.0000
##    420        0.3521          0.3767     0.0200   -0.0001
##    440        0.3460          0.3770     0.0200   -0.0001
##    460        0.3397          0.3779     0.0200   -0.0002
##    480        0.3330          0.3770     0.0200   -0.0001
##    500        0.3276          0.3782     0.0200   -0.0000
##    520        0.3220          0.3763     0.0200    0.0000
##    540        0.3164          0.3771     0.0200   -0.0001
##    560        0.3115          0.3773     0.0200   -0.0001
##    580        0.3063          0.3759     0.0200   -0.0000
##    600        0.3008          0.3747     0.0200   -0.0001
##    620        0.2956          0.3735     0.0200   -0.0001
##    640        0.2911          0.3720     0.0200   -0.0001
##    660        0.2862          0.3737     0.0200   -0.0001
##    680        0.2821          0.3746     0.0200   -0.0001
##    700        0.2781          0.3746     0.0200   -0.0001
##    720        0.2738          0.3748     0.0200   -0.0001
##    740        0.2687          0.3736     0.0200   -0.0000
##    760        0.2646          0.3749     0.0200   -0.0001
##    780        0.2603          0.3764     0.0200   -0.0001
##    800        0.2558          0.3757     0.0200   -0.0000
##    820        0.2515          0.3769     0.0200   -0.0001
```

```
##    840         0.2475          0.3770     0.0200   -0.0002
##    860         0.2438          0.3780     0.0200   -0.0000
##    880         0.2404          0.3772     0.0200   -0.0001
##    900         0.2376          0.3790     0.0200   -0.0001
##    920         0.2341          0.3786     0.0200   -0.0002
##    940         0.2307          0.3806     0.0200   -0.0001
##    960         0.2271          0.3800     0.0200   -0.0001
##    980         0.2237          0.3781     0.0200   -0.0000
##   1000         0.2207          0.3775     0.0200   -0.0001
##   1020         0.2177          0.3771     0.0200   -0.0001
##   1040         0.2148          0.3769     0.0200   -0.0001
##   1060         0.2115          0.3788     0.0200   -0.0000
##   1080         0.2085          0.3782     0.0200   -0.0001
##   1100         0.2056          0.3767     0.0200   -0.0001
##   1120         0.2026          0.3769     0.0200   -0.0001
##   1140         0.1994          0.3779     0.0200   -0.0000
##   1160         0.1963          0.3775     0.0200   -0.0000
##   1180         0.1934          0.3776     0.0200   -0.0000
##   1200         0.1907          0.3791     0.0200   -0.0000
##   1220         0.1880          0.3805     0.0200   -0.0001
##   1240         0.1852          0.3807     0.0200   -0.0000
##   1260         0.1826          0.3798     0.0200   -0.0000
##   1280         0.1802          0.3793     0.0200   -0.0001
##   1300         0.1771          0.3776     0.0200    0.0000
##   1320         0.1746          0.3796     0.0200   -0.0001
##   1340         0.1719          0.3814     0.0200   -0.0001
##   1360         0.1695          0.3840     0.0200   -0.0000
##   1380         0.1671          0.3844     0.0200    0.0000
##   1400         0.1647          0.3840     0.0200   -0.0000
##   1420         0.1624          0.3822     0.0200   -0.0001
##   1440         0.1603          0.3808     0.0200   -0.0000
##   1460         0.1580          0.3810     0.0200   -0.0001
##   1480         0.1558          0.3808     0.0200   -0.0000
##   1500         0.1537          0.3830     0.0200   -0.0001
##   1520         0.1517          0.3829     0.0200   -0.0000
##   1540         0.1497          0.3837     0.0200   -0.0000
##   1560         0.1478          0.3821     0.0200   -0.0000
##   1580         0.1459          0.3815     0.0200   -0.0000
##   1600         0.1440          0.3812     0.0200   -0.0001
##   1620         0.1420          0.3805     0.0200   -0.0001
##   1640         0.1402          0.3798     0.0200   -0.0000
##   1660         0.1384          0.3803     0.0200   -0.0000
##   1680         0.1368          0.3811     0.0200   -0.0001
##   1700         0.1353          0.3830     0.0200   -0.0001
##   1720         0.1336          0.3835     0.0200   -0.0000
##   1740         0.1318          0.3842     0.0200   -0.0000
##   1760         0.1301          0.3853     0.0200   -0.0001
##   1780         0.1283          0.3850     0.0200   -0.0000
##   1800         0.1266          0.3844     0.0200   -0.0000
##   1820         0.1253          0.3835     0.0200   -0.0000
##   1840         0.1237          0.3842     0.0200   -0.0001
##   1860         0.1220          0.3825     0.0200   -0.0000
##   1880         0.1204          0.3836     0.0200   -0.0000
##   1900         0.1189          0.3850     0.0200   -0.0000
```

```
##   1920        0.1175          0.3855     0.0200   -0.0000
##   1940        0.1161          0.3870     0.0200   -0.0000
##   1960        0.1145          0.3882     0.0200   -0.0000
##   1980        0.1128          0.3883     0.0200   -0.0000
##   2000        0.1114          0.3868     0.0200   -0.0001
##   2020        0.1101          0.3874     0.0200   -0.0000
##   2040        0.1088          0.3884     0.0200   -0.0000
##   2060        0.1076          0.3879     0.0200   -0.0000
##   2080        0.1063          0.3874     0.0200   -0.0000
##   2100        0.1049          0.3872     0.0200    0.0000
##   2120        0.1036          0.3872     0.0200   -0.0001
##   2140        0.1023          0.3850     0.0200   -0.0001
##   2160        0.1010          0.3843     0.0200   -0.0000
##   2180        0.0997          0.3854     0.0200   -0.0000
##   2200        0.0986          0.3845     0.0200   -0.0000
##   2220        0.0974          0.3852     0.0200   -0.0000
##   2240        0.0963          0.3845     0.0200   -0.0001
##   2260        0.0950          0.3841     0.0200   -0.0000
##   2280        0.0936          0.3849     0.0200   -0.0000
##   2300        0.0927          0.3861     0.0200   -0.0000
##   2320        0.0914          0.3864     0.0200   -0.0000
##   2340        0.0904          0.3876     0.0200   -0.0000
##   2360        0.0894          0.3883     0.0200   -0.0000
##   2380        0.0883          0.3885     0.0200   -0.0001
##   2400        0.0871          0.3891     0.0200   -0.0000
##   2420        0.0859          0.3898     0.0200   -0.0000
##   2440        0.0851          0.3893     0.0200   -0.0000
##   2460        0.0842          0.3891     0.0200   -0.0000
##   2480        0.0832          0.3883     0.0200   -0.0000
##   2500        0.0823          0.3871     0.0200   -0.0000
##   2520        0.0813          0.3860     0.0200   -0.0000
##   2540        0.0804          0.3861     0.0200   -0.0000
##   2560        0.0794          0.3858     0.0200   -0.0000
##   2580        0.0785          0.3872     0.0200   -0.0000
##   2600        0.0777          0.3884     0.0200   -0.0000
##   2620        0.0767          0.3884     0.0200   -0.0000
##   2640        0.0759          0.3880     0.0200   -0.0001
##   2660        0.0750          0.3882     0.0200   -0.0000
##   2680        0.0742          0.3889     0.0200   -0.0000
##   2700        0.0733          0.3876     0.0200   -0.0000
##   2720        0.0725          0.3884     0.0200   -0.0000
##   2740        0.0718          0.3894     0.0200   -0.0000
##   2760        0.0711          0.3901     0.0200   -0.0000
##   2780        0.0704          0.3914     0.0200   -0.0000
##   2800        0.0696          0.3932     0.0200   -0.0000
##   2820        0.0689          0.3937     0.0200   -0.0000
##   2840        0.0681          0.3938     0.0200   -0.0000
##   2860        0.0674          0.3933     0.0200   -0.0000
##   2880        0.0667          0.3930     0.0200   -0.0000
##   2900        0.0659          0.3937     0.0200   -0.0000
##   2920        0.0652          0.3927     0.0200   -0.0000
##   2940        0.0644          0.3911     0.0200   -0.0000
##   2960        0.0637          0.3924     0.0200   -0.0000
##   2980        0.0631          0.3953     0.0200   -0.0000
```

```
##   3000        0.0624          0.3932     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter 'train.fraction' is deprecated, please specify
## 'nTrain' instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2634          1.2647     0.0300    0.0149
##      2        1.2360          1.2356     0.0300    0.0139
##      3        1.2092          1.2072     0.0300    0.0132
##      4        1.1849          1.1813     0.0300    0.0119
##      5        1.1648          1.1611     0.0300    0.0092
##      6        1.1436          1.1374     0.0300    0.0099
##      7        1.1214          1.1138     0.0300    0.0105
##      8        1.1006          1.0918     0.0300    0.0098
##      9        1.0798          1.0698     0.0300    0.0101
##     10        1.0622          1.0513     0.0300    0.0086
##     20        0.9190          0.9019     0.0300    0.0059
##     40        0.7323          0.7062     0.0300    0.0033
##     60        0.6203          0.5919     0.0300    0.0019
##     80        0.5487          0.5135     0.0300    0.0011
##    100        0.5019          0.4676     0.0300    0.0007
##    120        0.4701          0.4350     0.0300    0.0002
##    140        0.4453          0.4137     0.0300    0.0003
##    160        0.4251          0.3932     0.0300    0.0004
##    180        0.4086          0.3853     0.0300    0.0001
##    200        0.3944          0.3774     0.0300   -0.0001
##    220        0.3819          0.3734     0.0300    0.0000
##    240        0.3704          0.3678     0.0300   -0.0001
##    260        0.3588          0.3656     0.0300   -0.0001
##    280        0.3485          0.3648     0.0300   -0.0000
##    300        0.3375          0.3638     0.0300   -0.0001
##    320        0.3279          0.3631     0.0300    0.0000
##    340        0.3182          0.3625     0.0300   -0.0002
##    360        0.3098          0.3621     0.0300   -0.0002
##    380        0.3013          0.3636     0.0300    0.0000
##    400        0.2933          0.3631     0.0300   -0.0001
##    420        0.2871          0.3627     0.0300    0.0000
##    440        0.2805          0.3618     0.0300   -0.0001
##    460        0.2737          0.3652     0.0300   -0.0002
##    480        0.2674          0.3663     0.0300   -0.0002
##    500        0.2611          0.3692     0.0300   -0.0001
##    520        0.2550          0.3681     0.0300   -0.0002
##    540        0.2481          0.3666     0.0300   -0.0002
##    560        0.2422          0.3683     0.0300   -0.0001
##    580        0.2362          0.3701     0.0300   -0.0001
##    600        0.2306          0.3735     0.0300   -0.0001
##    620        0.2252          0.3712     0.0300   -0.0001
##    640        0.2202          0.3703     0.0300   -0.0000
##    660        0.2156          0.3699     0.0300   -0.0001
##    680        0.2107          0.3697     0.0300   -0.0001
##    700        0.2056          0.3705     0.0300   -0.0001
##    720        0.2010          0.3667     0.0300   -0.0001
##    740        0.1968          0.3674     0.0300   -0.0002
```

```
##    760        0.1924          0.3684     0.0300   -0.0000
##    780        0.1888          0.3689     0.0300   -0.0001
##    800        0.1850          0.3676     0.0300    0.0000
##    820        0.1808          0.3691     0.0300   -0.0001
##    840        0.1771          0.3717     0.0300   -0.0002
##    860        0.1738          0.3711     0.0300   -0.0001
##    880        0.1703          0.3712     0.0300   -0.0001
##    900        0.1665          0.3694     0.0300   -0.0001
##    920        0.1632          0.3724     0.0300   -0.0002
##    940        0.1599          0.3745     0.0300   -0.0001
##    960        0.1563          0.3746     0.0300   -0.0000
##    980        0.1531          0.3742     0.0300   -0.0000
##   1000        0.1504          0.3718     0.0300   -0.0002
##   1020        0.1476          0.3751     0.0300   -0.0001
##   1040        0.1449          0.3780     0.0300   -0.0001
##   1060        0.1418          0.3794     0.0300   -0.0000
##   1080        0.1389          0.3789     0.0300   -0.0000
##   1100        0.1357          0.3787     0.0300   -0.0000
##   1120        0.1329          0.3826     0.0300   -0.0000
##   1140        0.1303          0.3846     0.0300   -0.0002
##   1160        0.1278          0.3871     0.0300   -0.0001
##   1180        0.1255          0.3867     0.0300   -0.0001
##   1200        0.1234          0.3875     0.0300   -0.0001
##   1220        0.1213          0.3881     0.0300   -0.0001
##   1240        0.1192          0.3901     0.0300   -0.0001
##   1260        0.1170          0.3900     0.0300   -0.0000
##   1280        0.1148          0.3920     0.0300   -0.0000
##   1300        0.1128          0.3930     0.0300   -0.0000
##   1320        0.1103          0.3929     0.0300   -0.0001
##   1340        0.1086          0.3925     0.0300   -0.0000
##   1360        0.1062          0.3923     0.0300   -0.0000
##   1380        0.1042          0.3940     0.0300   -0.0001
##   1400        0.1023          0.3935     0.0300   -0.0000
##   1420        0.1005          0.3942     0.0300   -0.0001
##   1440        0.0990          0.3971     0.0300   -0.0000
##   1460        0.0973          0.4002     0.0300   -0.0001
##   1480        0.0955          0.4013     0.0300   -0.0001
##   1500        0.0939          0.4012     0.0300   -0.0000
##   1520        0.0924          0.4022     0.0300   -0.0000
##   1540        0.0906          0.3995     0.0300   -0.0000
##   1560        0.0891          0.4008     0.0300   -0.0000
##   1580        0.0876          0.3996     0.0300   -0.0000
##   1600        0.0861          0.3986     0.0300   -0.0000
##   1620        0.0846          0.3973     0.0300   -0.0000
##   1640        0.0832          0.3978     0.0300   -0.0000
##   1660        0.0819          0.3990     0.0300   -0.0000
##   1680        0.0806          0.4007     0.0300   -0.0000
##   1700        0.0792          0.4002     0.0300   -0.0001
##   1720        0.0779          0.3987     0.0300   -0.0000
##   1740        0.0766          0.4004     0.0300   -0.0000
##   1760        0.0753          0.4013     0.0300   -0.0000
##   1780        0.0741          0.4016     0.0300   -0.0001
##   1800        0.0729          0.4046     0.0300   -0.0000
##   1820        0.0717          0.4045     0.0300   -0.0000
```

```
##   1840        0.0707          0.4046     0.0300   -0.0000
##   1860        0.0695          0.4059     0.0300   -0.0000
##   1880        0.0684          0.4070     0.0300   -0.0000
##   1900        0.0674          0.4091     0.0300   -0.0000
##   1920        0.0662          0.4079     0.0300   -0.0000
##   1940        0.0652          0.4093     0.0300   -0.0000
##   1960        0.0641          0.4107     0.0300   -0.0000
##   1980        0.0631          0.4140     0.0300   -0.0000
##   2000        0.0622          0.4134     0.0300   -0.0000
##   2020        0.0610          0.4117     0.0300   -0.0000
##   2040        0.0598          0.4115     0.0300   -0.0001
##   2060        0.0589          0.4107     0.0300   -0.0000
##   2080        0.0579          0.4120     0.0300   -0.0000
##   2100        0.0568          0.4118     0.0300   -0.0000
##   2120        0.0555          0.4097     0.0300   -0.0000
##   2140        0.0548          0.4110     0.0300   -0.0000
##   2160        0.0539          0.4126     0.0300   -0.0000
##   2180        0.0528          0.4133     0.0300   -0.0000
##   2200        0.0520          0.4145     0.0300   -0.0000
##   2220        0.0510          0.4158     0.0300   -0.0000
##   2240        0.0503          0.4165     0.0300   -0.0000
##   2260        0.0495          0.4140     0.0300   -0.0000
##   2280        0.0488          0.4181     0.0300   -0.0000
##   2300        0.0480          0.4193     0.0300   -0.0000
##   2320        0.0472          0.4211     0.0300   -0.0000
##   2340        0.0463          0.4204     0.0300   -0.0000
##   2360        0.0455          0.4211     0.0300   -0.0000
##   2380        0.0447          0.4201     0.0300   -0.0000
##   2400        0.0440          0.4199     0.0300   -0.0000
##   2420        0.0433          0.4190     0.0300   -0.0000
##   2440        0.0426          0.4211     0.0300   -0.0000
##   2460        0.0420          0.4231     0.0300   -0.0000
##   2480        0.0413          0.4228     0.0300   -0.0000
##   2500        0.0406          0.4205     0.0300   -0.0000
##   2520        0.0399          0.4220     0.0300   -0.0000
##   2540        0.0393          0.4221     0.0300   -0.0000
##   2560        0.0386          0.4226     0.0300   -0.0000
##   2580        0.0380          0.4238     0.0300   -0.0000
##   2600        0.0374          0.4250     0.0300   -0.0000
##   2620        0.0368          0.4257     0.0300   -0.0000
##   2640        0.0361          0.4262     0.0300   -0.0000
##   2660        0.0355          0.4269     0.0300   -0.0000
##   2680        0.0350          0.4307     0.0300   -0.0000
##   2700        0.0344          0.4297     0.0300   -0.0000
##   2720        0.0339          0.4292     0.0300   -0.0000
##   2740        0.0334          0.4306     0.0300   -0.0000
##   2760        0.0329          0.4310     0.0300   -0.0000
##   2780        0.0324          0.4312     0.0300   -0.0000
##   2800        0.0319          0.4324     0.0300   -0.0000
##   2820        0.0314          0.4355     0.0300   -0.0000
##   2840        0.0309          0.4351     0.0300   -0.0000
##   2860        0.0304          0.4378     0.0300   -0.0000
##   2880        0.0299          0.4367     0.0300   -0.0000
##   2900        0.0295          0.4369     0.0300   -0.0000
```

```
##   2920        0.0291          0.4364     0.0300   -0.0000
##   2940        0.0286          0.4352     0.0300   -0.0000
##   2960        0.0281          0.4369     0.0300   -0.0000
##   2980        0.0278          0.4386     0.0300   -0.0000
##   3000        0.0274          0.4405     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2862          1.2541     0.0100    0.0054
##      2        1.2761          1.2442     0.0100    0.0052
##      3        1.2666          1.2351     0.0100    0.0048
##      4        1.2566          1.2256     0.0100    0.0049
##      5        1.2467          1.2157     0.0100    0.0049
##      6        1.2374          1.2068     0.0100    0.0045
##      7        1.2289          1.1987     0.0100    0.0042
##      8        1.2201          1.1904     0.0100    0.0043
##      9        1.2111          1.1812     0.0100    0.0042
##     10        1.2029          1.1728     0.0100    0.0042
##     20        1.1283          1.1015     0.0100    0.0034
##     40        1.0075          0.9789     0.0100    0.0025
##     60        0.9145          0.8833     0.0100    0.0019
##     80        0.8402          0.8062     0.0100    0.0015
##    100        0.7774          0.7429     0.0100    0.0015
##    120        0.7260          0.6916     0.0100    0.0010
##    140        0.6833          0.6474     0.0100    0.0009
##    160        0.6466          0.6093     0.0100    0.0007
##    180        0.6156          0.5768     0.0100    0.0005
##    200        0.5891          0.5496     0.0100    0.0004
##    220        0.5667          0.5261     0.0100    0.0006
##    240        0.5475          0.5075     0.0100    0.0002
##    260        0.5291          0.4883     0.0100    0.0004
##    280        0.5151          0.4735     0.0100    0.0002
##    300        0.5022          0.4611     0.0100    0.0001
##    320        0.4919          0.4529     0.0100    0.0002
##    340        0.4823          0.4450     0.0100    0.0001
##    360        0.4730          0.4372     0.0100    0.0000
##    380        0.4652          0.4302     0.0100    0.0001
##    400        0.4580          0.4236     0.0100    0.0000
##    420        0.4508          0.4171     0.0100    0.0001
##    440        0.4441          0.4127     0.0100    0.0000
##    460        0.4384          0.4091     0.0100    0.0001
##    480        0.4330          0.4057     0.0100    0.0000
##    500        0.4276          0.4019     0.0100    0.0000
##    520        0.4223          0.3978     0.0100    0.0001
##    540        0.4174          0.3943     0.0100    0.0000
##    560        0.4127          0.3932     0.0100   -0.0000
##    580        0.4083          0.3909     0.0100   -0.0001
##    600        0.4042          0.3892     0.0100    0.0000
##    620        0.3996          0.3877     0.0100    0.0000
##    640        0.3951          0.3852     0.0100    0.0000
##    660        0.3910          0.3848     0.0100   -0.0001
```

```
##    680         0.3868          0.3824     0.0100    0.0000
##    700         0.3830          0.3810     0.0100   -0.0000
##    720         0.3797          0.3801     0.0100   -0.0001
##    740         0.3763          0.3793     0.0100   -0.0000
##    760         0.3727          0.3780     0.0100    0.0000
##    780         0.3692          0.3779     0.0100   -0.0000
##    800         0.3655          0.3766     0.0100    0.0000
##    820         0.3620          0.3759     0.0100   -0.0000
##    840         0.3584          0.3759     0.0100   -0.0000
##    860         0.3552          0.3756     0.0100   -0.0000
##    880         0.3517          0.3760     0.0100   -0.0000
##    900         0.3491          0.3760     0.0100   -0.0001
##    920         0.3459          0.3755     0.0100   -0.0001
##    940         0.3429          0.3759     0.0100   -0.0000
##    960         0.3397          0.3765     0.0100   -0.0000
##    980         0.3369          0.3757     0.0100   -0.0001
##   1000         0.3339          0.3750     0.0100   -0.0001
##   1020         0.3311          0.3751     0.0100   -0.0000
##   1040         0.3277          0.3754     0.0100   -0.0000
##   1060         0.3247          0.3746     0.0100    0.0000
##   1080         0.3222          0.3748     0.0100   -0.0001
##   1100         0.3195          0.3742     0.0100   -0.0001
##   1120         0.3170          0.3740     0.0100   -0.0000
##   1140         0.3146          0.3737     0.0100   -0.0000
##   1160         0.3119          0.3746     0.0100   -0.0000
##   1180         0.3094          0.3745     0.0100   -0.0001
##   1200         0.3069          0.3756     0.0100   -0.0001
##   1220         0.3046          0.3747     0.0100   -0.0000
##   1240         0.3025          0.3750     0.0100   -0.0001
##   1260         0.2999          0.3747     0.0100   -0.0001
##   1280         0.2973          0.3739     0.0100   -0.0000
##   1300         0.2952          0.3745     0.0100   -0.0000
##   1320         0.2928          0.3745     0.0100   -0.0001
##   1340         0.2906          0.3750     0.0100   -0.0000
##   1360         0.2883          0.3745     0.0100    0.0000
##   1380         0.2862          0.3731     0.0100   -0.0000
##   1400         0.2838          0.3729     0.0100   -0.0001
##   1420         0.2818          0.3732     0.0100   -0.0000
##   1440         0.2797          0.3730     0.0100   -0.0001
##   1460         0.2774          0.3731     0.0100   -0.0000
##   1480         0.2751          0.3735     0.0100   -0.0001
##   1500         0.2731          0.3751     0.0100    0.0000
##   1520         0.2709          0.3746     0.0100   -0.0000
##   1540         0.2688          0.3736     0.0100   -0.0000
##   1560         0.2669          0.3752     0.0100   -0.0001
##   1580         0.2648          0.3750     0.0100   -0.0000
##   1600         0.2626          0.3746     0.0100   -0.0000
##   1620         0.2607          0.3753     0.0100   -0.0000
##   1640         0.2587          0.3755     0.0100   -0.0000
##   1660         0.2567          0.3766     0.0100   -0.0000
##   1680         0.2548          0.3761     0.0100   -0.0000
##   1700         0.2528          0.3751     0.0100   -0.0000
##   1720         0.2511          0.3751     0.0100   -0.0001
##   1740         0.2492          0.3757     0.0100   -0.0000
```

```
##   1760        0.2475          0.3748     0.0100   -0.0000
##   1780        0.2457          0.3748     0.0100   -0.0000
##   1800        0.2439          0.3757     0.0100   -0.0000
##   1820        0.2420          0.3756     0.0100   -0.0000
##   1840        0.2399          0.3755     0.0100   -0.0000
##   1860        0.2382          0.3751     0.0100   -0.0001
##   1880        0.2362          0.3747     0.0100   -0.0001
##   1900        0.2345          0.3747     0.0100   -0.0000
##   1920        0.2327          0.3736     0.0100   -0.0001
##   1940        0.2308          0.3736     0.0100   -0.0000
##   1960        0.2290          0.3738     0.0100   -0.0000
##   1980        0.2273          0.3730     0.0100   -0.0000
##   2000        0.2258          0.3734     0.0100   -0.0000
##   2020        0.2237          0.3737     0.0100   -0.0000
##   2040        0.2218          0.3747     0.0100   -0.0000
##   2060        0.2204          0.3760     0.0100   -0.0001
##   2080        0.2187          0.3755     0.0100   -0.0000
##   2100        0.2171          0.3759     0.0100   -0.0000
##   2120        0.2155          0.3758     0.0100   -0.0001
##   2140        0.2139          0.3773     0.0100   -0.0000
##   2160        0.2124          0.3774     0.0100   -0.0000
##   2180        0.2109          0.3770     0.0100   -0.0001
##   2200        0.2092          0.3759     0.0100   -0.0000
##   2220        0.2076          0.3762     0.0100   -0.0000
##   2240        0.2061          0.3757     0.0100   -0.0000
##   2260        0.2047          0.3763     0.0100   -0.0001
##   2280        0.2033          0.3771     0.0100    0.0000
##   2300        0.2020          0.3764     0.0100   -0.0000
##   2320        0.2007          0.3762     0.0100   -0.0000
##   2340        0.1990          0.3764     0.0100   -0.0000
##   2360        0.1976          0.3766     0.0100   -0.0000
##   2380        0.1962          0.3765     0.0100   -0.0000
##   2400        0.1948          0.3769     0.0100   -0.0000
##   2420        0.1934          0.3766     0.0100   -0.0000
##   2440        0.1920          0.3765     0.0100   -0.0000
##   2460        0.1907          0.3759     0.0100   -0.0000
##   2480        0.1895          0.3758     0.0100   -0.0000
##   2500        0.1881          0.3762     0.0100   -0.0000
##   2520        0.1868          0.3764     0.0100   -0.0000
##   2540        0.1855          0.3764     0.0100   -0.0000
##   2560        0.1841          0.3762     0.0100   -0.0000
##   2580        0.1830          0.3760     0.0100   -0.0001
##   2600        0.1818          0.3759     0.0100   -0.0000
##   2620        0.1806          0.3757     0.0100   -0.0000
##   2640        0.1793          0.3756     0.0100   -0.0000
##   2660        0.1780          0.3761     0.0100   -0.0000
##   2680        0.1769          0.3774     0.0100   -0.0000
##   2700        0.1756          0.3769     0.0100   -0.0000
##   2720        0.1743          0.3773     0.0100   -0.0000
##   2740        0.1731          0.3770     0.0100   -0.0000
##   2760        0.1720          0.3762     0.0100   -0.0000
##   2780        0.1708          0.3761     0.0100   -0.0000
##   2800        0.1695          0.3767     0.0100   -0.0000
##   2820        0.1683          0.3768     0.0100   -0.0000
```

```
##   2840        0.1671           0.3764     0.0100   -0.0000
##   2860        0.1660           0.3766     0.0100   -0.0000
##   2880        0.1649           0.3765     0.0100   -0.0000
##   2900        0.1637           0.3764     0.0100   -0.0000
##   2920        0.1626           0.3764     0.0100   -0.0000
##   2940        0.1616           0.3759     0.0100   -0.0000
##   2960        0.1607           0.3759     0.0100   -0.0000
##   2980        0.1595           0.3756     0.0100   -0.0000
##   3000        0.1584           0.3763     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2775          1.2466     0.0200    0.0100
##      2        1.2575          1.2270     0.0200    0.0098
##      3        1.2402          1.2099     0.0200    0.0085
##      4        1.2219          1.1921     0.0200    0.0087
##      5        1.2037          1.1744     0.0200    0.0084
##      6        1.1868          1.1591     0.0200    0.0079
##      7        1.1704          1.1434     0.0200    0.0082
##      8        1.1543          1.1271     0.0200    0.0078
##      9        1.1389          1.1120     0.0200    0.0072
##     10        1.1247          1.0981     0.0200    0.0070
##     20        1.0057          0.9745     0.0200    0.0051
##     40        0.8379          0.8046     0.0200    0.0033
##     60        0.7251          0.6916     0.0200    0.0021
##     80        0.6450          0.6093     0.0200    0.0013
##    100        0.5878          0.5520     0.0200    0.0010
##    120        0.5466          0.5078     0.0200    0.0007
##    140        0.5170          0.4783     0.0200    0.0004
##    160        0.4929          0.4557     0.0200    0.0001
##    180        0.4743          0.4396     0.0200    0.0002
##    200        0.4586          0.4280     0.0200    0.0001
##    220        0.4447          0.4165     0.0200    0.0001
##    240        0.4337          0.4088     0.0200    0.0001
##    260        0.4241          0.4041     0.0200    0.0001
##    280        0.4145          0.3978     0.0200   -0.0001
##    300        0.4058          0.3939     0.0200   -0.0001
##    320        0.3969          0.3899     0.0200   -0.0000
##    340        0.3892          0.3877     0.0200   -0.0000
##    360        0.3811          0.3828     0.0200   -0.0001
##    380        0.3740          0.3823     0.0200   -0.0001
##    400        0.3673          0.3792     0.0200   -0.0001
##    420        0.3604          0.3776     0.0200   -0.0001
##    440        0.3543          0.3763     0.0200    0.0000
##    460        0.3479          0.3746     0.0200   -0.0001
##    480        0.3418          0.3749     0.0200   -0.0001
##    500        0.3361          0.3764     0.0200   -0.0001
##    520        0.3308          0.3745     0.0200   -0.0001
##    540        0.3255          0.3715     0.0200    0.0000
##    560        0.3202          0.3711     0.0200   -0.0001
##    580        0.3137          0.3680     0.0200   -0.0001
```

```
##    600        0.3078         0.3686     0.0200   -0.0001
##    620        0.3032         0.3660     0.0200   -0.0001
##    640        0.2972         0.3648     0.0200   -0.0001
##    660        0.2928         0.3640     0.0200   -0.0001
##    680        0.2880         0.3627     0.0200   -0.0001
##    700        0.2838         0.3623     0.0200   -0.0001
##    720        0.2792         0.3640     0.0200   -0.0001
##    740        0.2750         0.3623     0.0200   -0.0001
##    760        0.2705         0.3636     0.0200   -0.0001
##    780        0.2664         0.3620     0.0200   -0.0001
##    800        0.2619         0.3637     0.0200    0.0000
##    820        0.2576         0.3628     0.0200   -0.0000
##    840        0.2535         0.3612     0.0200   -0.0001
##    860        0.2501         0.3591     0.0200   -0.0001
##    880        0.2464         0.3599     0.0200   -0.0001
##    900        0.2424         0.3608     0.0200   -0.0001
##    920        0.2390         0.3615     0.0200   -0.0001
##    940        0.2355         0.3624     0.0200   -0.0001
##    960        0.2326         0.3623     0.0200   -0.0001
##    980        0.2292         0.3625     0.0200   -0.0001
##   1000        0.2257         0.3622     0.0200   -0.0000
##   1020        0.2223         0.3621     0.0200   -0.0000
##   1040        0.2190         0.3653     0.0200   -0.0000
##   1060        0.2156         0.3666     0.0200   -0.0001
##   1080        0.2120         0.3649     0.0200   -0.0000
##   1100        0.2089         0.3659     0.0200   -0.0001
##   1120        0.2059         0.3666     0.0200   -0.0001
##   1140        0.2027         0.3650     0.0200   -0.0001
##   1160        0.1996         0.3649     0.0200   -0.0001
##   1180        0.1968         0.3638     0.0200   -0.0001
##   1200        0.1939         0.3638     0.0200   -0.0001
##   1220        0.1907         0.3662     0.0200   -0.0000
##   1240        0.1880         0.3655     0.0200   -0.0001
##   1260        0.1852         0.3637     0.0200   -0.0001
##   1280        0.1826         0.3639     0.0200   -0.0000
##   1300        0.1804         0.3640     0.0200   -0.0001
##   1320        0.1780         0.3649     0.0200   -0.0001
##   1340        0.1754         0.3660     0.0200   -0.0001
##   1360        0.1729         0.3648     0.0200   -0.0001
##   1380        0.1703         0.3659     0.0200   -0.0001
##   1400        0.1677         0.3664     0.0200   -0.0000
##   1420        0.1657         0.3656     0.0200   -0.0000
##   1440        0.1635         0.3654     0.0200   -0.0001
##   1460        0.1615         0.3662     0.0200   -0.0001
##   1480        0.1594         0.3665     0.0200   -0.0001
##   1500        0.1569         0.3664     0.0200   -0.0000
##   1520        0.1550         0.3664     0.0200   -0.0000
##   1540        0.1529         0.3678     0.0200   -0.0000
##   1560        0.1510         0.3670     0.0200   -0.0000
##   1580        0.1490         0.3666     0.0200   -0.0001
##   1600        0.1471         0.3679     0.0200   -0.0001
##   1620        0.1452         0.3676     0.0200   -0.0000
##   1640        0.1432         0.3671     0.0200   -0.0001
##   1660        0.1413         0.3685     0.0200   -0.0000
```

```
##   1680        0.1395          0.3684     0.0200   -0.0000
##   1700        0.1376          0.3666     0.0200   -0.0000
##   1720        0.1357          0.3667     0.0200   -0.0001
##   1740        0.1341          0.3673     0.0200   -0.0001
##   1760        0.1324          0.3667     0.0200   -0.0000
##   1780        0.1303          0.3665     0.0200   -0.0001
##   1800        0.1287          0.3684     0.0200   -0.0001
##   1820        0.1272          0.3693     0.0200   -0.0000
##   1840        0.1258          0.3706     0.0200   -0.0000
##   1860        0.1243          0.3720     0.0200   -0.0000
##   1880        0.1226          0.3726     0.0200   -0.0000
##   1900        0.1212          0.3721     0.0200   -0.0000
##   1920        0.1197          0.3710     0.0200   -0.0000
##   1940        0.1182          0.3711     0.0200   -0.0000
##   1960        0.1168          0.3710     0.0200   -0.0000
##   1980        0.1152          0.3709     0.0200   -0.0001
##   2000        0.1139          0.3700     0.0200   -0.0000
##   2020        0.1126          0.3716     0.0200   -0.0001
##   2040        0.1112          0.3716     0.0200   -0.0000
##   2060        0.1101          0.3723     0.0200   -0.0000
##   2080        0.1085          0.3722     0.0200   -0.0000
##   2100        0.1072          0.3703     0.0200   -0.0000
##   2120        0.1059          0.3693     0.0200   -0.0000
##   2140        0.1045          0.3708     0.0200   -0.0001
##   2160        0.1032          0.3713     0.0200   -0.0001
##   2180        0.1022          0.3740     0.0200   -0.0000
##   2200        0.1008          0.3734     0.0200   -0.0000
##   2220        0.0997          0.3753     0.0200   -0.0000
##   2240        0.0985          0.3764     0.0200   -0.0000
##   2260        0.0972          0.3768     0.0200    0.0000
##   2280        0.0958          0.3756     0.0200   -0.0000
##   2300        0.0949          0.3763     0.0200   -0.0000
##   2320        0.0938          0.3767     0.0200   -0.0000
##   2340        0.0929          0.3777     0.0200   -0.0000
##   2360        0.0918          0.3774     0.0200   -0.0000
##   2380        0.0909          0.3788     0.0200   -0.0000
##   2400        0.0900          0.3776     0.0200   -0.0000
##   2420        0.0888          0.3781     0.0200   -0.0000
##   2440        0.0877          0.3776     0.0200   -0.0000
##   2460        0.0867          0.3775     0.0200   -0.0000
##   2480        0.0857          0.3786     0.0200   -0.0000
##   2500        0.0847          0.3795     0.0200   -0.0000
##   2520        0.0840          0.3789     0.0200   -0.0000
##   2540        0.0830          0.3802     0.0200   -0.0000
##   2560        0.0822          0.3795     0.0200   -0.0000
##   2580        0.0812          0.3794     0.0200   -0.0000
##   2600        0.0803          0.3791     0.0200   -0.0000
##   2620        0.0793          0.3812     0.0200   -0.0000
##   2640        0.0784          0.3817     0.0200   -0.0000
##   2660        0.0775          0.3834     0.0200   -0.0000
##   2680        0.0767          0.3832     0.0200   -0.0000
##   2700        0.0758          0.3831     0.0200   -0.0000
##   2720        0.0750          0.3841     0.0200   -0.0000
##   2740        0.0741          0.3845     0.0200   -0.0000
```

```
##   2760        0.0733           0.3842     0.0200   -0.0000
##   2780        0.0725           0.3844     0.0200   -0.0000
##   2800        0.0717           0.3842     0.0200   -0.0000
##   2820        0.0708           0.3840     0.0200   -0.0000
##   2840        0.0699           0.3853     0.0200   -0.0000
##   2860        0.0690           0.3849     0.0200   -0.0000
##   2880        0.0682           0.3855     0.0200   -0.0000
##   2900        0.0674           0.3859     0.0200   -0.0000
##   2920        0.0667           0.3882     0.0200   -0.0000
##   2940        0.0659           0.3884     0.0200   -0.0000
##   2960        0.0652           0.3881     0.0200   -0.0000
##   2980        0.0645           0.3885     0.0200   -0.0000
##   3000        0.0638           0.3905     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2650          1.2334     0.0300    0.0167
##      2        1.2365          1.2044     0.0300    0.0140
##      3        1.2091          1.1767     0.0300    0.0136
##      4        1.1833          1.1505     0.0300    0.0138
##      5        1.1600          1.1276     0.0300    0.0111
##      6        1.1371          1.1054     0.0300    0.0107
##      7        1.1158          1.0837     0.0300    0.0106
##      8        1.0968          1.0648     0.0300    0.0096
##      9        1.0779          1.0463     0.0300    0.0091
##     10        1.0596          1.0279     0.0300    0.0094
##     20        0.9092          0.8716     0.0300    0.0061
##     40        0.7180          0.6745     0.0300    0.0035
##     60        0.6082          0.5620     0.0300    0.0018
##     80        0.5440          0.4999     0.0300    0.0012
##    100        0.4990          0.4529     0.0300    0.0003
##    120        0.4687          0.4254     0.0300    0.0005
##    140        0.4483          0.4130     0.0300    0.0001
##    160        0.4291          0.3979     0.0300    0.0001
##    180        0.4142          0.3936     0.0300   -0.0001
##    200        0.4012          0.3876     0.0300   -0.0001
##    220        0.3896          0.3833     0.0300   -0.0002
##    240        0.3785          0.3804     0.0300    0.0000
##    260        0.3672          0.3801     0.0300   -0.0001
##    280        0.3576          0.3781     0.0300   -0.0002
##    300        0.3477          0.3758     0.0300    0.0000
##    320        0.3397          0.3748     0.0300   -0.0002
##    340        0.3312          0.3751     0.0300   -0.0000
##    360        0.3230          0.3748     0.0300   -0.0002
##    380        0.3160          0.3710     0.0300   -0.0002
##    400        0.3081          0.3702     0.0300   -0.0002
##    420        0.3001          0.3675     0.0300   -0.0001
##    440        0.2929          0.3672     0.0300   -0.0001
##    460        0.2853          0.3696     0.0300   -0.0001
##    480        0.2786          0.3713     0.0300   -0.0001
##    500        0.2715          0.3709     0.0300   -0.0000
```

```
##    520        0.2658          0.3721     0.0300   -0.0001
##    540        0.2602          0.3760     0.0300   -0.0001
##    560        0.2543          0.3768     0.0300   -0.0002
##    580        0.2487          0.3792     0.0300    0.0000
##    600        0.2434          0.3786     0.0300   -0.0001
##    620        0.2381          0.3782     0.0300   -0.0001
##    640        0.2327          0.3799     0.0300   -0.0000
##    660        0.2275          0.3790     0.0300   -0.0001
##    680        0.2223          0.3787     0.0300   -0.0001
##    700        0.2182          0.3796     0.0300   -0.0002
##    720        0.2142          0.3780     0.0300   -0.0002
##    740        0.2095          0.3768     0.0300   -0.0002
##    760        0.2046          0.3796     0.0300   -0.0001
##    780        0.2006          0.3829     0.0300   -0.0001
##    800        0.1966          0.3831     0.0300   -0.0002
##    820        0.1928          0.3830     0.0300   -0.0001
##    840        0.1893          0.3872     0.0300   -0.0001
##    860        0.1848          0.3890     0.0300   -0.0001
##    880        0.1806          0.3851     0.0300   -0.0001
##    900        0.1767          0.3895     0.0300   -0.0001
##    920        0.1728          0.3870     0.0300   -0.0001
##    940        0.1695          0.3864     0.0300   -0.0001
##    960        0.1662          0.3835     0.0300   -0.0000
##    980        0.1632          0.3842     0.0300   -0.0001
##   1000        0.1597          0.3862     0.0300   -0.0001
##   1020        0.1563          0.3851     0.0300   -0.0001
##   1040        0.1532          0.3860     0.0300   -0.0001
##   1060        0.1504          0.3878     0.0300   -0.0001
##   1080        0.1475          0.3894     0.0300   -0.0001
##   1100        0.1445          0.3903     0.0300   -0.0001
##   1120        0.1418          0.3891     0.0300   -0.0001
##   1140        0.1393          0.3914     0.0300   -0.0000
##   1160        0.1362          0.3911     0.0300   -0.0001
##   1180        0.1336          0.3942     0.0300   -0.0001
##   1200        0.1311          0.3980     0.0300   -0.0001
##   1220        0.1287          0.3963     0.0300    0.0001
##   1240        0.1260          0.3976     0.0300   -0.0000
##   1260        0.1239          0.3975     0.0300   -0.0001
##   1280        0.1217          0.4001     0.0300   -0.0000
##   1300        0.1197          0.4006     0.0300   -0.0000
##   1320        0.1175          0.4013     0.0300   -0.0000
##   1340        0.1153          0.4024     0.0300   -0.0001
##   1360        0.1133          0.4008     0.0300   -0.0001
##   1380        0.1112          0.4032     0.0300   -0.0001
##   1400        0.1090          0.4035     0.0300   -0.0000
##   1420        0.1072          0.4044     0.0300   -0.0001
##   1440        0.1052          0.4047     0.0300   -0.0001
##   1460        0.1032          0.4039     0.0300   -0.0001
##   1480        0.1013          0.4046     0.0300   -0.0001
##   1500        0.0995          0.4050     0.0300   -0.0001
##   1520        0.0978          0.4037     0.0300   -0.0001
##   1540        0.0957          0.4034     0.0300   -0.0000
##   1560        0.0940          0.4028     0.0300    0.0000
##   1580        0.0924          0.4026     0.0300   -0.0000
```

```
##   1600        0.0907          0.4015     0.0300   -0.0001
##   1620        0.0892          0.4024     0.0300   -0.0000
##   1640        0.0876          0.4017     0.0300   -0.0000
##   1660        0.0859          0.4016     0.0300   -0.0000
##   1680        0.0847          0.4015     0.0300   -0.0001
##   1700        0.0832          0.4037     0.0300    0.0000
##   1720        0.0819          0.4055     0.0300   -0.0001
##   1740        0.0805          0.4085     0.0300   -0.0001
##   1760        0.0794          0.4056     0.0300   -0.0001
##   1780        0.0781          0.4054     0.0300   -0.0001
##   1800        0.0767          0.4041     0.0300   -0.0001
##   1820        0.0753          0.4062     0.0300   -0.0000
##   1840        0.0740          0.4092     0.0300   -0.0001
##   1860        0.0728          0.4094     0.0300   -0.0001
##   1880        0.0716          0.4105     0.0300   -0.0000
##   1900        0.0702          0.4091     0.0300   -0.0000
##   1920        0.0688          0.4104     0.0300   -0.0001
##   1940        0.0677          0.4113     0.0300   -0.0000
##   1960        0.0666          0.4108     0.0300   -0.0000
##   1980        0.0657          0.4106     0.0300   -0.0001
##   2000        0.0647          0.4100     0.0300   -0.0000
##   2020        0.0635          0.4112     0.0300   -0.0001
##   2040        0.0623          0.4130     0.0300   -0.0000
##   2060        0.0614          0.4141     0.0300   -0.0001
##   2080        0.0604          0.4106     0.0300   -0.0000
##   2100        0.0595          0.4114     0.0300    0.0000
##   2120        0.0583          0.4131     0.0300   -0.0000
##   2140        0.0572          0.4139     0.0300    0.0000
##   2160        0.0564          0.4150     0.0300   -0.0000
##   2180        0.0554          0.4189     0.0300   -0.0000
##   2200        0.0543          0.4193     0.0300   -0.0000
##   2220        0.0535          0.4175     0.0300   -0.0000
##   2240        0.0527          0.4182     0.0300   -0.0000
##   2260        0.0517          0.4170     0.0300   -0.0000
##   2280        0.0508          0.4133     0.0300   -0.0000
##   2300        0.0500          0.4131     0.0300   -0.0000
##   2320        0.0493          0.4134     0.0300   -0.0000
##   2340        0.0486          0.4152     0.0300   -0.0000
##   2360        0.0478          0.4196     0.0300   -0.0000
##   2380        0.0470          0.4194     0.0300   -0.0000
##   2400        0.0462          0.4193     0.0300   -0.0000
##   2420        0.0454          0.4193     0.0300   -0.0000
##   2440        0.0447          0.4218     0.0300   -0.0000
##   2460        0.0441          0.4226     0.0300   -0.0000
##   2480        0.0435          0.4223     0.0300   -0.0000
##   2500        0.0428          0.4225     0.0300   -0.0000
##   2520        0.0421          0.4228     0.0300   -0.0000
##   2540        0.0414          0.4248     0.0300   -0.0000
##   2560        0.0408          0.4269     0.0300   -0.0000
##   2580        0.0402          0.4290     0.0300   -0.0000
##   2600        0.0395          0.4266     0.0300   -0.0000
##   2620        0.0390          0.4261     0.0300   -0.0000
##   2640        0.0383          0.4250     0.0300   -0.0000
##   2660        0.0377          0.4277     0.0300   -0.0000
```

```
##   2680        0.0371           0.4296     0.0300   -0.0000
##   2700        0.0364           0.4281     0.0300    0.0000
##   2720        0.0358           0.4275     0.0300   -0.0000
##   2740        0.0353           0.4279     0.0300   -0.0000
##   2760        0.0348           0.4291     0.0300   -0.0000
##   2780        0.0342           0.4288     0.0300   -0.0000
##   2800        0.0337           0.4325     0.0300   -0.0000
##   2820        0.0333           0.4346     0.0300   -0.0000
##   2840        0.0327           0.4357     0.0300   -0.0000
##   2860        0.0322           0.4347     0.0300   -0.0000
##   2880        0.0318           0.4342     0.0300   -0.0000
##   2900        0.0313           0.4332     0.0300   -0.0000
##   2920        0.0308           0.4320     0.0300   -0.0000
##   2940        0.0303           0.4326     0.0300   -0.0000
##   2960        0.0298           0.4333     0.0300   -0.0000
##   2980        0.0294           0.4354     0.0300   -0.0000
##   3000        0.0289           0.4373     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2858          1.2613     0.0100    0.0050
##      2        1.2758          1.2512     0.0100    0.0050
##      3        1.2660          1.2416     0.0100    0.0048
##      4        1.2571          1.2326     0.0100    0.0044
##      5        1.2473          1.2227     0.0100    0.0048
##      6        1.2376          1.2129     0.0100    0.0046
##      7        1.2290          1.2041     0.0100    0.0042
##      8        1.2204          1.1952     0.0100    0.0043
##      9        1.2123          1.1867     0.0100    0.0036
##     10        1.2036          1.1782     0.0100    0.0041
##     20        1.1271          1.1005     0.0100    0.0032
##     40        1.0064          0.9769     0.0100    0.0025
##     60        0.9139          0.8819     0.0100    0.0023
##     80        0.8360          0.8039     0.0100    0.0015
##    100        0.7753          0.7424     0.0100    0.0013
##    120        0.7226          0.6898     0.0100    0.0012
##    140        0.6794          0.6476     0.0100    0.0008
##    160        0.6412          0.6099     0.0100    0.0009
##    180        0.6100          0.5782     0.0100    0.0006
##    200        0.5832          0.5517     0.0100    0.0006
##    220        0.5599          0.5291     0.0100    0.0004
##    240        0.5397          0.5078     0.0100    0.0003
##    260        0.5223          0.4906     0.0100    0.0002
##    280        0.5072          0.4768     0.0100    0.0004
##    300        0.4946          0.4661     0.0100    0.0001
##    320        0.4834          0.4556     0.0100    0.0001
##    340        0.4735          0.4474     0.0100    0.0001
##    360        0.4642          0.4383     0.0100    0.0001
##    380        0.4559          0.4314     0.0100    0.0000
##    400        0.4485          0.4246     0.0100   -0.0000
##    420        0.4417          0.4202     0.0100    0.0001
```

```
##    440         0.4352          0.4148     0.0100    0.0002
##    460         0.4286          0.4101     0.0100    0.0001
##    480         0.4231          0.4075     0.0100    0.0000
##    500         0.4177          0.4051     0.0100    0.0000
##    520         0.4126          0.4037     0.0100    0.0000
##    540         0.4071          0.4001     0.0100    0.0000
##    560         0.4024          0.3978     0.0100   -0.0000
##    580         0.3975          0.3964     0.0100   -0.0000
##    600         0.3930          0.3944     0.0100    0.0000
##    620         0.3884          0.3916     0.0100   -0.0000
##    640         0.3844          0.3902     0.0100    0.0000
##    660         0.3804          0.3889     0.0100    0.0001
##    680         0.3767          0.3875     0.0100   -0.0000
##    700         0.3730          0.3869     0.0100    0.0000
##    720         0.3694          0.3865     0.0100   -0.0000
##    740         0.3658          0.3859     0.0100   -0.0000
##    760         0.3621          0.3848     0.0100   -0.0000
##    780         0.3588          0.3836     0.0100    0.0000
##    800         0.3555          0.3845     0.0100   -0.0001
##    820         0.3517          0.3855     0.0100   -0.0000
##    840         0.3483          0.3845     0.0100   -0.0000
##    860         0.3449          0.3834     0.0100   -0.0001
##    880         0.3413          0.3841     0.0100    0.0000
##    900         0.3381          0.3833     0.0100    0.0000
##    920         0.3349          0.3838     0.0100   -0.0000
##    940         0.3317          0.3841     0.0100    0.0000
##    960         0.3285          0.3837     0.0100   -0.0000
##    980         0.3255          0.3828     0.0100   -0.0000
##   1000         0.3221          0.3824     0.0100   -0.0000
##   1020         0.3193          0.3822     0.0100   -0.0000
##   1040         0.3165          0.3817     0.0100   -0.0001
##   1060         0.3135          0.3814     0.0100   -0.0001
##   1080         0.3108          0.3832     0.0100   -0.0000
##   1100         0.3081          0.3841     0.0100   -0.0000
##   1120         0.3054          0.3846     0.0100   -0.0000
##   1140         0.3027          0.3847     0.0100   -0.0000
##   1160         0.2995          0.3852     0.0100   -0.0000
##   1180         0.2968          0.3848     0.0100   -0.0001
##   1200         0.2944          0.3846     0.0100   -0.0001
##   1220         0.2921          0.3847     0.0100   -0.0001
##   1240         0.2894          0.3851     0.0100   -0.0000
##   1260         0.2870          0.3849     0.0100   -0.0001
##   1280         0.2846          0.3855     0.0100   -0.0000
##   1300         0.2822          0.3860     0.0100   -0.0001
##   1320         0.2795          0.3846     0.0100   -0.0000
##   1340         0.2769          0.3845     0.0100   -0.0001
##   1360         0.2746          0.3852     0.0100   -0.0001
##   1380         0.2724          0.3853     0.0100   -0.0000
##   1400         0.2701          0.3869     0.0100   -0.0000
##   1420         0.2677          0.3856     0.0100   -0.0000
##   1440         0.2656          0.3856     0.0100   -0.0000
##   1460         0.2636          0.3861     0.0100   -0.0000
##   1480         0.2613          0.3865     0.0100   -0.0001
##   1500         0.2591          0.3858     0.0100   -0.0000
```

```
##   1520        0.2573          0.3856     0.0100   -0.0000
##   1540        0.2553          0.3858     0.0100   -0.0001
##   1560        0.2531          0.3864     0.0100   -0.0000
##   1580        0.2510          0.3871     0.0100   -0.0000
##   1600        0.2491          0.3870     0.0100   -0.0000
##   1620        0.2472          0.3873     0.0100   -0.0000
##   1640        0.2453          0.3861     0.0100   -0.0000
##   1660        0.2428          0.3862     0.0100   -0.0000
##   1680        0.2409          0.3869     0.0100   -0.0000
##   1700        0.2391          0.3878     0.0100    0.0000
##   1720        0.2371          0.3878     0.0100   -0.0001
##   1740        0.2354          0.3880     0.0100   -0.0000
##   1760        0.2335          0.3883     0.0100   -0.0000
##   1780        0.2319          0.3887     0.0100   -0.0000
##   1800        0.2304          0.3889     0.0100   -0.0000
##   1820        0.2285          0.3888     0.0100   -0.0001
##   1840        0.2268          0.3893     0.0100   -0.0001
##   1860        0.2251          0.3895     0.0100   -0.0000
##   1880        0.2235          0.3898     0.0100    0.0000
##   1900        0.2219          0.3905     0.0100   -0.0000
##   1920        0.2201          0.3892     0.0100   -0.0001
##   1940        0.2185          0.3889     0.0100   -0.0000
##   1960        0.2170          0.3888     0.0100   -0.0000
##   1980        0.2153          0.3884     0.0100    0.0000
##   2000        0.2138          0.3886     0.0100   -0.0000
##   2020        0.2119          0.3881     0.0100   -0.0000
##   2040        0.2104          0.3877     0.0100   -0.0000
##   2060        0.2088          0.3872     0.0100   -0.0000
##   2080        0.2070          0.3871     0.0100   -0.0000
##   2100        0.2056          0.3874     0.0100   -0.0000
##   2120        0.2040          0.3885     0.0100   -0.0000
##   2140        0.2025          0.3891     0.0100   -0.0000
##   2160        0.2011          0.3904     0.0100   -0.0000
##   2180        0.1997          0.3913     0.0100   -0.0000
##   2200        0.1981          0.3928     0.0100   -0.0000
##   2220        0.1967          0.3936     0.0100   -0.0001
##   2240        0.1953          0.3938     0.0100   -0.0000
##   2260        0.1937          0.3944     0.0100   -0.0000
##   2280        0.1923          0.3944     0.0100   -0.0000
##   2300        0.1910          0.3945     0.0100   -0.0000
##   2320        0.1898          0.3948     0.0100   -0.0000
##   2340        0.1884          0.3950     0.0100   -0.0001
##   2360        0.1869          0.3937     0.0100   -0.0000
##   2380        0.1855          0.3942     0.0100   -0.0001
##   2400        0.1841          0.3942     0.0100   -0.0000
##   2420        0.1828          0.3945     0.0100   -0.0000
##   2440        0.1816          0.3954     0.0100   -0.0000
##   2460        0.1802          0.3943     0.0100   -0.0000
##   2480        0.1786          0.3934     0.0100   -0.0000
##   2500        0.1774          0.3939     0.0100   -0.0001
##   2520        0.1763          0.3936     0.0100   -0.0000
##   2540        0.1752          0.3941     0.0100   -0.0000
##   2560        0.1739          0.3932     0.0100   -0.0000
##   2580        0.1726          0.3936     0.0100   -0.0000
```

```
##   2600        0.1713          0.3936     0.0100   -0.0000
##   2620        0.1701          0.3941     0.0100   -0.0000
##   2640        0.1690          0.3950     0.0100   -0.0000
##   2660        0.1680          0.3950     0.0100   -0.0000
##   2680        0.1667          0.3948     0.0100   -0.0000
##   2700        0.1656          0.3954     0.0100   -0.0000
##   2720        0.1645          0.3960     0.0100   -0.0000
##   2740        0.1633          0.3959     0.0100    0.0000
##   2760        0.1621          0.3952     0.0100   -0.0000
##   2780        0.1609          0.3951     0.0100   -0.0000
##   2800        0.1598          0.3947     0.0100   -0.0000
##   2820        0.1587          0.3960     0.0100   -0.0000
##   2840        0.1576          0.3957     0.0100   -0.0000
##   2860        0.1564          0.3956     0.0100   -0.0000
##   2880        0.1553          0.3952     0.0100   -0.0000
##   2900        0.1542          0.3955     0.0100   -0.0000
##   2920        0.1532          0.3966     0.0100   -0.0000
##   2940        0.1522          0.3964     0.0100   -0.0000
##   2960        0.1512          0.3961     0.0100   -0.0000
##   2980        0.1503          0.3975     0.0100   -0.0000
##   3000        0.1494          0.3968     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2758          1.2519     0.0200    0.0102
##      2        1.2560          1.2317     0.0200    0.0100
##      3        1.2370          1.2120     0.0200    0.0094
##      4        1.2194          1.1931     0.0200    0.0083
##      5        1.2015          1.1743     0.0200    0.0089
##      6        1.1864          1.1588     0.0200    0.0072
##      7        1.1704          1.1430     0.0200    0.0079
##      8        1.1550          1.1270     0.0200    0.0071
##      9        1.1402          1.1124     0.0200    0.0073
##     10        1.1255          1.0978     0.0200    0.0071
##     20        1.0053          0.9754     0.0200    0.0047
##     40        0.8352          0.8032     0.0200    0.0030
##     60        0.7212          0.6883     0.0200    0.0021
##     80        0.6418          0.6072     0.0200    0.0016
##    100        0.5833          0.5442     0.0200    0.0011
##    120        0.5423          0.5065     0.0200    0.0003
##    140        0.5106          0.4755     0.0200    0.0005
##    160        0.4858          0.4549     0.0200    0.0002
##    180        0.4668          0.4372     0.0200    0.0003
##    200        0.4508          0.4260     0.0200    0.0001
##    220        0.4362          0.4155     0.0200    0.0001
##    240        0.4236          0.4072     0.0200   -0.0001
##    260        0.4130          0.4002     0.0200    0.0001
##    280        0.4038          0.3969     0.0200    0.0000
##    300        0.3947          0.3943     0.0200   -0.0002
##    320        0.3862          0.3922     0.0200   -0.0001
##    340        0.3785          0.3893     0.0200    0.0000
```

```
##    360         0.3713          0.3897     0.0200   -0.0001
##    380         0.3639          0.3866     0.0200   -0.0002
##    400         0.3569          0.3840     0.0200   -0.0001
##    420         0.3502          0.3855     0.0200   -0.0001
##    440         0.3435          0.3833     0.0200   -0.0001
##    460         0.3367          0.3801     0.0200   -0.0001
##    480         0.3310          0.3809     0.0200   -0.0001
##    500         0.3248          0.3808     0.0200   -0.0001
##    520         0.3188          0.3803     0.0200   -0.0000
##    540         0.3130          0.3793     0.0200   -0.0001
##    560         0.3071          0.3787     0.0200   -0.0001
##    580         0.3012          0.3795     0.0200   -0.0001
##    600         0.2962          0.3805     0.0200   -0.0001
##    620         0.2914          0.3809     0.0200   -0.0001
##    640         0.2866          0.3828     0.0200   -0.0001
##    660         0.2821          0.3824     0.0200   -0.0000
##    680         0.2769          0.3843     0.0200   -0.0000
##    700         0.2728          0.3848     0.0200   -0.0000
##    720         0.2679          0.3857     0.0200   -0.0002
##    740         0.2636          0.3863     0.0200   -0.0001
##    760         0.2592          0.3878     0.0200   -0.0001
##    780         0.2550          0.3882     0.0200   -0.0001
##    800         0.2507          0.3869     0.0200   -0.0001
##    820         0.2469          0.3877     0.0200   -0.0001
##    840         0.2430          0.3884     0.0200   -0.0001
##    860         0.2393          0.3880     0.0200   -0.0000
##    880         0.2355          0.3875     0.0200   -0.0001
##    900         0.2317          0.3879     0.0200   -0.0001
##    920         0.2282          0.3879     0.0200   -0.0000
##    940         0.2248          0.3873     0.0200   -0.0001
##    960         0.2218          0.3859     0.0200   -0.0001
##    980         0.2185          0.3863     0.0200   -0.0001
##   1000         0.2151          0.3883     0.0200   -0.0001
##   1020         0.2112          0.3860     0.0200   -0.0001
##   1040         0.2080          0.3857     0.0200   -0.0001
##   1060         0.2047          0.3861     0.0200   -0.0001
##   1080         0.2014          0.3876     0.0200   -0.0001
##   1100         0.1987          0.3869     0.0200   -0.0001
##   1120         0.1958          0.3872     0.0200   -0.0000
##   1140         0.1929          0.3868     0.0200   -0.0001
##   1160         0.1899          0.3878     0.0200   -0.0000
##   1180         0.1869          0.3876     0.0200   -0.0001
##   1200         0.1846          0.3871     0.0200   -0.0000
##   1220         0.1817          0.3864     0.0200   -0.0000
##   1240         0.1788          0.3865     0.0200   -0.0000
##   1260         0.1765          0.3871     0.0200   -0.0000
##   1280         0.1739          0.3883     0.0200   -0.0001
##   1300         0.1713          0.3899     0.0200   -0.0001
##   1320         0.1691          0.3887     0.0200   -0.0001
##   1340         0.1668          0.3880     0.0200    0.0000
##   1360         0.1642          0.3885     0.0200   -0.0001
##   1380         0.1620          0.3879     0.0200   -0.0001
##   1400         0.1599          0.3896     0.0200   -0.0002
##   1420         0.1578          0.3883     0.0200   -0.0000
```

```
##   1440        0.1555          0.3904     0.0200   -0.0001
##   1460        0.1530          0.3902     0.0200   -0.0001
##   1480        0.1509          0.3896     0.0200   -0.0000
##   1500        0.1490          0.3906     0.0200   -0.0001
##   1520        0.1472          0.3911     0.0200   -0.0001
##   1540        0.1452          0.3910     0.0200   -0.0000
##   1560        0.1432          0.3906     0.0200   -0.0000
##   1580        0.1413          0.3917     0.0200   -0.0001
##   1600        0.1396          0.3921     0.0200   -0.0001
##   1620        0.1377          0.3932     0.0200   -0.0001
##   1640        0.1359          0.3933     0.0200   -0.0001
##   1660        0.1341          0.3949     0.0200   -0.0000
##   1680        0.1324          0.3939     0.0200   -0.0000
##   1700        0.1307          0.3933     0.0200   -0.0001
##   1720        0.1290          0.3944     0.0200   -0.0001
##   1740        0.1273          0.3956     0.0200   -0.0001
##   1760        0.1257          0.3953     0.0200   -0.0000
##   1780        0.1241          0.3955     0.0200   -0.0000
##   1800        0.1225          0.3939     0.0200   -0.0000
##   1820        0.1209          0.3946     0.0200   -0.0001
##   1840        0.1196          0.3931     0.0200   -0.0000
##   1860        0.1183          0.3932     0.0200   -0.0000
##   1880        0.1167          0.3934     0.0200   -0.0000
##   1900        0.1152          0.3935     0.0200   -0.0000
##   1920        0.1138          0.3931     0.0200   -0.0000
##   1940        0.1123          0.3932     0.0200   -0.0000
##   1960        0.1109          0.3934     0.0200   -0.0000
##   1980        0.1094          0.3926     0.0200   -0.0000
##   2000        0.1084          0.3916     0.0200   -0.0000
##   2020        0.1068          0.3903     0.0200   -0.0000
##   2040        0.1055          0.3912     0.0200   -0.0000
##   2060        0.1042          0.3919     0.0200   -0.0000
##   2080        0.1029          0.3929     0.0200   -0.0000
##   2100        0.1018          0.3938     0.0200   -0.0000
##   2120        0.1004          0.3936     0.0200   -0.0000
##   2140        0.0991          0.3934     0.0200   -0.0000
##   2160        0.0977          0.3937     0.0200    0.0000
##   2180        0.0965          0.3924     0.0200   -0.0000
##   2200        0.0953          0.3926     0.0200   -0.0000
##   2220        0.0941          0.3932     0.0200   -0.0000
##   2240        0.0930          0.3925     0.0200   -0.0000
##   2260        0.0917          0.3938     0.0200   -0.0000
##   2280        0.0905          0.3925     0.0200   -0.0000
##   2300        0.0893          0.3927     0.0200   -0.0000
##   2320        0.0882          0.3939     0.0200   -0.0000
##   2340        0.0873          0.3952     0.0200   -0.0000
##   2360        0.0863          0.3956     0.0200   -0.0000
##   2380        0.0852          0.3955     0.0200   -0.0000
##   2400        0.0843          0.3965     0.0200   -0.0000
##   2420        0.0833          0.3970     0.0200   -0.0000
##   2440        0.0824          0.3973     0.0200   -0.0000
##   2460        0.0813          0.3964     0.0200   -0.0000
##   2480        0.0803          0.3973     0.0200   -0.0000
##   2500        0.0792          0.3976     0.0200   -0.0000
```

```
##   2520        0.0783          0.3982     0.0200   -0.0000
##   2540        0.0773          0.3999     0.0200   -0.0000
##   2560        0.0763          0.4007     0.0200   -0.0000
##   2580        0.0754          0.4009     0.0200   -0.0000
##   2600        0.0746          0.4014     0.0200   -0.0000
##   2620        0.0737          0.4020     0.0200   -0.0000
##   2640        0.0729          0.4033     0.0200   -0.0000
##   2660        0.0719          0.4026     0.0200   -0.0000
##   2680        0.0711          0.4034     0.0200   -0.0000
##   2700        0.0702          0.4034     0.0200   -0.0000
##   2720        0.0693          0.4050     0.0200   -0.0000
##   2740        0.0685          0.4036     0.0200   -0.0000
##   2760        0.0678          0.4039     0.0200   -0.0000
##   2780        0.0671          0.4046     0.0200   -0.0000
##   2800        0.0663          0.4035     0.0200   -0.0000
##   2820        0.0655          0.4043     0.0200   -0.0000
##   2840        0.0647          0.4034     0.0200   -0.0000
##   2860        0.0639          0.4045     0.0200   -0.0000
##   2880        0.0632          0.4049     0.0200   -0.0000
##   2900        0.0625          0.4054     0.0200   -0.0000
##   2920        0.0617          0.4060     0.0200   -0.0000
##   2940        0.0609          0.4044     0.0200   -0.0000
##   2960        0.0602          0.4045     0.0200   -0.0000
##   2980        0.0595          0.4047     0.0200   -0.0000
##   3000        0.0587          0.4034     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2635          1.2381     0.0300    0.0160
##      2        1.2342          1.2083     0.0300    0.0154
##      3        1.2080          1.1814     0.0300    0.0122
##      4        1.1823          1.1569     0.0300    0.0127
##      5        1.1576          1.1318     0.0300    0.0124
##      6        1.1341          1.1077     0.0300    0.0110
##      7        1.1132          1.0870     0.0300    0.0101
##      8        1.0949          1.0676     0.0300    0.0088
##      9        1.0761          1.0491     0.0300    0.0093
##     10        1.0560          1.0274     0.0300    0.0094
##     20        0.9109          0.8748     0.0300    0.0054
##     40        0.7209          0.6903     0.0300    0.0030
##     60        0.6088          0.5747     0.0300    0.0020
##     80        0.5391          0.5096     0.0300    0.0011
##    100        0.4945          0.4664     0.0300    0.0007
##    120        0.4652          0.4382     0.0300    0.0003
##    140        0.4436          0.4216     0.0300    0.0003
##    160        0.4268          0.4108     0.0300    0.0001
##    180        0.4119          0.4041     0.0300   -0.0002
##    200        0.3980          0.3993     0.0300   -0.0000
##    220        0.3855          0.3977     0.0300   -0.0002
##    240        0.3738          0.3956     0.0300   -0.0000
##    260        0.3628          0.3921     0.0300    0.0001
```

```
##    280         0.3527          0.3918     0.0300   -0.0001
##    300         0.3429          0.3916     0.0300   -0.0000
##    320         0.3333          0.3887     0.0300   -0.0001
##    340         0.3241          0.3845     0.0300   -0.0001
##    360         0.3152          0.3846     0.0300   -0.0001
##    380         0.3074          0.3870     0.0300   -0.0002
##    400         0.3000          0.3903     0.0300   -0.0002
##    420         0.2933          0.3877     0.0300   -0.0004
##    440         0.2860          0.3890     0.0300   -0.0001
##    460         0.2790          0.3893     0.0300   -0.0001
##    480         0.2716          0.3901     0.0300   -0.0002
##    500         0.2651          0.3886     0.0300   -0.0001
##    520         0.2585          0.3882     0.0300   -0.0000
##    540         0.2532          0.3895     0.0300   -0.0001
##    560         0.2475          0.3924     0.0300   -0.0001
##    580         0.2415          0.3890     0.0300   -0.0001
##    600         0.2356          0.3916     0.0300   -0.0001
##    620         0.2308          0.3912     0.0300   -0.0001
##    640         0.2260          0.3914     0.0300   -0.0002
##    660         0.2210          0.3951     0.0300   -0.0001
##    680         0.2160          0.3949     0.0300   -0.0001
##    700         0.2111          0.3962     0.0300   -0.0001
##    720         0.2056          0.3957     0.0300    0.0000
##    740         0.2012          0.4005     0.0300   -0.0001
##    760         0.1969          0.3998     0.0300   -0.0002
##    780         0.1923          0.4013     0.0300   -0.0001
##    800         0.1880          0.4029     0.0300   -0.0001
##    820         0.1840          0.4020     0.0300   -0.0002
##    840         0.1798          0.4025     0.0300   -0.0001
##    860         0.1758          0.4029     0.0300   -0.0000
##    880         0.1719          0.4033     0.0300   -0.0001
##    900         0.1679          0.4069     0.0300   -0.0001
##    920         0.1644          0.4013     0.0300   -0.0001
##    940         0.1610          0.4034     0.0300   -0.0000
##    960         0.1575          0.4060     0.0300   -0.0001
##    980         0.1543          0.4031     0.0300   -0.0000
##   1000         0.1510          0.4027     0.0300   -0.0001
##   1020         0.1484          0.4029     0.0300   -0.0001
##   1040         0.1454          0.4053     0.0300   -0.0001
##   1060         0.1423          0.4060     0.0300   -0.0001
##   1080         0.1398          0.4072     0.0300   -0.0001
##   1100         0.1368          0.4073     0.0300   -0.0000
##   1120         0.1338          0.4061     0.0300   -0.0000
##   1140         0.1311          0.4044     0.0300   -0.0001
##   1160         0.1291          0.4046     0.0300   -0.0001
##   1180         0.1269          0.4056     0.0300   -0.0001
##   1200         0.1247          0.4053     0.0300   -0.0001
##   1220         0.1223          0.4038     0.0300   -0.0001
##   1240         0.1200          0.4046     0.0300   -0.0001
##   1260         0.1178          0.4051     0.0300   -0.0000
##   1280         0.1158          0.4077     0.0300   -0.0001
##   1300         0.1136          0.4105     0.0300   -0.0001
##   1320         0.1115          0.4130     0.0300   -0.0000
##   1340         0.1093          0.4105     0.0300   -0.0000
```

```
##   1360        0.1073          0.4106     0.0300   -0.0000
##   1380        0.1052          0.4072     0.0300   -0.0000
##   1400        0.1030          0.4093     0.0300   -0.0000
##   1420        0.1013          0.4094     0.0300   -0.0000
##   1440        0.0993          0.4105     0.0300   -0.0001
##   1460        0.0976          0.4118     0.0300   -0.0000
##   1480        0.0956          0.4125     0.0300   -0.0001
##   1500        0.0941          0.4102     0.0300   -0.0000
##   1520        0.0922          0.4119     0.0300   -0.0001
##   1540        0.0909          0.4128     0.0300   -0.0000
##   1560        0.0891          0.4127     0.0300   -0.0000
##   1580        0.0875          0.4105     0.0300   -0.0001
##   1600        0.0860          0.4075     0.0300   -0.0001
##   1620        0.0845          0.4079     0.0300   -0.0000
##   1640        0.0833          0.4088     0.0300   -0.0001
##   1660        0.0817          0.4071     0.0300   -0.0000
##   1680        0.0802          0.4083     0.0300   -0.0000
##   1700        0.0788          0.4066     0.0300   -0.0001
##   1720        0.0774          0.4084     0.0300   -0.0001
##   1740        0.0759          0.4060     0.0300   -0.0001
##   1760        0.0748          0.4055     0.0300   -0.0001
##   1780        0.0737          0.4051     0.0300   -0.0000
##   1800        0.0725          0.4041     0.0300   -0.0000
##   1820        0.0712          0.4047     0.0300   -0.0001
##   1840        0.0700          0.4069     0.0300   -0.0000
##   1860        0.0688          0.4068     0.0300   -0.0000
##   1880        0.0674          0.4080     0.0300   -0.0000
##   1900        0.0663          0.4089     0.0300   -0.0000
##   1920        0.0652          0.4098     0.0300   -0.0000
##   1940        0.0641          0.4109     0.0300   -0.0000
##   1960        0.0629          0.4105     0.0300   -0.0000
##   1980        0.0618          0.4106     0.0300   -0.0000
##   2000        0.0608          0.4113     0.0300   -0.0000
##   2020        0.0598          0.4113     0.0300   -0.0000
##   2040        0.0588          0.4129     0.0300   -0.0000
##   2060        0.0577          0.4122     0.0300   -0.0000
##   2080        0.0567          0.4087     0.0300   -0.0000
##   2100        0.0559          0.4094     0.0300   -0.0000
##   2120        0.0550          0.4130     0.0300   -0.0000
##   2140        0.0540          0.4140     0.0300   -0.0000
##   2160        0.0531          0.4124     0.0300   -0.0000
##   2180        0.0522          0.4119     0.0300   -0.0000
##   2200        0.0510          0.4104     0.0300   -0.0000
##   2220        0.0502          0.4101     0.0300   -0.0000
##   2240        0.0494          0.4129     0.0300   -0.0000
##   2260        0.0484          0.4074     0.0300   -0.0000
##   2280        0.0476          0.4070     0.0300   -0.0000
##   2300        0.0469          0.4076     0.0300   -0.0000
##   2320        0.0461          0.4080     0.0300   -0.0000
##   2340        0.0454          0.4094     0.0300   -0.0000
##   2360        0.0447          0.4099     0.0300   -0.0000
##   2380        0.0439          0.4095     0.0300   -0.0000
##   2400        0.0432          0.4092     0.0300   -0.0000
##   2420        0.0426          0.4102     0.0300   -0.0000
```

```
##   2440        0.0419          0.4094     0.0300   -0.0000
##   2460        0.0411          0.4095     0.0300   -0.0000
##   2480        0.0403          0.4111     0.0300   -0.0000
##   2500        0.0397          0.4114     0.0300   -0.0000
##   2520        0.0391          0.4125     0.0300   -0.0000
##   2540        0.0385          0.4146     0.0300   -0.0000
##   2560        0.0379          0.4154     0.0300   -0.0000
##   2580        0.0374          0.4173     0.0300   -0.0000
##   2600        0.0367          0.4155     0.0300   -0.0000
##   2620        0.0360          0.4139     0.0300   -0.0000
##   2640        0.0355          0.4139     0.0300   -0.0000
##   2660        0.0348          0.4152     0.0300   -0.0000
##   2680        0.0343          0.4150     0.0300    0.0000
##   2700        0.0337          0.4154     0.0300   -0.0000
##   2720        0.0331          0.4148     0.0300   -0.0000
##   2740        0.0326          0.4170     0.0300   -0.0000
##   2760        0.0322          0.4184     0.0300   -0.0000
##   2780        0.0317          0.4169     0.0300   -0.0000
##   2800        0.0311          0.4173     0.0300   -0.0000
##   2820        0.0306          0.4201     0.0300   -0.0000
##   2840        0.0301          0.4210     0.0300   -0.0000
##   2860        0.0296          0.4219     0.0300   -0.0000
##   2880        0.0291          0.4224     0.0300    0.0000
##   2900        0.0285          0.4236     0.0300   -0.0000
##   2920        0.0281          0.4225     0.0300   -0.0000
##   2940        0.0277          0.4254     0.0300   -0.0000
##   2960        0.0272          0.4263     0.0300   -0.0000
##   2980        0.0268          0.4270     0.0300   -0.0000
##   3000        0.0264          0.4292     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2851          1.2633     0.0100    0.0054
##      2        1.2752          1.2530     0.0100    0.0046
##      3        1.2651          1.2423     0.0100    0.0048
##      4        1.2559          1.2324     0.0100    0.0046
##      5        1.2466          1.2226     0.0100    0.0045
##      6        1.2371          1.2133     0.0100    0.0043
##      7        1.2285          1.2040     0.0100    0.0039
##      8        1.2197          1.1953     0.0100    0.0042
##      9        1.2118          1.1869     0.0100    0.0037
##     10        1.2033          1.1777     0.0100    0.0041
##     20        1.1276          1.0986     0.0100    0.0033
##     40        1.0077          0.9703     0.0100    0.0025
##     60        0.9140          0.8719     0.0100    0.0023
##     80        0.8384          0.7896     0.0100    0.0015
##    100        0.7792          0.7267     0.0100    0.0012
##    120        0.7268          0.6706     0.0100    0.0010
##    140        0.6845          0.6284     0.0100    0.0007
##    160        0.6486          0.5918     0.0100    0.0007
##    180        0.6166          0.5572     0.0100    0.0007
```

```
##    200         0.5909          0.5312     0.0100    0.0005
##    220         0.5683          0.5079     0.0100    0.0006
##    240         0.5486          0.4870     0.0100    0.0003
##    260         0.5325          0.4700     0.0100    0.0003
##    280         0.5167          0.4529     0.0100    0.0003
##    300         0.5037          0.4400     0.0100    0.0002
##    320         0.4920          0.4282     0.0100    0.0001
##    340         0.4816          0.4185     0.0100    0.0001
##    360         0.4733          0.4114     0.0100    0.0001
##    380         0.4647          0.4038     0.0100    0.0002
##    400         0.4573          0.3986     0.0100    0.0000
##    420         0.4504          0.3937     0.0100    0.0001
##    440         0.4442          0.3881     0.0100   -0.0000
##    460         0.4380          0.3830     0.0100    0.0000
##    480         0.4320          0.3791     0.0100   -0.0000
##    500         0.4265          0.3761     0.0100   -0.0000
##    520         0.4211          0.3746     0.0100    0.0000
##    540         0.4159          0.3709     0.0100    0.0000
##    560         0.4114          0.3689     0.0100   -0.0000
##    580         0.4071          0.3666     0.0100    0.0000
##    600         0.4027          0.3658     0.0100    0.0000
##    620         0.3986          0.3644     0.0100   -0.0001
##    640         0.3946          0.3611     0.0100   -0.0000
##    660         0.3902          0.3587     0.0100    0.0000
##    680         0.3864          0.3568     0.0100    0.0000
##    700         0.3827          0.3552     0.0100    0.0000
##    720         0.3791          0.3541     0.0100   -0.0000
##    740         0.3750          0.3513     0.0100    0.0000
##    760         0.3713          0.3512     0.0100   -0.0000
##    780         0.3677          0.3520     0.0100   -0.0000
##    800         0.3639          0.3516     0.0100   -0.0000
##    820         0.3608          0.3508     0.0100   -0.0001
##    840         0.3576          0.3501     0.0100   -0.0000
##    860         0.3538          0.3496     0.0100   -0.0001
##    880         0.3508          0.3494     0.0100   -0.0001
##    900         0.3481          0.3495     0.0100   -0.0000
##    920         0.3452          0.3487     0.0100   -0.0001
##    940         0.3419          0.3483     0.0100   -0.0000
##    960         0.3391          0.3483     0.0100   -0.0000
##    980         0.3366          0.3475     0.0100   -0.0001
##   1000         0.3338          0.3464     0.0100   -0.0001
##   1020         0.3310          0.3469     0.0100    0.0000
##   1040         0.3279          0.3468     0.0100   -0.0000
##   1060         0.3250          0.3477     0.0100   -0.0000
##   1080         0.3223          0.3475     0.0100   -0.0001
##   1100         0.3193          0.3448     0.0100   -0.0001
##   1120         0.3164          0.3431     0.0100   -0.0000
##   1140         0.3136          0.3425     0.0100   -0.0000
##   1160         0.3111          0.3422     0.0100   -0.0001
##   1180         0.3085          0.3405     0.0100   -0.0000
##   1200         0.3054          0.3399     0.0100   -0.0000
##   1220         0.3033          0.3386     0.0100   -0.0001
##   1240         0.3009          0.3378     0.0100   -0.0000
##   1260         0.2983          0.3381     0.0100   -0.0000
```

```
##   1280        0.2961          0.3376     0.0100   -0.0001
##   1300        0.2937          0.3364     0.0100   -0.0000
##   1320        0.2915          0.3360     0.0100   -0.0000
##   1340        0.2892          0.3355     0.0100   -0.0001
##   1360        0.2870          0.3352     0.0100   -0.0001
##   1380        0.2846          0.3344     0.0100   -0.0000
##   1400        0.2825          0.3344     0.0100   -0.0000
##   1420        0.2805          0.3343     0.0100   -0.0001
##   1440        0.2782          0.3333     0.0100    0.0000
##   1460        0.2759          0.3332     0.0100   -0.0000
##   1480        0.2737          0.3327     0.0100   -0.0000
##   1500        0.2717          0.3326     0.0100   -0.0001
##   1520        0.2696          0.3315     0.0100   -0.0000
##   1540        0.2677          0.3304     0.0100   -0.0001
##   1560        0.2658          0.3305     0.0100   -0.0000
##   1580        0.2639          0.3306     0.0100   -0.0000
##   1600        0.2615          0.3296     0.0100   -0.0000
##   1620        0.2593          0.3289     0.0100   -0.0000
##   1640        0.2575          0.3287     0.0100   -0.0000
##   1660        0.2555          0.3293     0.0100   -0.0000
##   1680        0.2537          0.3296     0.0100   -0.0000
##   1700        0.2517          0.3300     0.0100   -0.0000
##   1720        0.2498          0.3300     0.0100   -0.0001
##   1740        0.2479          0.3297     0.0100   -0.0000
##   1760        0.2461          0.3307     0.0100   -0.0000
##   1780        0.2443          0.3306     0.0100   -0.0000
##   1800        0.2424          0.3312     0.0100   -0.0000
##   1820        0.2406          0.3297     0.0100   -0.0001
##   1840        0.2389          0.3297     0.0100   -0.0000
##   1860        0.2371          0.3288     0.0100   -0.0000
##   1880        0.2353          0.3292     0.0100   -0.0000
##   1900        0.2336          0.3295     0.0100   -0.0000
##   1920        0.2320          0.3291     0.0100   -0.0000
##   1940        0.2299          0.3292     0.0100   -0.0001
##   1960        0.2283          0.3283     0.0100   -0.0000
##   1980        0.2267          0.3283     0.0100   -0.0000
##   2000        0.2252          0.3286     0.0100   -0.0000
##   2020        0.2233          0.3287     0.0100   -0.0000
##   2040        0.2219          0.3282     0.0100   -0.0000
##   2060        0.2204          0.3282     0.0100   -0.0000
##   2080        0.2189          0.3276     0.0100   -0.0000
##   2100        0.2173          0.3278     0.0100   -0.0000
##   2120        0.2157          0.3275     0.0100   -0.0000
##   2140        0.2141          0.3271     0.0100   -0.0000
##   2160        0.2126          0.3275     0.0100   -0.0000
##   2180        0.2113          0.3277     0.0100   -0.0000
##   2200        0.2098          0.3267     0.0100   -0.0000
##   2220        0.2085          0.3267     0.0100   -0.0000
##   2240        0.2069          0.3264     0.0100   -0.0000
##   2260        0.2054          0.3255     0.0100   -0.0000
##   2280        0.2041          0.3263     0.0100   -0.0000
##   2300        0.2028          0.3262     0.0100   -0.0000
##   2320        0.2014          0.3258     0.0100   -0.0001
##   2340        0.1999          0.3253     0.0100   -0.0000
```

```
##   2360        0.1985           0.3251     0.0100   -0.0000
##   2380        0.1972           0.3244     0.0100   -0.0001
##   2400        0.1958           0.3234     0.0100   -0.0000
##   2420        0.1943           0.3224     0.0100   -0.0000
##   2440        0.1929           0.3221     0.0100   -0.0000
##   2460        0.1913           0.3213     0.0100   -0.0000
##   2480        0.1898           0.3207     0.0100   -0.0000
##   2500        0.1885           0.3213     0.0100   -0.0000
##   2520        0.1874           0.3207     0.0100   -0.0000
##   2540        0.1861           0.3207     0.0100   -0.0000
##   2560        0.1848           0.3209     0.0100   -0.0000
##   2580        0.1834           0.3216     0.0100   -0.0001
##   2600        0.1820           0.3207     0.0100   -0.0000
##   2620        0.1807           0.3208     0.0100   -0.0001
##   2640        0.1795           0.3199     0.0100   -0.0001
##   2660        0.1781           0.3198     0.0100   -0.0000
##   2680        0.1770           0.3200     0.0100   -0.0000
##   2700        0.1757           0.3198     0.0100   -0.0000
##   2720        0.1743           0.3197     0.0100   -0.0000
##   2740        0.1732           0.3195     0.0100   -0.0000
##   2760        0.1720           0.3200     0.0100   -0.0000
##   2780        0.1709           0.3210     0.0100   -0.0000
##   2800        0.1696           0.3207     0.0100   -0.0000
##   2820        0.1684           0.3209     0.0100   -0.0000
##   2840        0.1673           0.3208     0.0100   -0.0000
##   2860        0.1662           0.3208     0.0100   -0.0000
##   2880        0.1651           0.3209     0.0100   -0.0000
##   2900        0.1640           0.3203     0.0100   -0.0000
##   2920        0.1628           0.3199     0.0100   -0.0000
##   2940        0.1617           0.3190     0.0100   -0.0000
##   2960        0.1606           0.3191     0.0100   -0.0001
##   2980        0.1595           0.3197     0.0100   -0.0000
##   3000        0.1585           0.3196     0.0100   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2759          1.2528     0.0200    0.0094
##      2        1.2569          1.2329     0.0200    0.0097
##      3        1.2384          1.2136     0.0200    0.0088
##      4        1.2215          1.1959     0.0200    0.0085
##      5        1.2054          1.1788     0.0200    0.0081
##      6        1.1886          1.1606     0.0200    0.0085
##      7        1.1735          1.1447     0.0200    0.0076
##      8        1.1582          1.1296     0.0200    0.0078
##      9        1.1430          1.1131     0.0200    0.0076
##     10        1.1273          1.0961     0.0200    0.0073
##     20        1.0056          0.9674     0.0200    0.0053
##     40        0.8428          0.7889     0.0200    0.0031
##     60        0.7305          0.6753     0.0200    0.0022
##     80        0.6542          0.5986     0.0200    0.0016
##    100        0.5947          0.5378     0.0200    0.0011
```

```
##    120        0.5494          0.4904     0.0200    0.0006
##    140        0.5191          0.4620     0.0200    0.0007
##    160        0.4924          0.4360     0.0200    0.0005
##    180        0.4736          0.4210     0.0200    0.0000
##    200        0.4577          0.4062     0.0200    0.0002
##    220        0.4440          0.3971     0.0200   -0.0000
##    240        0.4320          0.3852     0.0200    0.0001
##    260        0.4218          0.3779     0.0200    0.0000
##    280        0.4129          0.3746     0.0200   -0.0000
##    300        0.4031          0.3689     0.0200    0.0000
##    320        0.3950          0.3652     0.0200    0.0000
##    340        0.3861          0.3636     0.0200   -0.0001
##    360        0.3788          0.3619     0.0200   -0.0001
##    380        0.3712          0.3602     0.0200   -0.0001
##    400        0.3644          0.3583     0.0200   -0.0001
##    420        0.3585          0.3600     0.0200   -0.0001
##    440        0.3520          0.3602     0.0200    0.0001
##    460        0.3459          0.3569     0.0200   -0.0001
##    480        0.3400          0.3567     0.0200   -0.0000
##    500        0.3347          0.3541     0.0200   -0.0000
##    520        0.3288          0.3532     0.0200   -0.0001
##    540        0.3233          0.3517     0.0200   -0.0002
##    560        0.3178          0.3506     0.0200    0.0000
##    580        0.3128          0.3493     0.0200   -0.0002
##    600        0.3071          0.3474     0.0200   -0.0000
##    620        0.3021          0.3470     0.0200   -0.0000
##    640        0.2971          0.3453     0.0200   -0.0000
##    660        0.2922          0.3455     0.0200   -0.0001
##    680        0.2878          0.3466     0.0200   -0.0001
##    700        0.2831          0.3458     0.0200   -0.0001
##    720        0.2788          0.3440     0.0200   -0.0001
##    740        0.2742          0.3439     0.0200   -0.0000
##    760        0.2696          0.3417     0.0200   -0.0001
##    780        0.2652          0.3414     0.0200   -0.0001
##    800        0.2615          0.3423     0.0200   -0.0001
##    820        0.2583          0.3433     0.0200   -0.0000
##    840        0.2548          0.3438     0.0200   -0.0001
##    860        0.2513          0.3425     0.0200   -0.0001
##    880        0.2477          0.3415     0.0200   -0.0002
##    900        0.2439          0.3435     0.0200   -0.0000
##    920        0.2401          0.3411     0.0200   -0.0001
##    940        0.2369          0.3417     0.0200   -0.0001
##    960        0.2337          0.3418     0.0200   -0.0001
##    980        0.2305          0.3406     0.0200   -0.0003
##   1000        0.2272          0.3404     0.0200   -0.0000
##   1020        0.2235          0.3408     0.0200   -0.0000
##   1040        0.2201          0.3403     0.0200   -0.0000
##   1060        0.2166          0.3381     0.0200   -0.0000
##   1080        0.2137          0.3367     0.0200   -0.0002
##   1100        0.2108          0.3377     0.0200   -0.0001
##   1120        0.2078          0.3358     0.0200    0.0000
##   1140        0.2049          0.3352     0.0200   -0.0001
##   1160        0.2019          0.3355     0.0200   -0.0001
##   1180        0.1991          0.3359     0.0200   -0.0000
```

```
##   1200        0.1963          0.3368     0.0200   -0.0001
##   1220        0.1935          0.3391     0.0200   -0.0001
##   1240        0.1908          0.3370     0.0200   -0.0001
##   1260        0.1879          0.3365     0.0200   -0.0000
##   1280        0.1856          0.3351     0.0200   -0.0000
##   1300        0.1828          0.3359     0.0200   -0.0001
##   1320        0.1800          0.3343     0.0200   -0.0000
##   1340        0.1775          0.3335     0.0200   -0.0000
##   1360        0.1753          0.3332     0.0200   -0.0000
##   1380        0.1727          0.3326     0.0200    0.0000
##   1400        0.1702          0.3322     0.0200   -0.0000
##   1420        0.1680          0.3326     0.0200   -0.0000
##   1440        0.1655          0.3313     0.0200   -0.0000
##   1460        0.1636          0.3305     0.0200   -0.0000
##   1480        0.1615          0.3312     0.0200   -0.0001
##   1500        0.1595          0.3317     0.0200   -0.0001
##   1520        0.1574          0.3304     0.0200   -0.0001
##   1540        0.1556          0.3311     0.0200   -0.0001
##   1560        0.1536          0.3317     0.0200   -0.0000
##   1580        0.1516          0.3311     0.0200   -0.0000
##   1600        0.1497          0.3307     0.0200   -0.0001
##   1620        0.1478          0.3320     0.0200   -0.0000
##   1640        0.1458          0.3314     0.0200   -0.0000
##   1660        0.1438          0.3308     0.0200    0.0000
##   1680        0.1418          0.3307     0.0200   -0.0001
##   1700        0.1401          0.3319     0.0200   -0.0000
##   1720        0.1382          0.3317     0.0200   -0.0001
##   1740        0.1365          0.3315     0.0200   -0.0001
##   1760        0.1345          0.3303     0.0200   -0.0000
##   1780        0.1329          0.3298     0.0200   -0.0000
##   1800        0.1312          0.3303     0.0200   -0.0000
##   1820        0.1295          0.3284     0.0200   -0.0001
##   1840        0.1279          0.3275     0.0200   -0.0000
##   1860        0.1265          0.3280     0.0200   -0.0000
##   1880        0.1249          0.3270     0.0200   -0.0000
##   1900        0.1235          0.3251     0.0200   -0.0001
##   1920        0.1219          0.3248     0.0200   -0.0001
##   1940        0.1202          0.3251     0.0200   -0.0000
##   1960        0.1187          0.3257     0.0200   -0.0000
##   1980        0.1171          0.3268     0.0200   -0.0000
##   2000        0.1158          0.3267     0.0200   -0.0000
##   2020        0.1144          0.3284     0.0200   -0.0001
##   2040        0.1129          0.3294     0.0200   -0.0000
##   2060        0.1116          0.3291     0.0200    0.0001
##   2080        0.1102          0.3297     0.0200   -0.0000
##   2100        0.1089          0.3299     0.0200   -0.0000
##   2120        0.1076          0.3306     0.0200   -0.0000
##   2140        0.1063          0.3294     0.0200   -0.0000
##   2160        0.1049          0.3297     0.0200   -0.0001
##   2180        0.1039          0.3293     0.0200   -0.0000
##   2200        0.1026          0.3287     0.0200   -0.0000
##   2220        0.1012          0.3292     0.0200   -0.0001
##   2240        0.1001          0.3308     0.0200   -0.0000
##   2260        0.0988          0.3307     0.0200   -0.0000
```

```
##   2280        0.0975          0.3289     0.0200   -0.0000
##   2300        0.0965          0.3284     0.0200   -0.0000
##   2320        0.0953          0.3262     0.0200   -0.0000
##   2340        0.0942          0.3237     0.0200   -0.0000
##   2360        0.0929          0.3242     0.0200   -0.0000
##   2380        0.0918          0.3246     0.0200    0.0000
##   2400        0.0907          0.3243     0.0200   -0.0000
##   2420        0.0896          0.3241     0.0200   -0.0000
##   2440        0.0885          0.3233     0.0200   -0.0000
##   2460        0.0875          0.3258     0.0200   -0.0000
##   2480        0.0865          0.3254     0.0200   -0.0000
##   2500        0.0857          0.3250     0.0200   -0.0000
##   2520        0.0846          0.3243     0.0200   -0.0000
##   2540        0.0836          0.3245     0.0200   -0.0000
##   2560        0.0827          0.3228     0.0200   -0.0000
##   2580        0.0816          0.3235     0.0200   -0.0000
##   2600        0.0807          0.3235     0.0200   -0.0000
##   2620        0.0798          0.3226     0.0200   -0.0000
##   2640        0.0788          0.3233     0.0200   -0.0000
##   2660        0.0780          0.3229     0.0200   -0.0000
##   2680        0.0772          0.3235     0.0200   -0.0000
##   2700        0.0764          0.3236     0.0200   -0.0000
##   2720        0.0754          0.3245     0.0200   -0.0000
##   2740        0.0746          0.3251     0.0200   -0.0000
##   2760        0.0738          0.3248     0.0200   -0.0000
##   2780        0.0730          0.3247     0.0200   -0.0000
##   2800        0.0722          0.3232     0.0200   -0.0000
##   2820        0.0715          0.3228     0.0200   -0.0000
##   2840        0.0708          0.3226     0.0200   -0.0000
##   2860        0.0700          0.3228     0.0200   -0.0000
##   2880        0.0692          0.3228     0.0200   -0.0000
##   2900        0.0684          0.3216     0.0200   -0.0000
##   2920        0.0677          0.3209     0.0200   -0.0000
##   2940        0.0671          0.3216     0.0200   -0.0000
##   2960        0.0664          0.3208     0.0200   -0.0000
##   2980        0.0656          0.3201     0.0200   -0.0000
##   3000        0.0649          0.3197     0.0200   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2643          1.2410     0.0300    0.0155
##      2        1.2347          1.2097     0.0300    0.0144
##      3        1.2085          1.1819     0.0300    0.0125
##      4        1.1849          1.1571     0.0300    0.0119
##      5        1.1626          1.1334     0.0300    0.0102
##      6        1.1394          1.1086     0.0300    0.0113
##      7        1.1196          1.0885     0.0300    0.0093
##      8        1.1002          1.0688     0.0300    0.0092
##      9        1.0806          1.0484     0.0300    0.0090
##     10        1.0629          1.0294     0.0300    0.0082
##     20        0.9181          0.8763     0.0300    0.0060
```

```
##      40         0.7283          0.6767     0.0300    0.0033
##      60         0.6169          0.5596     0.0300    0.0018
##      80         0.5450          0.4889     0.0300    0.0014
##     100         0.5008          0.4457     0.0300    0.0004
##     120         0.4710          0.4176     0.0300    0.0002
##     140         0.4491          0.3982     0.0300    0.0000
##     160         0.4315          0.3852     0.0300   -0.0000
##     180         0.4157          0.3780     0.0300   -0.0001
##     200         0.4033          0.3737     0.0300   -0.0001
##     220         0.3910          0.3707     0.0300   -0.0001
##     240         0.3799          0.3671     0.0300   -0.0002
##     260         0.3695          0.3656     0.0300   -0.0001
##     280         0.3594          0.3613     0.0300   -0.0001
##     300         0.3491          0.3578     0.0300   -0.0002
##     320         0.3401          0.3572     0.0300   -0.0002
##     340         0.3322          0.3569     0.0300   -0.0001
##     360         0.3239          0.3551     0.0300   -0.0002
##     380         0.3166          0.3556     0.0300   -0.0002
##     400         0.3091          0.3538     0.0300   -0.0002
##     420         0.3023          0.3554     0.0300   -0.0001
##     440         0.2954          0.3522     0.0300   -0.0000
##     460         0.2893          0.3509     0.0300   -0.0001
##     480         0.2815          0.3492     0.0300   -0.0001
##     500         0.2753          0.3487     0.0300   -0.0002
##     520         0.2696          0.3458     0.0300   -0.0000
##     540         0.2633          0.3487     0.0300   -0.0001
##     560         0.2574          0.3503     0.0300   -0.0001
##     580         0.2519          0.3517     0.0300   -0.0001
##     600         0.2462          0.3498     0.0300   -0.0000
##     620         0.2409          0.3490     0.0300   -0.0001
##     640         0.2354          0.3482     0.0300   -0.0001
##     660         0.2305          0.3459     0.0300   -0.0001
##     680         0.2255          0.3478     0.0300   -0.0002
##     700         0.2207          0.3487     0.0300   -0.0002
##     720         0.2154          0.3463     0.0300   -0.0000
##     740         0.2108          0.3454     0.0300   -0.0001
##     760         0.2062          0.3422     0.0300   -0.0001
##     780         0.2015          0.3432     0.0300   -0.0001
##     800         0.1973          0.3408     0.0300   -0.0001
##     820         0.1933          0.3404     0.0300   -0.0001
##     840         0.1889          0.3385     0.0300   -0.0001
##     860         0.1851          0.3387     0.0300   -0.0001
##     880         0.1815          0.3387     0.0300   -0.0000
##     900         0.1778          0.3369     0.0300   -0.0001
##     920         0.1740          0.3391     0.0300   -0.0001
##     940         0.1709          0.3395     0.0300   -0.0000
##     960         0.1670          0.3372     0.0300   -0.0001
##     980         0.1634          0.3363     0.0300   -0.0001
##    1000         0.1600          0.3367     0.0300   -0.0000
##    1020         0.1568          0.3358     0.0300   -0.0000
##    1040         0.1538          0.3347     0.0300   -0.0001
##    1060         0.1508          0.3371     0.0300   -0.0001
##    1080         0.1475          0.3391     0.0300   -0.0001
##    1100         0.1445          0.3387     0.0300   -0.0000
```

```
##   1120        0.1424          0.3383     0.0300   -0.0001
##   1140        0.1395          0.3379     0.0300   -0.0000
##   1160        0.1369          0.3394     0.0300   -0.0000
##   1180        0.1341          0.3404     0.0300   -0.0000
##   1200        0.1314          0.3408     0.0300   -0.0001
##   1220        0.1289          0.3411     0.0300   -0.0001
##   1240        0.1268          0.3409     0.0300   -0.0001
##   1260        0.1245          0.3424     0.0300   -0.0000
##   1280        0.1223          0.3418     0.0300   -0.0000
##   1300        0.1199          0.3405     0.0300   -0.0001
##   1320        0.1178          0.3395     0.0300   -0.0001
##   1340        0.1155          0.3413     0.0300   -0.0000
##   1360        0.1136          0.3401     0.0300   -0.0000
##   1380        0.1113          0.3370     0.0300   -0.0001
##   1400        0.1092          0.3367     0.0300   -0.0001
##   1420        0.1072          0.3376     0.0300   -0.0001
##   1440        0.1050          0.3360     0.0300   -0.0000
##   1460        0.1033          0.3351     0.0300   -0.0000
##   1480        0.1016          0.3356     0.0300   -0.0000
##   1500        0.0998          0.3349     0.0300   -0.0000
##   1520        0.0979          0.3338     0.0300   -0.0001
##   1540        0.0963          0.3348     0.0300   -0.0000
##   1560        0.0946          0.3333     0.0300   -0.0000
##   1580        0.0931          0.3344     0.0300   -0.0001
##   1600        0.0916          0.3343     0.0300   -0.0000
##   1620        0.0901          0.3321     0.0300   -0.0001
##   1640        0.0887          0.3331     0.0300   -0.0001
##   1660        0.0873          0.3338     0.0300   -0.0000
##   1680        0.0859          0.3342     0.0300   -0.0000
##   1700        0.0843          0.3348     0.0300   -0.0001
##   1720        0.0831          0.3340     0.0300   -0.0001
##   1740        0.0817          0.3349     0.0300   -0.0000
##   1760        0.0804          0.3362     0.0300   -0.0001
##   1780        0.0790          0.3358     0.0300   -0.0000
##   1800        0.0777          0.3347     0.0300   -0.0001
##   1820        0.0763          0.3333     0.0300   -0.0000
##   1840        0.0748          0.3324     0.0300   -0.0000
##   1860        0.0737          0.3307     0.0300   -0.0001
##   1880        0.0724          0.3311     0.0300   -0.0000
##   1900        0.0712          0.3311     0.0300   -0.0001
##   1920        0.0699          0.3313     0.0300   -0.0000
##   1940        0.0687          0.3301     0.0300   -0.0000
##   1960        0.0677          0.3290     0.0300   -0.0000
##   1980        0.0664          0.3275     0.0300   -0.0000
##   2000        0.0653          0.3272     0.0300   -0.0000
##   2020        0.0642          0.3285     0.0300   -0.0000
##   2040        0.0632          0.3268     0.0300   -0.0000
##   2060        0.0620          0.3247     0.0300   -0.0000
##   2080        0.0611          0.3253     0.0300   -0.0000
##   2100        0.0600          0.3245     0.0300   -0.0000
##   2120        0.0591          0.3251     0.0300   -0.0000
##   2140        0.0583          0.3251     0.0300   -0.0000
##   2160        0.0574          0.3253     0.0300   -0.0000
##   2180        0.0566          0.3244     0.0300   -0.0000
```

```
##   2200        0.0557           0.3246     0.0300   -0.0000
##   2220        0.0548           0.3237     0.0300   -0.0000
##   2240        0.0541           0.3254     0.0300   -0.0000
##   2260        0.0531           0.3237     0.0300    0.0000
##   2280        0.0523           0.3228     0.0300   -0.0000
##   2300        0.0513           0.3234     0.0300   -0.0001
##   2320        0.0504           0.3235     0.0300   -0.0000
##   2340        0.0496           0.3250     0.0300   -0.0000
##   2360        0.0489           0.3262     0.0300   -0.0001
##   2380        0.0481           0.3267     0.0300   -0.0000
##   2400        0.0472           0.3265     0.0300   -0.0000
##   2420        0.0464           0.3262     0.0300   -0.0000
##   2440        0.0456           0.3271     0.0300   -0.0000
##   2460        0.0450           0.3277     0.0300   -0.0000
##   2480        0.0443           0.3292     0.0300   -0.0000
##   2500        0.0437           0.3287     0.0300   -0.0000
##   2520        0.0430           0.3285     0.0300   -0.0000
##   2540        0.0424           0.3287     0.0300   -0.0000
##   2560        0.0417           0.3292     0.0300   -0.0000
##   2580        0.0411           0.3299     0.0300   -0.0000
##   2600        0.0404           0.3287     0.0300   -0.0000
##   2620        0.0399           0.3295     0.0300   -0.0000
##   2640        0.0394           0.3295     0.0300   -0.0000
##   2660        0.0386           0.3271     0.0300   -0.0000
##   2680        0.0380           0.3277     0.0300   -0.0000
##   2700        0.0374           0.3273     0.0300   -0.0000
##   2720        0.0369           0.3275     0.0300   -0.0000
##   2740        0.0363           0.3278     0.0300   -0.0000
##   2760        0.0355           0.3261     0.0300    0.0000
##   2780        0.0350           0.3270     0.0300   -0.0000
##   2800        0.0344           0.3277     0.0300   -0.0000
##   2820        0.0339           0.3306     0.0300   -0.0000
##   2840        0.0334           0.3329     0.0300   -0.0000
##   2860        0.0329           0.3330     0.0300   -0.0000
##   2880        0.0323           0.3327     0.0300   -0.0000
##   2900        0.0318           0.3313     0.0300   -0.0000
##   2920        0.0313           0.3319     0.0300   -0.0000
##   2940        0.0308           0.3317     0.0300   -0.0000
##   2960        0.0303           0.3309     0.0300   -0.0000
##   2980        0.0298           0.3319     0.0300   -0.0000
##   3000        0.0293           0.3324     0.0300   -0.0000

## Warning in (function (x, y, offset = NULL, misc = NULL, distribution =
## "bernoulli", : Parameter ‘train.fraction‘ is deprecated, please specify
## ‘nTrain‘ instead.

## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        1.2852          1.2658     0.0100    0.0051
##      2        1.2752          1.2561     0.0100    0.0049
##      3        1.2653          1.2463     0.0100    0.0047
##      4        1.2561          1.2368     0.0100    0.0047
##      5        1.2467          1.2277     0.0100    0.0044
##      6        1.2374          1.2183     0.0100    0.0046
##      7        1.2295          1.2104     0.0100    0.0039
```

```
##      8        1.2206          1.2012     0.0100    0.0044
##      9        1.2118          1.1923     0.0100    0.0045
##     10        1.2036          1.1837     0.0100    0.0038
##     20        1.1271          1.1065     0.0100    0.0036
##     40        1.0046          0.9812     0.0100    0.0023
##     60        0.9136          0.8848     0.0100    0.0018
##     80        0.8411          0.8100     0.0100    0.0016
##    100        0.7791          0.7467     0.0100    0.0013
##    120        0.7287          0.6961     0.0100    0.0011
##    140        0.6865          0.6541     0.0100    0.0008
##    160        0.6498          0.6164     0.0100    0.0008
##    180        0.6174          0.5821     0.0100    0.0006
##    200        0.5908          0.5547     0.0100    0.0006
##    220        0.5677          0.5313     0.0100    0.0005
##    240        0.5466          0.5091     0.0100    0.0004
##    260        0.5300          0.4928     0.0100    0.0002
##    280        0.5154          0.4787     0.0100    0.0003
##    300        0.5018          0.4644     0.0100    0.0003
##    320        0.4901          0.4522     0.0100    0.0002
##    340        0.4803          0.4432     0.0100    0.0001
##    360        0.4723          0.4373     0.0100    0.0000
##    380        0.4640          0.4299     0.0100    0.0002
##    400        0.4560          0.4226     0.0100    0.0002
##    420        0.4490          0.4159     0.0100    0.0000
##    440        0.4426          0.4108     0.0100    0.0001
##    460        0.4365          0.4068     0.0100    0.0000
##    480        0.4308          0.4032     0.0100    0.0000
##    500        0.4255          0.4003     0.0100    0.0000
##    520        0.4205          0.3978     0.0100   -0.0000
##    540        0.4155          0.3949     0.0100   -0.0000
##    560        0.4106          0.3936     0.0100    0.0000
##    580        0.4065          0.3919     0.0100   -0.0000
##    600        0.4021          0.3899     0.0100    0.0000
##    620        0.3980          0.3887     0.0100   -0.0000
##    640        0.3938          0.3873     0.0100    0.0000
##    660        0.3899          0.3873     0.0100   -0.0000
##    680        0.3859          0.3852     0.0100   -0.0000
##    700        0.3823          0.3839     0.0100   -0.0001
##    720        0.3791          0.3832     0.0100   -0.0000
##    740        0.3755          0.3807     0.0100   -0.0000
##    760        0.3718          0.3801     0.0100   -0.0000
##    780        0.3687          0.3786     0.0100    0.0000
##    800        0.3658          0.3780     0.0100   -0.0000
##    820        0.3625          0.3777     0.0100   -0.0001
##    840        0.3591          0.3775     0.0100   -0.0000
##    860        0.3559          0.3769     0.0100   -0.0000
##    880        0.3530          0.3750     0.0100   -0.0000
##    900        0.3499          0.3752     0.0100   -0.0000
##    920        0.3470          0.3745     0.0100   -0.0000
##    940        0.3444          0.3750     0.0100   -0.0001
##    960        0.3415          0.3741     0.0100   -0.0001
##    980        0.3388          0.3735     0.0100   -0.0001
##   1000        0.3362          0.3730     0.0100   -0.0001
```

```
gridTrainResult<-as.data.frame(Boosting_alzh_grid$results)
gridTrainResult[which.max(gridTrainResult$Sens),]
```

```
##   shrinkage interaction.depth n.minobsinnode n.trees       ROC      Sens
## 1      0.01                 4             10    1000 0.9493692 0.9690222
##       Spec       ROCSD     SensSD     SpecSD
## 1 0.911216 0.006962202 0.01422369 0.03009368
```

```
Boosting_alzh_grid$bestTune
```

```
##   n.trees interaction.depth shrinkage n.minobsinnode
## 1    1000                 4      0.01             10
```

```
set.seed(12345)
for.final.gbm<-ALZH.gbm.forTuning%>%select(-c(CholesterolTotal,CholesterolLDL,CholesterolTriglycerides))
Boosting_alzh_grid.final<-gbm(Diagnosis~.,data=for.final.gbm,distribution="bernoulli",n.trees=1000,inte
yhat.boost.final<-predict(Boosting_alzh_grid.final,newdata = ALZH.gbm.realTest,n.trees = 1000,interacti
pred_gbm_class_final <- ifelse(yhat.boost.final > 0.5, 1, 0)
knitr::kable(table(pred_gbm_class_final,ALZH.gbm.realTest$Diagnosis))
```

| | 0 | 1 |
|---|---|---|
| 0 | 126 | 3 |
| 1 | 4 | 82 |

```
Recall.grid.gbm<-sum(pred_gbm_class_final == 1 & ALZH.gbm.realTest$Diagnosis == 1)/sum(ALZH.gbm.realTes
Precision.grid.gbm<-sum(pred_gbm_class_final == 1 & ALZH.gbm.realTest$Diagnosis == 1)/sum(pred_gbm_class
F1_Score.grid.gbm<-2*Precision.grid.gbm*Recall.grid.gbm/(Precision.grid.gbm+Recall.grid.gbm)
Accuracy.grid.gbm<-sum(pred_gbm_class_final == ALZH.gbm.realTest$Diagnosis)/length(ALZH.gbm.realTest$Di

Recall.grid.gbm
```

```
## [1] 0.9647059
```

```
Accuracy.grid.gbm
```

```
## [1] 0.9674419
```

```
Precision.grid.gbm
```

```
## [1] 0.9534884
```

```
F1_Score.grid.gbm
```

```
## [1] 0.9590643
```

```
Metric.gbm<-data.frame("Recall"= Recall.grid.gbm,"Precision"=Precision.grid.gbm,"Accuracy"=Accuracy.gri
```

```
alzh.forCI<-ALZH.gbm
#alzh.forCI$Diagnosis<-as.factor(alzh.forCI$Diagnosis)
set.seed(99325)
recall.forCI<-numeric()

for (m in 1:10){
  print(m)
  cv.folds<-createFolds(alzh.forCI$Diagnosis,5)
  recall.contain<-numeric()

  for (fold in cv.folds){
    train_data<-alzh.forCI[-fold,]
    test_data<-alzh.forCI[fold,]

   model<-gbm(Diagnosis~.,data=train_data,distribution="bernoulli",n.trees=1000,interaction.depth=4,shri

    preds<-predict(model,newdata=test_data,n.trees = 1000,interaction.depth = 4,shrinkage = 0.01,type="
    preds_class<-ifelse(preds>0.5,1,0)


    preds_class<-as.factor(preds_class)
    test_data$Diagnosis<-as.factor(test_data$Diagnosis)
    confusion<-confusionMatrix(preds_class,test_data$Diagnosis)

    recall.contain<-c(recall.contain,confusion$byClass["Sensitivity"])
    mean.recall<-mean(recall.contain)

  }
  mean.recall<-mean(recall.contain)
  recall.forCI<-c(recall.forCI,mean.recall)

}
```

```
## [1] 1
## [1] 2
## [1] 3
## [1] 4
## [1] 5
## [1] 6
## [1] 7
## [1] 8
## [1] 9
## [1] 10
```

```
Metric.All<-rbind(Metric.regular,Metric.mlr.bestSub,Metric.lasso,Metric.knn,Metric.gbm)
Method<-c("Regular MLR","MLR Best Subset","Lasso","KNN","GBM")
Metric.All<-cbind(Method,Metric.All)
knitr::kable(Metric.All)
```

| Method | Recall | Precision | Accuracy | F1.score |
|---|---|---|---|---|
| Regular MLR | 0.7764706 | 0.8800000 | 0.8697674 | 0.8250000 |
| MLR Best Subset | 0.7647059 | 0.8552632 | 0.8558140 | 0.8074534 |
| Lasso | 0.6000000 | 0.9272727 | 0.8232558 | 0.7285714 |
| KNN | 0.6470588 | 0.6547619 | 0.7255814 | 0.6508876 |
| GBM | 0.9647059 | 0.9534884 | 0.9674419 | 0.9590643 |