Module6L4

Neha Parulekar

March 14, 2016

# Additional packages needed

* If necessary install the followings packages.

install.packages("ggplot2");  
install.packages("MASS");  
install.packages("car");

require(ggplot2)

## Loading required package: ggplot2

require(MASS)

## Loading required package: MASS

## Warning: package 'MASS' was built under R version 3.2.4

require(car)

## Loading required package: car

## Warning: package 'car' was built under R version 3.2.4

* Go to the [UC Irvine Machine Learning Repository](https://archive.ics.uci.edu/ml/) and find a dataset for supervised classification. Every student MUST use a different dataset so you MUST get approved for which you can going to use. This can be the same dataset you used for the unsupervised clustering as long as the data has some labeled data.

## **About the dataset**

The dataset used is taken from UCI Machine learning Repository. The name of the dataset is **Yeast Dataset**. This dataset predicts the cellular localization sites of proteins. There are 8 attributes and 1484 instances. There are8 predictive and 1 outcome variables. The outcome class is localization sites.

Attribute Information. 1.Sequence Name: Accession number for the SWISS-PROT database 2.mcg: McGeoch's method for signal sequence recognition. 3.gvh: von Heijne's method for signal sequence recognition. 4.alm: Score of the ALOM membrane spanning region prediction program. 5.mit: Score of discriminant analysis of the amino acid content of the N-terminal region (20 residues long) of mitochondrial and non-mitochondrial proteins. 6.erl:Presence of "HDEL" substring (thought to act as a signal for retention in the endoplasmic reticulum lumen). Binary attribute. 7.pox: Peroxisomal targeting signal in the C-terminus. 8.vac: Score of discriminant analysis of the amino acid content of vacuolar and extracellular proteins. 9.nuc: Score of discriminant analysis of nuclear localization signals of nuclear and non-nuclear proteins.

# Loading the data   
data\_url <-"https://archive.ics.uci.edu/ml/machine-learning-databases/yeast/yeast.data"  
YeastData <- read.csv(url(data\_url), header = FALSE, sep = "")  
head(YeastData)

## V1 V2 V3 V4 V5 V6 V7 V8 V9 V10  
## 1 ADT1\_YEAST 0.58 0.61 0.47 0.13 0.5 0.0 0.48 0.22 MIT  
## 2 ADT2\_YEAST 0.43 0.67 0.48 0.27 0.5 0.0 0.53 0.22 MIT  
## 3 ADT3\_YEAST 0.64 0.62 0.49 0.15 0.5 0.0 0.53 0.22 MIT  
## 4 AAR2\_YEAST 0.58 0.44 0.57 0.13 0.5 0.0 0.54 0.22 NUC  
## 5 AATM\_YEAST 0.42 0.44 0.48 0.54 0.5 0.0 0.48 0.22 MIT  
## 6 AATC\_YEAST 0.51 0.40 0.56 0.17 0.5 0.5 0.49 0.22 CYT

YeastData$V1 <- NULL  
YeastData$V7 <- NULL  
  
# About data  
head(YeastData)

## V2 V3 V4 V5 V6 V8 V9 V10  
## 1 0.58 0.61 0.47 0.13 0.5 0.48 0.22 MIT  
## 2 0.43 0.67 0.48 0.27 0.5 0.53 0.22 MIT  
## 3 0.64 0.62 0.49 0.15 0.5 0.53 0.22 MIT  
## 4 0.58 0.44 0.57 0.13 0.5 0.54 0.22 NUC  
## 5 0.42 0.44 0.48 0.54 0.5 0.48 0.22 MIT  
## 6 0.51 0.40 0.56 0.17 0.5 0.49 0.22 CYT

summary(YeastData)

## V2 V3 V4 V5   
## Min. :0.1100 Min. :0.1300 Min. :0.21 Min. :0.0000   
## 1st Qu.:0.4100 1st Qu.:0.4200 1st Qu.:0.46 1st Qu.:0.1700   
## Median :0.4900 Median :0.4900 Median :0.51 Median :0.2200   
## Mean :0.5001 Mean :0.4999 Mean :0.50 Mean :0.2612   
## 3rd Qu.:0.5800 3rd Qu.:0.5700 3rd Qu.:0.55 3rd Qu.:0.3200   
## Max. :1.0000 Max. :1.0000 Max. :1.00 Max. :1.0000   
##   
## V6 V8 V9 V10   
## Min. :0.5000 Min. :0.0000 Min. :0.0000 CYT :463   
## 1st Qu.:0.5000 1st Qu.:0.4800 1st Qu.:0.2200 NUC :429   
## Median :0.5000 Median :0.5100 Median :0.2200 MIT :244   
## Mean :0.5047 Mean :0.4999 Mean :0.2762 ME3 :163   
## 3rd Qu.:0.5000 3rd Qu.:0.5300 3rd Qu.:0.3000 ME2 : 51   
## Max. :1.0000 Max. :0.7300 Max. :1.0000 ME1 : 44   
## (Other): 90

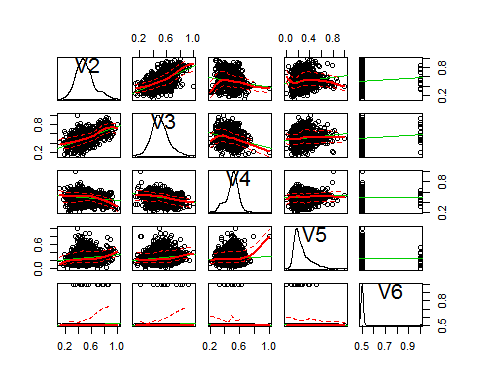
length(YeastData)

## [1] 8

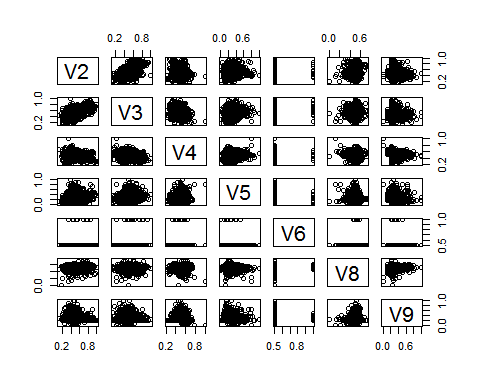
\***Classify your data using Linear Discriminant Analysis (LDA). Answer the following questions:**

# Embed PLots  
# scatterplots  
scatterplotMatrix(YeastData[1:5])

## Warning in smoother(x, y, col = col[2], log.x = FALSE, log.y = FALSE,  
## spread = spread, : could not fit smooth  
  
## Warning in smoother(x, y, col = col[2], log.x = FALSE, log.y = FALSE,  
## spread = spread, : could not fit smooth  
  
## Warning in smoother(x, y, col = col[2], log.x = FALSE, log.y = FALSE,  
## spread = spread, : could not fit smooth  
  
## Warning in smoother(x, y, col = col[2], log.x = FALSE, log.y = FALSE,  
## spread = spread, : could not fit smooth



pairs(YeastData[,1:7])

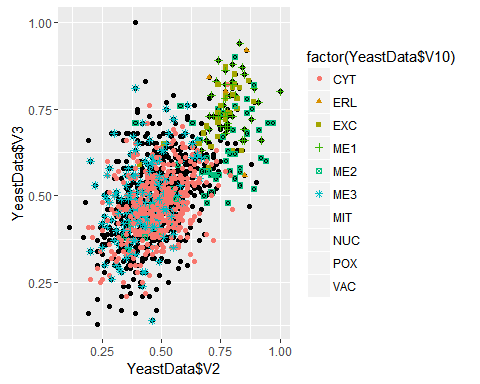


# plot for V2 and V3  
qplot(YeastData$V2, YeastData$V3, data = YeastData) + geom\_point(aes(color = factor(YeastData$V10), shape = factor(YeastData$V10)))

## Warning: The shape palette can deal with a maximum of 6 discrete values  
## because more than 6 becomes difficult to discriminate; you have  
## 10. Consider specifying shapes manually if you must have them.

## Warning: Removed 723 rows containing missing values (geom\_point).

## Warning: The shape palette can deal with a maximum of 6 discrete values  
## because more than 6 becomes difficult to discriminate; you have  
## 10. Consider specifying shapes manually if you must have them.

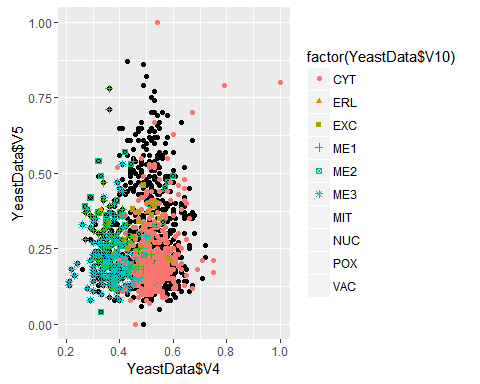


# plot for V4 and V5  
qplot(YeastData$V4, YeastData$V5, data = YeastData) + geom\_point(aes(color = factor(YeastData$V10), shape = factor(YeastData$V10)))

## Warning: The shape palette can deal with a maximum of 6 discrete values  
## because more than 6 becomes difficult to discriminate; you have  
## 10. Consider specifying shapes manually if you must have them.

## Warning: Removed 723 rows containing missing values (geom\_point).

## Warning: The shape palette can deal with a maximum of 6 discrete values  
## because more than 6 becomes difficult to discriminate; you have  
## 10. Consider specifying shapes manually if you must have them.



# Linear Discriminant Analysis for YeastData  
  
lda.m1 <- lda(V10 ~ V4 + V5, data = YeastData)  
lda.m1

## Call:  
## lda(V10 ~ V4 + V5, data = YeastData)  
##   
## Prior probabilities of groups:  
## CYT ERL EXC ME1 ME2 ME3   
## 0.311994609 0.003369272 0.023584906 0.029649596 0.034366577 0.109838275   
## MIT NUC POX VAC   
## 0.164420485 0.289083558 0.013477089 0.020215633   
##   
## Group means:  
## V4 V5  
## CYT 0.5354212 0.2271058  
## ERL 0.4820000 0.3360000  
## EXC 0.4925714 0.2920000  
## ME1 0.3761364 0.3118182  
## ME2 0.4149020 0.2825490  
## ME3 0.3642945 0.2134969  
## MIT 0.5173770 0.4044262  
## NUC 0.5293240 0.2283450  
## POX 0.5065000 0.2475000  
## VAC 0.4653333 0.2010000  
##   
## Coefficients of linear discriminants:  
## LD1 LD2  
## V4 -15.658709 0.3954564  
## V5 0.294847 -8.3510423  
##   
## Proportion of trace:  
## LD1 LD2   
## 0.729 0.271

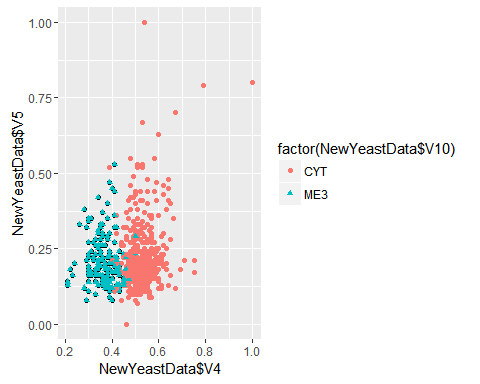
# Taking two output variable ME3 and CYT  
NewYeastData <- YeastData[which(YeastData$V10 == "CYT" | YeastData$V10 == "ME3"),]  
head(NewYeastData)

## V2 V3 V4 V5 V6 V8 V9 V10  
## 6 0.51 0.40 0.56 0.17 0.5 0.49 0.22 CYT  
## 10 0.40 0.39 0.60 0.15 0.5 0.58 0.30 CYT  
## 13 0.40 0.42 0.57 0.35 0.5 0.53 0.25 CYT  
## 16 0.46 0.44 0.52 0.11 0.5 0.50 0.22 CYT  
## 17 0.47 0.39 0.50 0.11 0.5 0.49 0.40 CYT  
## 21 0.45 0.40 0.50 0.16 0.5 0.50 0.22 CYT

summary(NewYeastData)

## V2 V3 V4 V5   
## Min. :0.1900 Min. :0.1400 Min. :0.2100 Min. :0.0000   
## 1st Qu.:0.3900 1st Qu.:0.4100 1st Qu.:0.4300 1st Qu.:0.1600   
## Median :0.4700 Median :0.4700 Median :0.5100 Median :0.1900   
## Mean :0.4677 Mean :0.4747 Mean :0.4909 Mean :0.2236   
## 3rd Qu.:0.5400 3rd Qu.:0.5400 3rd Qu.:0.5500 3rd Qu.:0.2600   
## Max. :0.8000 Max. :0.8200 Max. :1.0000 Max. :1.0000   
##   
## V6 V8 V9 V10   
## Min. :0.500 Min. :0.1300 Min. :0.0000 CYT :463   
## 1st Qu.:0.500 1st Qu.:0.4800 1st Qu.:0.2200 ME3 :163   
## Median :0.500 Median :0.5100 Median :0.2200 ERL : 0   
## Mean :0.504 Mean :0.5022 Mean :0.2606 EXC : 0   
## 3rd Qu.:0.500 3rd Qu.:0.5300 3rd Qu.:0.2700 ME1 : 0   
## Max. :1.000 Max. :0.7300 Max. :0.8300 ME2 : 0   
## (Other): 0

# Plot  
qplot(NewYeastData$V4, NewYeastData$V5, data = NewYeastData) + geom\_point(aes(color = factor(NewYeastData$V10), shape = factor(NewYeastData$V10)))



# Linear Discriminant Analysis for NewYeastData  
lda.m2 <- lda(V10 ~ V4 + V5, data = NewYeastData)

## Warning in lda.default(x, grouping, ...): groups ERL EXC ME1 ME2 MIT NUC  
## POX VAC are empty

lda.m2

## Call:  
## lda(V10 ~ V4 + V5, data = NewYeastData)  
##   
## Prior probabilities of groups:  
## CYT ME3   
## 0.7396166 0.2603834   
##   
## Group means:  
## V4 V5  
## CYT 0.5354212 0.2271058  
## ME3 0.3642945 0.2134969  
##   
## Coefficients of linear discriminants:  
## LD1  
## V4 -16.477741  
## V5 1.699526

# Predicting  
lda.m2.p <- predict(lda.m2, newdata = NewYeastData[,c(3,4)])  
lda.m2.p

## $class  
## [1] CYT CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [18] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [35] CYT CYT CYT ME3 CYT ME3 ME3 CYT CYT ME3 CYT CYT CYT CYT ME3 CYT CYT  
## [52] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3  
## [69] ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [86] CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [103] CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT CYT ME3  
## [120] ME3 CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 ME3 CYT  
## [137] ME3 CYT CYT CYT ME3 CYT ME3 CYT CYT ME3 CYT ME3 CYT ME3 CYT CYT CYT  
## [154] CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3  
## [171] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3  
## [188] ME3 ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3  
## [205] CYT CYT CYT CYT CYT ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3 CYT CYT CYT CYT  
## [222] CYT CYT ME3 CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT ME3 CYT ME3 CYT  
## [239] CYT ME3 CYT ME3 ME3 CYT CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT  
## [256] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [273] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 ME3 CYT ME3 ME3 CYT  
## [290] ME3 ME3 ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [307] CYT CYT CYT CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT  
## [324] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [341] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [358] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [375] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [392] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT  
## [409] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3 ME3  
## [426] ME3 CYT CYT CYT CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT ME3 ME3 CYT ME3  
## [443] CYT CYT ME3 ME3 CYT ME3 CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [460] CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT CYT ME3 ME3 CYT ME3 CYT  
## [477] CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT CYT CYT CYT ME3 CYT ME3 CYT CYT  
## [494] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [511] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [528] CYT CYT ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [545] CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [562] CYT CYT CYT CYT CYT ME3 CYT CYT ME3 ME3 ME3 CYT CYT CYT CYT ME3 CYT  
## [579] CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3  
## [596] ME3 CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 CYT CYT CYT ME3 ME3 ME3 ME3  
## [613] ME3 CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT  
## Levels: CYT ERL EXC ME1 ME2 ME3 MIT NUC POX VAC  
##   
## $posterior  
## CYT ME3  
## 6 9.982714e-01 1.728645e-03  
## 10 9.997508e-01 2.491895e-04  
## 13 9.974369e-01 2.563090e-03  
## 16 9.918420e-01 8.157992e-03  
## 17 9.797455e-01 2.025451e-02  
## 21 9.744508e-01 2.554925e-02  
## 22 9.194159e-01 8.058413e-02  
## 23 3.294325e-01 6.705675e-01  
## 24 9.910357e-01 8.964251e-03  
## 25 9.901506e-01 9.849402e-03  
## 27 9.924689e-01 7.531118e-03  
## 28 9.997126e-01 2.873684e-04  
## 33 9.998637e-01 1.363073e-04  
## 38 9.988559e-01 1.144111e-03  
## 44 1.654905e-01 8.345095e-01  
## 50 2.338639e-02 9.766136e-01  
## 51 9.794563e-01 2.054372e-02  
## 52 8.072439e-01 1.927561e-01  
## 54 9.988931e-01 1.106950e-03  
## 55 9.977022e-01 2.297787e-03  
## 56 9.978086e-01 2.191362e-03  
## 57 9.696936e-01 3.030644e-02  
## 58 9.642253e-01 3.577470e-02  
## 59 9.924689e-01 7.531118e-03  
## 65 7.784323e-01 2.215677e-01  
## 66 7.411513e-01 2.588487e-01  
## 67 9.992538e-01 7.462143e-04  
## 68 9.978401e-01 2.159942e-03  
## 69 9.996050e-01 3.950028e-04  
## 71 9.849717e-01 1.502830e-02  
## 72 9.344786e-01 6.552135e-02  
## 86 6.908703e-05 9.999309e-01  
## 87 3.657564e-02 9.634244e-01  
## 90 9.669035e-01 3.309652e-02  
## 91 9.995674e-01 4.325962e-04  
## 93 9.980070e-01 1.993043e-03  
## 95 9.400641e-01 5.993590e-02  
## 96 5.600079e-02 9.439992e-01  
## 100 9.982462e-01 1.753802e-03  
## 101 2.529939e-02 9.747006e-01  
## 102 2.248381e-01 7.751619e-01  
## 103 9.241804e-01 7.581963e-02  
## 105 9.961856e-01 3.814388e-03  
## 106 5.677085e-02 9.432292e-01  
## 107 9.954565e-01 4.543485e-03  
## 108 9.971293e-01 2.870678e-03  
## 109 9.896761e-01 1.032390e-02  
## 110 9.158234e-01 8.417657e-02  
## 125 1.160227e-02 9.883977e-01  
## 130 9.981948e-01 1.805217e-03  
## 131 9.990078e-01 9.922207e-04  
## 132 9.791630e-01 2.083698e-02  
## 133 9.984050e-01 1.595018e-03  
## 136 9.678174e-01 3.218262e-02  
## 137 9.595333e-01 4.046669e-02  
## 139 9.993739e-01 6.260854e-04  
## 141 9.983515e-01 1.648537e-03  
## 145 9.934632e-01 6.536849e-03  
## 147 9.767136e-01 2.328636e-02  
## 148 8.814954e-01 1.185046e-01  
## 152 9.940524e-01 5.947605e-03  
## 154 9.763822e-01 2.361782e-02  
## 157 9.987600e-01 1.240008e-03  
## 161 9.999979e-01 2.084570e-06  
## 162 9.999979e-01 2.084570e-06  
## 163 9.521350e-01 4.786503e-02  
## 166 6.577175e-01 3.422825e-01  
## 167 4.414068e-01 5.585932e-01  
## 168 8.466631e-03 9.915334e-01  
## 169 4.611732e-02 9.538827e-01  
## 170 4.784450e-03 9.952155e-01  
## 172 6.651201e-01 3.348799e-01  
## 173 9.647212e-01 3.527879e-02  
## 174 9.979401e-01 2.059889e-03  
## 180 9.308435e-01 6.915646e-02  
## 181 9.999955e-01 4.543152e-06  
## 182 9.858624e-01 1.413757e-02  
## 183 9.886582e-01 1.134176e-02  
## 184 9.632133e-01 3.678673e-02  
## 185 9.997701e-01 2.299005e-04  
## 186 9.891790e-01 1.082100e-02  
## 187 9.756078e-01 2.439223e-02  
## 188 9.849717e-01 1.502830e-02  
## 189 9.818819e-01 1.811812e-02  
## 190 9.871279e-01 1.287206e-02  
## 193 9.996686e-01 3.313948e-04  
## 214 7.733995e-01 2.266005e-01  
## 215 9.499217e-01 5.007830e-02  
## 216 9.997839e-01 2.160818e-04  
## 222 9.497048e-02 9.050295e-01  
## 224 9.993943e-01 6.057399e-04  
## 225 9.991675e-01 8.325217e-04  
## 233 1.633939e-02 9.836606e-01  
## 236 9.993739e-01 6.260854e-04  
## 237 9.999997e-01 2.728439e-07  
## 238 9.999997e-01 2.728439e-07  
## 244 9.973125e-01 2.687519e-03  
## 245 9.906035e-01 9.396508e-03  
## 246 9.976252e-01 2.374830e-03  
## 249 1.216017e-02 9.878398e-01  
## 250 2.710396e-03 9.972896e-01  
## 262 9.994492e-01 5.508408e-04  
## 263 9.756078e-01 2.439223e-02  
## 271 9.934632e-01 6.536849e-03  
## 273 3.657564e-02 9.634244e-01  
## 274 9.969900e-01 3.009994e-03  
## 278 9.928160e-01 7.184050e-03  
## 279 9.678174e-01 3.218262e-02  
## 281 2.841957e-03 9.971580e-01  
## 283 9.948387e-01 5.161306e-03  
## 284 9.911993e-01 8.800656e-03  
## 285 9.861191e-01 1.388089e-02  
## 286 2.850688e-01 7.149312e-01  
## 287 9.497048e-02 9.050295e-01  
## 289 6.469386e-01 3.530614e-01  
## 290 9.109187e-01 8.908133e-02  
## 292 8.396163e-01 1.603837e-01  
## 294 8.072439e-01 1.927561e-01  
## 295 3.118811e-01 6.881189e-01  
## 296 1.209254e-01 8.790746e-01  
## 297 5.678048e-01 4.321952e-01  
## 298 9.978401e-01 2.159942e-03  
## 300 8.744131e-01 1.255869e-01  
## 301 4.531566e-01 5.468434e-01  
## 307 9.618734e-01 3.812659e-02  
## 308 9.434637e-01 5.653627e-02  
## 309 7.030453e-01 2.969547e-01  
## 310 5.361329e-01 4.638671e-01  
## 311 9.821376e-01 1.786243e-02  
## 312 9.904678e-01 9.532189e-03  
## 313 9.763822e-01 2.361782e-02  
## 314 9.937647e-01 6.235314e-03  
## 315 1.419888e-02 9.858011e-01  
## 316 4.181155e-01 5.818845e-01  
## 317 1.820597e-03 9.981794e-01  
## 322 9.989089e-01 1.091061e-03  
## 325 2.660971e-01 7.339029e-01  
## 328 9.985007e-01 1.499269e-03  
## 329 9.993435e-01 6.565417e-04  
## 330 9.161397e-01 8.386026e-02  
## 331 7.112482e-03 9.928875e-01  
## 332 9.492287e-01 5.077130e-02  
## 333 3.001148e-02 9.699885e-01  
## 335 9.923599e-01 7.640071e-03  
## 337 9.977768e-01 2.223238e-03  
## 338 4.297222e-01 5.702778e-01  
## 339 9.901506e-01 9.849402e-03  
## 341 9.096314e-02 9.090369e-01  
## 343 9.353593e-01 6.464073e-02  
## 345 1.853136e-02 9.814686e-01  
## 349 9.875413e-01 1.245872e-02  
## 350 8.635973e-01 1.364027e-01  
## 351 9.169325e-01 8.306751e-02  
## 352 9.875413e-01 1.245872e-02  
## 353 9.801110e-01 1.988901e-02  
## 354 4.332726e-01 5.667274e-01  
## 355 9.787805e-01 2.121953e-02  
## 356 9.582301e-01 4.176993e-02  
## 363 9.995445e-01 4.555119e-04  
## 365 9.945888e-01 5.411186e-03  
## 366 9.881127e-01 1.188729e-02  
## 367 8.145318e-01 1.854682e-01  
## 368 2.687419e-02 9.731258e-01  
## 369 9.865098e-01 1.349019e-02  
## 370 9.408744e-01 5.912560e-02  
## 371 9.896761e-01 1.032390e-02  
## 372 9.562857e-01 4.371431e-02  
## 373 9.971293e-01 2.870678e-03  
## 375 9.956665e-01 4.333499e-03  
## 377 1.969338e-02 9.803066e-01  
## 378 9.823897e-01 1.761029e-02  
## 380 9.238919e-01 7.610814e-02  
## 381 8.421030e-01 1.578970e-01  
## 382 9.732404e-01 2.675964e-02  
## 383 9.979101e-01 2.089856e-03  
## 385 9.732404e-01 2.675964e-02  
## 388 9.120861e-01 8.791385e-02  
## 389 9.740879e-01 2.591206e-02  
## 392 9.998571e-01 1.429414e-04  
## 397 9.600916e-01 3.990843e-02  
## 401 9.132398e-01 8.676022e-02  
## 402 9.928160e-01 7.184050e-03  
## 404 9.093991e-01 9.060085e-02  
## 405 9.983515e-01 1.648537e-03  
## 411 7.540209e-02 9.245979e-01  
## 414 9.980993e-01 1.900705e-03  
## 415 1.534057e-03 9.984659e-01  
## 416 6.910955e-03 9.930890e-01  
## 424 4.091878e-03 9.959081e-01  
## 427 9.600916e-01 3.990843e-02  
## 430 9.891790e-01 1.082100e-02  
## 431 9.992061e-01 7.939084e-04  
## 432 1.537217e-02 9.846278e-01  
## 435 9.542551e-01 4.574487e-02  
## 441 9.315077e-01 6.849232e-02  
## 442 9.556767e-01 4.432335e-02  
## 443 1.466909e-02 9.853309e-01  
## 444 1.466909e-02 9.853309e-01  
## 445 2.710396e-03 9.972896e-01  
## 446 3.435001e-03 9.965650e-01  
## 447 1.034615e-01 8.965385e-01  
## 448 3.601606e-03 9.963984e-01  
## 449 3.601606e-03 9.963984e-01  
## 450 1.419888e-02 9.858011e-01  
## 454 9.999279e-01 7.213249e-05  
## 457 9.896761e-01 1.032390e-02  
## 465 5.794291e-01 4.205709e-01  
## 468 9.995992e-01 4.007590e-04  
## 469 6.360080e-01 3.639920e-01  
## 470 4.768004e-01 5.231996e-01  
## 474 7.456118e-03 9.925439e-01  
## 475 1.664077e-02 9.833592e-01  
## 477 3.087835e-01 6.912165e-01  
## 481 2.034179e-02 9.796582e-01  
## 482 5.242944e-01 4.757056e-01  
## 485 1.097567e-01 8.902433e-01  
## 486 1.743668e-02 9.825633e-01  
## 487 9.997624e-01 2.376254e-04  
## 498 7.840812e-01 2.159188e-01  
## 499 8.779985e-01 1.220015e-01  
## 501 9.648608e-01 3.513917e-02  
## 502 8.163873e-01 1.836127e-01  
## 505 9.981874e-01 1.812638e-03  
## 508 1.116388e-03 9.988836e-01  
## 510 9.962402e-01 3.759785e-03  
## 517 1.527763e-01 8.472237e-01  
## 518 9.958239e-01 4.176054e-03  
## 524 8.924679e-01 1.075321e-01  
## 525 9.635787e-01 3.642129e-02  
## 528 1.209254e-01 8.790746e-01  
## 532 4.530669e-02 9.546933e-01  
## 533 9.353593e-01 6.464073e-02  
## 535 8.579011e-01 1.420989e-01  
## 541 9.998801e-01 1.199184e-04  
## 542 1.071359e-02 9.892864e-01  
## 543 9.984279e-01 1.572135e-03  
## 545 1.071359e-02 9.892864e-01  
## 547 9.984789e-01 1.521093e-03  
## 558 9.054061e-01 9.459390e-02  
## 561 1.374070e-01 8.625930e-01  
## 563 7.411513e-01 2.588487e-01  
## 570 2.906399e-02 9.709360e-01  
## 573 4.414068e-01 5.585932e-01  
## 574 9.324253e-01 6.757465e-02  
## 575 9.964141e-01 3.585889e-03  
## 578 9.930479e-01 6.952076e-03  
## 592 9.998571e-01 1.429414e-04  
## 655 9.120861e-01 8.791385e-02  
## 659 2.306517e-01 7.693483e-01  
## 660 9.630674e-01 3.693265e-02  
## 661 9.719743e-01 2.802573e-02  
## 666 1.881671e-03 9.981183e-01  
## 667 9.972622e-01 2.737791e-03  
## 672 8.072439e-01 1.927561e-01  
## 675 9.788657e-01 2.113433e-02  
## 676 4.153148e-02 9.584685e-01  
## 687 9.969900e-01 3.009994e-03  
## 688 5.874629e-01 4.125371e-01  
## 690 9.821376e-01 1.786243e-02  
## 698 9.961856e-01 3.814388e-03  
## 716 7.319289e-01 2.680711e-01  
## 722 9.983515e-01 1.648537e-03  
## 723 9.914483e-01 8.551707e-03  
## 725 9.514710e-01 4.852897e-02  
## 730 9.998006e-01 1.993551e-04  
## 731 6.490662e-02 9.350934e-01  
## 734 9.934632e-01 6.536849e-03  
## 735 9.984050e-01 1.595018e-03  
## 736 8.459139e-01 1.540861e-01  
## 737 9.821376e-01 1.786243e-02  
## 738 9.922177e-01 7.782262e-03  
## 739 9.806675e-01 1.933251e-02  
## 743 1.485465e-01 8.514535e-01  
## 763 9.692653e-01 3.073468e-02  
## 764 9.284123e-01 7.158767e-02  
## 765 9.635787e-01 3.642129e-02  
## 766 9.997508e-01 2.491895e-04  
## 768 9.909063e-01 9.093748e-03  
## 769 9.293683e-01 7.063169e-02  
## 770 9.924689e-01 7.531118e-03  
## 771 9.975099e-01 2.490143e-03  
## 775 9.906035e-01 9.396508e-03  
## 779 2.101110e-02 9.789889e-01  
## 781 7.641734e-02 9.235827e-01  
## 783 2.034179e-02 9.796582e-01  
## 791 9.647212e-01 3.527879e-02  
## 793 1.608611e-03 9.983914e-01  
## 794 4.151284e-03 9.958487e-01  
## 796 9.950057e-01 4.994318e-03  
## 799 1.853136e-02 9.814686e-01  
## 800 3.276078e-03 9.967239e-01  
## 802 1.790392e-01 8.209608e-01  
## 803 3.606904e-02 9.639310e-01  
## 814 1.941590e-02 9.805841e-01  
## 816 9.937647e-01 6.235314e-03  
## 818 7.649617e-01 2.350383e-01  
## 822 9.958668e-01 4.133178e-03  
## 823 9.936744e-01 6.325640e-03  
## 824 9.434637e-01 5.653627e-02  
## 825 9.989089e-01 1.091061e-03  
## 826 9.980070e-01 1.993043e-03  
## 827 9.984789e-01 1.521093e-03  
## 830 9.732404e-01 2.675964e-02  
## 831 7.840812e-01 2.159188e-01  
## 846 9.891790e-01 1.082100e-02  
## 847 9.969900e-01 3.009994e-03  
## 848 9.970876e-01 2.912406e-03  
## 849 9.183370e-01 8.166299e-02  
## 850 7.847763e-01 2.152237e-01  
## 854 9.928160e-01 7.184050e-03  
## 855 9.444468e-01 5.555317e-02  
## 856 1.369205e-01 8.630795e-01  
## 857 9.986997e-01 1.300291e-03  
## 858 9.924689e-01 7.531118e-03  
## 859 9.981874e-01 1.812638e-03  
## 863 9.303106e-03 9.906969e-01  
## 864 9.630674e-01 3.693265e-02  
## 865 9.678174e-01 3.218262e-02  
## 866 9.740879e-01 2.591206e-02  
## 894 9.124152e-01 8.758484e-02  
## 895 9.744508e-01 2.554925e-02  
## 897 9.967382e-01 3.261777e-03  
## 898 9.954565e-01 4.543485e-03  
## 906 2.332300e-01 7.667700e-01  
## 916 7.383650e-01 2.616350e-01  
## 917 9.607975e-01 3.920245e-02  
## 923 9.787805e-01 2.121953e-02  
## 929 9.993648e-01 6.352070e-04  
## 930 9.993648e-01 6.352070e-04  
## 931 9.985007e-01 1.499269e-03  
## 932 9.980716e-01 1.928361e-03  
## 933 9.980716e-01 1.928361e-03  
## 934 9.973125e-01 2.687519e-03  
## 935 9.973125e-01 2.687519e-03  
## 936 9.888647e-01 1.113527e-02  
## 937 9.888647e-01 1.113527e-02  
## 938 9.992429e-01 7.570847e-04  
## 962 8.151519e-01 1.848481e-01  
## 963 9.999955e-01 4.543152e-06  
## 964 9.999955e-01 4.543152e-06  
## 965 9.801110e-01 1.988901e-02  
## 966 9.801110e-01 1.988901e-02  
## 967 9.483256e-01 5.167441e-02  
## 968 9.483256e-01 5.167441e-02  
## 969 9.995656e-01 4.343772e-04  
## 970 9.980993e-01 1.900705e-03  
## 971 9.980993e-01 1.900705e-03  
## 972 9.886582e-01 1.134176e-02  
## 973 9.886582e-01 1.134176e-02  
## 974 9.998107e-01 1.893236e-04  
## 975 9.998134e-01 1.866037e-04  
## 976 9.998134e-01 1.866037e-04  
## 977 9.998358e-01 1.641685e-04  
## 978 9.956036e-01 4.396397e-03  
## 979 7.030453e-01 2.969547e-01  
## 980 7.030453e-01 2.969547e-01  
## 981 9.999914e-01 8.585618e-06  
## 982 9.999914e-01 8.585618e-06  
## 983 9.595333e-01 4.046669e-02  
## 984 9.913247e-01 8.675296e-03  
## 985 9.996943e-01 3.057444e-04  
## 986 9.996943e-01 3.057444e-04  
## 987 9.999183e-01 8.165485e-05  
## 988 9.999183e-01 8.165485e-05  
## 989 9.999992e-01 8.225824e-07  
## 990 1.000000e+00 5.407683e-11  
## 991 1.000000e+00 5.407683e-11  
## 992 7.447005e-01 2.552995e-01  
## 993 7.950638e-01 2.049362e-01  
## 994 9.881609e-01 1.183911e-02  
## 995 9.980070e-01 1.993043e-03  
## 996 9.993435e-01 6.565417e-04  
## 997 9.527903e-01 4.720973e-02  
## 998 9.881127e-01 1.188729e-02  
## 999 9.963620e-01 3.637976e-03  
## 1000 8.878207e-01 1.121793e-01  
## 1001 9.979101e-01 2.089856e-03  
## 1006 7.411513e-01 2.588487e-01  
## 1007 9.997808e-01 2.192313e-04  
## 1008 9.997808e-01 2.192313e-04  
## 1009 9.947638e-01 5.236156e-03  
## 1010 9.947638e-01 5.236156e-03  
## 1011 9.771326e-01 2.286742e-02  
## 1012 9.945104e-01 5.489640e-03  
## 1013 9.945104e-01 5.489640e-03  
## 1014 9.999641e-01 3.587593e-05  
## 1015 9.986421e-01 1.357914e-03  
## 1016 9.986421e-01 1.357914e-03  
## 1017 9.988003e-01 1.199736e-03  
## 1018 9.988003e-01 1.199736e-03  
## 1019 9.620239e-01 3.797615e-02  
## 1020 9.620239e-01 3.797615e-02  
## 1021 9.993115e-01 6.884785e-04  
## 1022 9.945104e-01 5.489640e-03  
## 1023 9.998550e-01 1.450250e-04  
## 1024 9.999538e-01 4.616300e-05  
## 1025 9.993242e-01 6.758110e-04  
## 1026 9.993242e-01 6.758110e-04  
## 1027 9.996249e-01 3.751301e-04  
## 1028 9.996249e-01 3.751301e-04  
## 1032 9.990845e-01 9.154685e-04  
## 1033 9.550595e-01 4.494048e-02  
## 1034 3.573816e-01 6.426184e-01  
## 1035 9.556767e-01 4.432335e-02  
## 1036 9.953906e-01 4.609416e-03  
## 1038 9.940524e-01 5.947605e-03  
## 1039 9.158234e-01 8.417657e-02  
## 1041 9.906035e-01 9.396508e-03  
## 1042 1.354872e-02 9.864513e-01  
## 1049 9.837310e-01 1.626900e-02  
## 1050 9.562857e-01 4.371431e-02  
## 1053 9.988175e-01 1.182518e-03  
## 1054 9.945888e-01 5.411186e-03  
## 1055 9.910357e-01 8.964251e-03  
## 1056 9.993115e-01 6.884785e-04  
## 1057 9.881127e-01 1.188729e-02  
## 1058 8.691001e-01 1.308999e-01  
## 1060 9.678174e-01 3.218262e-02  
## 1062 9.303125e-01 6.968751e-02  
## 1063 9.873619e-01 1.263806e-02  
## 1064 9.984279e-01 1.572135e-03  
## 1065 5.616494e-03 9.943835e-01  
## 1066 9.803912e-01 1.960882e-02  
## 1067 2.305810e-02 9.769419e-01  
## 1068 3.187001e-02 9.681300e-01  
## 1069 1.034615e-01 8.965385e-01  
## 1070 9.982714e-01 1.728645e-03  
## 1073 9.988559e-01 1.144111e-03  
## 1074 9.630674e-01 3.693265e-02  
## 1075 9.999207e-01 7.932530e-05  
## 1078 2.506588e-01 7.493412e-01  
## 1079 1.071359e-02 9.892864e-01  
## 1082 9.978401e-01 2.159942e-03  
## 1089 8.829990e-01 1.170010e-01  
## 1091 9.998648e-01 1.351915e-04  
## 1100 9.990078e-01 9.922207e-04  
## 1103 2.429883e-03 9.975701e-01  
## 1106 9.910357e-01 8.964251e-03  
## 1107 1.021267e-01 8.978733e-01  
## 1109 2.170193e-02 9.782981e-01  
## 1111 9.937647e-01 6.235314e-03  
## 1112 2.612746e-02 9.738725e-01  
## 1118 9.740879e-01 2.591206e-02  
## 1119 9.957459e-01 4.254051e-03  
## 1120 1.973552e-04 9.998026e-01  
## 1121 8.636009e-05 9.999136e-01  
## 1122 9.702350e-01 2.976505e-02  
## 1124 1.209254e-01 8.790746e-01  
## 1125 8.969449e-01 1.030551e-01  
## 1131 7.878331e-02 9.212167e-01  
## 1132 9.893328e-01 1.066717e-02  
## 1137 9.992780e-01 7.219677e-04  
## 1138 9.992780e-01 7.219677e-04  
## 1139 9.812843e-01 1.871566e-02  
## 1167 9.093991e-01 9.060085e-02  
## 1168 9.997909e-01 2.090571e-04  
## 1169 9.784778e-01 2.152222e-02  
## 1170 9.426868e-01 5.731325e-02  
## 1171 8.520077e-01 1.479923e-01  
## 1172 9.973890e-01 2.611040e-03  
## 1173 9.821376e-01 1.786243e-02  
## 1174 9.812843e-01 1.871566e-02  
## 1175 9.740879e-01 2.591206e-02  
## 1176 9.821376e-01 1.786243e-02  
## 1177 9.877181e-01 1.228190e-02  
## 1178 9.877181e-01 1.228190e-02  
## 1181 9.688312e-01 3.116878e-02  
## 1184 1.505577e-04 9.998494e-01  
## 1185 6.588036e-05 9.999341e-01  
## 1187 5.088119e-01 4.911881e-01  
## 1188 5.794291e-01 4.205709e-01  
## 1191 5.297665e-04 9.994702e-01  
## 1192 1.260697e-01 8.739303e-01  
## 1193 9.998994e-01 1.006033e-04  
## 1194 3.432713e-01 6.567287e-01  
## 1195 9.969900e-01 3.009994e-03  
## 1197 9.924689e-01 7.531118e-03  
## 1199 5.777418e-02 9.422258e-01  
## 1203 1.467253e-01 8.532747e-01  
## 1205 9.476117e-01 5.238828e-02  
## 1212 9.999739e-01 2.609753e-05  
## 1213 9.966908e-01 3.309171e-03  
## 1214 9.996525e-01 3.475206e-04  
## 1215 2.198333e-01 7.801667e-01  
## 1216 9.977352e-01 2.264845e-03  
## 1217 9.281387e-01 7.186133e-02  
## 1218 6.402992e-01 3.597008e-01  
## 1219 9.901906e-01 9.809399e-03  
## 1227 1.209254e-01 8.790746e-01  
## 1228 9.521350e-01 4.786503e-02  
## 1229 5.697908e-03 9.943021e-01  
## 1231 6.899400e-01 3.100600e-01  
## 1232 8.194738e-01 1.805262e-01  
## 1233 9.054061e-01 9.459390e-02  
## 1234 9.886582e-01 1.134176e-02  
## 1235 8.829990e-01 1.170010e-01  
## 1236 9.521350e-01 4.786503e-02  
## 1237 9.849717e-01 1.502830e-02  
## 1238 8.748638e-01 1.251362e-01  
## 1239 9.135649e-01 8.643511e-02  
## 1240 9.097372e-01 9.026278e-02  
## 1243 9.506057e-01 4.939427e-02  
## 1244 9.506057e-01 4.939427e-02  
## 1245 9.847559e-01 1.524405e-02  
## 1246 9.941613e-01 5.838738e-03  
## 1254 9.995656e-01 4.343772e-04  
## 1255 9.918752e-01 8.124803e-03  
## 1256 9.990078e-01 9.922207e-04  
## 1257 9.706501e-01 2.934991e-02  
## 1258 9.998328e-01 1.672473e-04  
## 1259 9.706501e-01 2.934991e-02  
## 1260 9.992429e-01 7.570847e-04  
## 1261 9.886582e-01 1.134176e-02  
## 1262 9.767136e-01 2.328636e-02  
## 1263 9.984050e-01 1.595018e-03  
## 1264 9.837310e-01 1.626900e-02  
## 1265 9.837310e-01 1.626900e-02  
## 1267 9.937647e-01 6.235314e-03  
## 1270 9.858624e-01 1.413757e-02  
## 1271 9.865098e-01 1.349019e-02  
## 1279 9.344786e-01 6.552135e-02  
## 1280 9.931471e-01 6.852866e-03  
## 1281 9.954565e-01 4.543485e-03  
## 1282 9.956665e-01 4.333499e-03  
## 1283 9.999997e-01 3.299757e-07  
## 1284 9.999997e-01 2.728439e-07  
## 1285 9.890230e-01 1.097702e-02  
## 1286 8.999607e-01 1.000393e-01  
## 1287 9.777705e-01 2.222948e-02  
## 1288 5.209250e-02 9.479075e-01  
## 1289 9.408349e-02 9.059165e-01  
## 1292 9.945104e-01 5.489640e-03  
## 1293 9.945888e-01 5.411186e-03  
## 1294 9.752610e-01 2.473903e-02  
## 1295 9.752610e-01 2.473903e-02  
## 1296 9.763822e-01 2.361782e-02  
## 1297 5.989319e-01 4.010681e-01  
## 1298 9.924689e-01 7.531118e-03  
## 1301 9.996840e-01 3.160170e-04  
## 1302 9.989089e-01 1.091061e-03  
## 1303 9.924689e-01 7.531118e-03  
## 1304 9.972622e-01 2.737791e-03  
## 1308 9.931471e-01 6.852866e-03  
## 1309 9.483256e-01 5.167441e-02  
## 1310 9.752610e-01 2.473903e-02  
## 1311 9.344786e-01 6.552135e-02  
## 1312 9.344786e-01 6.552135e-02  
## 1313 3.606904e-02 9.639310e-01  
## 1314 9.981610e-01 1.839015e-03  
## 1315 9.997977e-01 2.022608e-04  
## 1316 8.396163e-01 1.603837e-01  
## 1317 9.977352e-01 2.264845e-03  
## 1318 9.777705e-01 2.222948e-02  
## 1319 6.960980e-01 3.039020e-01  
## 1321 1.487976e-02 9.851202e-01  
## 1325 9.977022e-01 2.297787e-03  
## 1327 9.988175e-01 1.182518e-03  
## 1328 9.975200e-01 2.479955e-03  
## 1329 9.969900e-01 3.009994e-03  
## 1330 8.072439e-01 1.927561e-01  
## 1334 7.039027e-01 2.960973e-01  
## 1346 9.896761e-01 1.032390e-02  
## 1347 8.779985e-01 1.220015e-01  
## 1348 9.803912e-01 1.960882e-02  
## 1349 9.958668e-01 4.133178e-03  
## 1350 9.869427e-01 1.305727e-02  
## 1351 2.697420e-01 7.302580e-01  
## 1353 9.858624e-01 1.413757e-02  
## 1354 9.989089e-01 1.091061e-03  
## 1361 5.937024e-02 9.406298e-01  
## 1362 2.632802e-01 7.367198e-01  
## 1366 2.391937e-01 7.608063e-01  
## 1368 9.344786e-01 6.552135e-02  
## 1369 9.966427e-01 3.357252e-03  
## 1371 8.194738e-01 1.805262e-01  
## 1372 8.459139e-01 1.540861e-01  
## 1376 9.096314e-02 9.090369e-01  
## 1378 6.024035e-01 3.975965e-01  
## 1379 9.981610e-01 1.839015e-03  
## 1381 1.021267e-01 8.978733e-01  
## 1382 4.329469e-02 9.567053e-01  
## 1384 7.984015e-02 9.201598e-01  
## 1386 1.546591e-01 8.453409e-01  
## 1391 3.149957e-01 6.850043e-01  
## 1393 2.673872e-04 9.997326e-01  
## 1395 5.616494e-03 9.943835e-01  
## 1397 8.336828e-01 1.663172e-01  
## 1399 3.650087e-01 6.349913e-01  
## 1401 3.142646e-02 9.685735e-01  
## 1402 5.973611e-03 9.940264e-01  
## 1403 1.408740e-01 8.591260e-01  
## 1406 2.131088e-02 9.786891e-01  
## 1407 4.297222e-01 5.702778e-01  
## 1408 2.087047e-01 7.912953e-01  
## 1412 5.677085e-02 9.432292e-01  
## 1414 3.606904e-02 9.639310e-01  
## 1415 9.984279e-01 1.572135e-03  
## 1416 9.012562e-01 9.874382e-02  
## 1417 7.997400e-01 2.002600e-01  
## 1418 6.208082e-02 9.379192e-01  
## 1420 1.314001e-01 8.685999e-01  
## 1422 4.649588e-01 5.350412e-01  
## 1425 3.776261e-03 9.962237e-01  
## 1427 1.419888e-02 9.858011e-01  
## 1428 1.071359e-02 9.892864e-01  
## 1429 8.145318e-01 1.854682e-01  
## 1430 9.536192e-01 4.638083e-02  
## 1431 5.909660e-01 4.090340e-01  
## 1432 1.889638e-01 8.110362e-01  
## 1434 7.312960e-02 9.268704e-01  
## 1439 2.649826e-02 9.735017e-01  
## 1441 2.242172e-03 9.977578e-01  
## 1446 1.941590e-02 9.805841e-01  
## 1447 9.975656e-01 2.434405e-03  
## 1454 8.743601e-02 9.125640e-01  
## 1458 9.992429e-01 7.570847e-04  
## 1460 8.123353e-01 1.876647e-01  
## 1467 3.484904e-03 9.965151e-01  
## 1468 9.979780e-01 2.022039e-03  
## 1474 9.967382e-01 3.261777e-03  
## 1475 9.989089e-01 1.091061e-03  
## 1476 9.719743e-01 2.802573e-02  
## 1477 9.936744e-01 6.325640e-03  
## 1478 9.998643e-01 1.357483e-04  
## 1479 9.999594e-01 4.061218e-05  
## 1484 9.964141e-01 3.585889e-03  
##   
## $x  
## LD1  
## 6 -1.230258388  
## 10 -1.923358559  
## 13 -1.089121100  
## 16 -0.673120306  
## 17 -0.343565481  
## 21 -0.258589176  
## 22 0.172937216  
## 23 1.297563779  
## 24 -0.639129784  
## 25 -0.605139261  
## 27 -0.701935629  
## 28 -1.872372776  
## 33 -2.139121755  
## 38 -1.378040539  
## 44 1.621943404  
## 50 2.377849421  
## 51 -0.338390282  
## 52 0.531307363  
## 54 -1.389860601  
## 55 -1.128286821  
## 56 -1.145282082  
## 57 -0.195783330  
## 58 -0.134447148  
## 59 -0.701935629  
## 65 0.594113209  
## 66 0.667269453  
## 67 -1.530997889  
## 68 -1.150457281  
## 69 -1.758581147  
## 71 -0.452181911  
## 72 0.093136109  
## 86 4.468969997  
## 87 2.213072008  
## 90 -0.163262471  
## 91 -1.726060288  
## 93 -1.179272605  
## 95 0.059145587  
## 96 2.053469795  
## 100 -1.225083189  
## 101 2.349034098  
## 102 1.485981315  
## 103 0.149297092  
## 105 -0.946514148  
## 106 2.048294596  
## 107 -0.883708302  
## 108 -1.048485715  
## 109 -0.588144000  
## 110 0.189932477  
## 125 2.632778338  
## 130 -1.214732790  
## 131 -1.429026323  
## 132 -0.333215083  
## 133 -1.259073711  
## 136 -0.173612870  
## 137 -0.088636564  
## 139 -1.593803735  
## 141 -1.247253649  
## 145 -0.752921412  
## 147 -0.292579698  
## 148 0.325894566  
## 152 -0.786911935  
## 154 -0.287404499  
## 157 -1.349225216  
## 161 -3.633938527  
## 162 -3.633938527  
## 163 -0.025830719  
## 166 0.809876404  
## 167 1.127611167  
## 168 2.746569967  
## 169 2.126626039  
## 170 2.951982764  
## 172 0.798056343  
## 173 -0.139622348  
## 174 -1.167452543  
## 180 0.113836906  
## 181 -3.355369486  
## 182 -0.474352371  
## 183 -0.554153478  
## 184 -0.124096750  
## 185 -1.952173882  
## 186 -0.571148739  
## 187 -0.275584437  
## 188 -0.452181911  
## 189 -0.384200866  
## 190 -0.508342894  
## 193 -1.821386992  
## 214 0.604463607  
## 215 -0.008835458  
## 216 -1.974344343  
## 222 1.849526662  
## 224 -1.605623797  
## 225 -1.491832168  
## 233 2.508636311  
## 236 -1.593803735  
## 237 -4.361029221  
## 238 -4.361029221  
## 244 -1.072125838  
## 245 -0.622134522  
## 246 -1.116466759  
## 249 2.615783077  
## 250 3.155925898  
## 262 -1.639614319  
## 263 -0.275584437  
## 271 -0.752921412  
## 273 2.213072008  
## 274 -1.031490453  
## 278 -0.718930890  
## 279 -0.173612870  
## 281 3.138930637  
## 283 -0.837897718  
## 284 -0.645774646  
## 285 -0.480997234  
## 286 1.372189686  
## 287 1.849526662  
## 289 0.826871666  
## 290 0.212102937  
## 292 0.451506257  
## 294 0.531307363  
## 295 1.326379102  
## 296 1.752730294  
## 297 0.945838494  
## 298 -1.150457281  
## 300 0.349534690  
## 301 1.110615906  
## 307 -0.110807024  
## 308 0.036975127  
## 309 0.735250497  
## 310 0.991649078  
## 311 -0.389376066  
## 312 -0.616959323  
## 313 -0.287404499  
## 314 -0.769916674  
## 315 2.559622094  
## 316 1.161601689  
## 317 3.298532850  
## 322 -1.395035800  
## 325 1.406180208  
## 328 -1.281244171  
## 329 -1.576808474  
## 330 0.188462813  
## 331 2.809375812  
## 332 -0.003660258  
## 333 2.286228252  
## 335 -0.696760430  
## 337 -1.140106883  
## 338 1.144606428  
## 339 -0.605139261  
## 341 1.866521923  
## 343 0.087960910  
## 345 2.462825726  
## 349 -0.520162956  
## 350 0.383525212  
## 351 0.184757278  
## 352 -0.520162956  
## 353 -0.350210344  
## 354 1.139431229  
## 355 -0.326570220  
## 356 -0.076816502  
## 363 -1.707595364  
## 365 -0.820902457  
## 366 -0.537158217  
## 367 0.514312102  
## 368 2.326863637  
## 369 -0.491347632  
## 370 0.053970388  
## 371 -0.588144000  
## 372 -0.059821241  
## 373 -1.048485715  
## 375 -0.900703563  
## 377 2.440655266  
## 378 -0.394551265  
## 380 0.150766755  
## 381 0.444861394  
## 382 -0.241593914  
## 383 -1.162277343  
## 385 -0.241593914  
## 388 0.206927738  
## 389 -0.253413976  
## 392 -2.122126494  
## 397 -0.093811763  
## 401 0.201752539  
## 402 -0.718930890  
## 404 0.218747800  
## 405 -1.247253649  
## 411 1.939678166  
## 414 -1.196267866  
## 415 3.359869031  
## 416 2.819726210  
## 424 3.008143747  
## 427 -0.093811763  
## 430 -0.571148739  
## 431 -1.508827429  
## 432 2.530806771  
## 435 -0.042825980  
## 441 0.110131370  
## 442 -0.054646042  
## 443 2.547802032  
## 444 2.547802032  
## 445 3.155925898  
## 446 3.070949592  
## 447 1.815536139  
## 448 3.053954331  
## 449 3.053954331  
## 450 2.559622094  
## 454 -2.366705013  
## 457 -0.588144000  
## 465 0.928843233  
## 468 -1.753405948  
## 469 0.843866927  
## 470 1.076625384  
## 474 2.792380551  
## 475 2.501991448  
## 477 1.331554301  
## 481 2.428835204  
## 482 1.008644339  
## 485 1.791896015  
## 486 2.484996187  
## 487 -1.940353821  
## 498 0.582293147  
## 499 0.337714628  
## 501 -0.141092011  
## 502 0.509903112  
## 505 -1.213263127  
## 508 3.473660660  
## 510 -0.951689347  
## 517 1.655933926  
## 518 -0.913993289  
## 524 0.286728845  
## 525 -0.127802286  
## 528 1.752730294  
## 532 2.133270902  
## 533 0.087960910  
## 535 0.400520473  
## 541 -2.184932339  
## 542 2.661593661  
## 543 -1.264248910  
## 545 2.661593661  
## 547 -1.276068972  
## 558 0.235743061  
## 561 1.700274847  
## 563 0.667269453  
## 570 2.298048314  
## 573 1.127611167  
## 574 0.104956171  
## 575 -0.968684608  
## 578 -0.730750952  
## 592 -2.122126494  
## 655 0.206927738  
## 659 1.474161253  
## 660 -0.122627086  
## 661 -0.224598653  
## 666 3.286712788  
## 667 -1.065480976  
## 672 0.531307363  
## 675 -0.328039884  
## 676 2.165791761  
## 687 -1.031490453  
## 688 0.917023171  
## 690 -0.389376066  
## 698 -0.946514148  
## 716 0.684264714  
## 722 -1.247253649  
## 723 -0.656125045  
## 725 -0.020655520  
## 730 -2.003159666  
## 731 1.997308813  
## 734 -0.752921412  
## 735 -1.259073711  
## 736 0.434510996  
## 737 -0.389376066  
## 738 -0.690115567  
## 739 -0.360560742  
## 743 1.667753988  
## 763 -0.190608131  
## 764 0.127126632  
## 765 -0.127802286  
## 766 -1.923358559  
## 768 -0.633954584  
## 769 0.121951432  
## 770 -0.701935629  
## 771 -1.099471498  
## 775 -0.622134522  
## 779 2.417015142  
## 781 1.934502967  
## 783 2.428835204  
## 791 -0.139622348  
## 793 3.342873770  
## 794 3.002968547  
## 796 -0.849717780  
## 799 2.462825726  
## 800 3.087944853  
## 802 1.587952882  
## 803 2.218247208  
## 814 2.445830465  
## 816 -0.769916674  
## 818 0.621458868  
## 822 -0.917698825  
## 823 -0.764741474  
## 824 0.036975127  
## 825 -1.395035800  
## 826 -1.179272605  
## 827 -1.276068972  
## 830 -0.241593914  
## 831 0.582293147  
## 846 -0.571148739  
## 847 -1.031490453  
## 848 -1.043310515  
## 849 0.178112415  
## 850 0.580823483  
## 854 -0.718930890  
## 855 0.030330264  
## 856 1.701744510  
## 857 -1.332229955  
## 858 -0.701935629  
## 859 -1.213263127  
## 863 2.712579444  
## 864 -0.122627086  
## 865 -0.173612870  
## 866 -0.253413976  
## 894 0.205458075  
## 895 -0.258589176  
## 897 -1.002675130  
## 898 -0.883708302  
## 906 1.468986054  
## 916 0.672444652  
## 917 -0.100456626  
## 923 -0.326570220  
## 929 -1.588628536  
## 930 -1.588628536  
## 931 -1.281244171  
## 932 -1.191092666  
## 933 -1.191092666  
## 934 -1.072125838  
## 935 -1.072125838  
## 936 -0.560798341  
## 937 -0.560798341  
## 938 -1.525822690  
## 962 0.512842439  
## 963 -3.355369486  
## 964 -3.355369486  
## 965 -0.350210344  
## 966 -0.350210344  
## 967 0.002984604  
## 968 0.002984604  
## 969 -1.724590625  
## 970 -1.196267866  
## 971 -1.196267866  
## 972 -0.554153478  
## 973 -0.554153478  
## 974 -2.021624591  
## 975 -2.026799790  
## 976 -2.026799790  
## 977 -2.072610374  
## 978 -0.895528364  
## 979 0.735250497  
## 980 0.735250497  
## 981 -3.127786229  
## 982 -3.127786229  
## 983 -0.088636564  
## 984 -0.650949845  
## 985 -1.850202316  
## 986 -1.850202316  
## 987 -2.322364092  
## 988 -2.322364092  
## 989 -3.966432679  
## 990 -7.409763075  
## 991 -7.409763075  
## 992 0.660624590  
## 993 0.558653023  
## 994 -0.538627880  
## 995 -1.179272605  
## 996 -1.576808474  
## 997 -0.031005918  
## 998 -0.537158217  
## 999 -0.963509409  
## 1000 0.303724106  
## 1001 -1.162277343  
## 1006 0.667269453  
## 1007 -1.969169144  
## 1008 -1.969169144  
## 1009 -0.832722519  
## 1010 -0.832722519  
## 1011 -0.299224561  
## 1012 -0.815727258  
## 1013 -0.815727258  
## 1014 -2.616458731  
## 1015 -1.316704357  
## 1016 -1.316704357  
## 1017 -1.361045278  
## 1018 -1.361045278  
## 1019 -0.112276688  
## 1020 -0.112276688  
## 1021 -1.559813213  
## 1022 -0.815727258  
## 1023 -2.116951295  
## 1024 -2.526307226  
## 1025 -1.566458075  
## 1026 -1.566458075  
## 1027 -1.777046072  
## 1028 -1.777046072  
## 1032 -1.457841646  
## 1033 -0.049470843  
## 1034 1.253222858  
## 1035 -0.054646042  
## 1036 -0.878533103  
## 1038 -0.786911935  
## 1039 0.189932477  
## 1041 -0.622134522  
## 1042 2.576617355  
## 1049 -0.423366588  
## 1050 -0.059821241  
## 1053 -1.366220477  
## 1054 -0.820902457  
## 1055 -0.639129784  
## 1056 -1.559813213  
## 1057 -0.537158217  
## 1058 0.366529951  
## 1060 -0.173612870  
## 1062 0.116776233  
## 1063 -0.514987756  
## 1064 -1.264248910  
## 1065 2.894352118  
## 1066 -0.355385543  
## 1067 2.383024620  
## 1068 2.264057792  
## 1069 1.815536139  
## 1070 -1.230258388  
## 1073 -1.378040539  
## 1074 -0.122627086  
## 1075 -2.332714490  
## 1078 1.434995531  
## 1079 2.661593661  
## 1082 -1.150457281  
## 1089 0.320719367  
## 1091 -2.142061082  
## 1100 -1.429026323  
## 1103 3.195091619  
## 1106 -0.639129784  
## 1107 1.820711338  
## 1109 2.405195080  
## 1111 -0.769916674  
## 1112 2.337214036  
## 1118 -0.253413976  
## 1119 -0.907348426  
## 1120 4.093604588  
## 1121 4.389168890  
## 1122 -0.202428193  
## 1124 1.752730294  
## 1125 0.269733583  
## 1131 1.922682905  
## 1132 -0.576323938  
## 1137 -1.542817951  
## 1138 -1.542817951  
## 1139 -0.372380804  
## 1167 0.218747800  
## 1168 -1.986164405  
## 1169 -0.321395021  
## 1170 0.042150326  
## 1171 0.417515735  
## 1172 -1.082476237  
## 1173 -0.389376066  
## 1174 -0.372380804  
## 1175 -0.253413976  
## 1176 -0.389376066  
## 1177 -0.525338155  
## 1178 -0.525338155  
## 1181 -0.185432932  
## 1184 4.190400955  
## 1185 4.485965258  
## 1187 1.030814799  
## 1188 0.928843233  
## 1191 3.740409639  
## 1192 1.735735033  
## 1193 -2.247738185  
## 1194 1.275393318  
## 1195 -1.031490453  
## 1197 -0.701935629  
## 1199 2.041649733  
## 1203 1.672929187  
## 1205 0.008159804  
## 1212 -2.730250360  
## 1213 -0.997499931  
## 1214 -1.804391731  
## 1215 1.496331713  
## 1216 -1.133462020  
## 1217 0.128596295  
## 1218 0.837222064  
## 1219 -0.606608925  
## 1227 1.752730294  
## 1228 -0.025830719  
## 1229 2.889176919  
## 1231 0.757420958  
## 1232 0.502492040  
## 1233 0.235743061  
## 1234 -0.554153478  
## 1235 0.320719367  
## 1236 -0.025830719  
## 1237 -0.452181911  
## 1238 0.348065027  
## 1239 0.200282875  
## 1240 0.217278137  
## 1243 -0.014010657  
## 1244 -0.014010657  
## 1245 -0.447006712  
## 1246 -0.793556797  
## 1254 -1.724590625  
## 1255 -0.674589969  
## 1256 -1.429026323  
## 1257 -0.207603392  
## 1258 -2.065965511  
## 1259 -0.207603392  
## 1260 -1.525822690  
## 1261 -0.554153478  
## 1262 -0.292579698  
## 1263 -1.259073711  
## 1264 -0.423366588  
## 1265 -0.423366588  
## 1267 -0.769916674  
## 1270 -0.474352371  
## 1271 -0.491347632  
## 1279 0.093136109  
## 1280 -0.735926151  
## 1281 -0.883708302  
## 1282 -0.900703563  
## 1283 -4.293048176  
## 1284 -4.361029221  
## 1285 -0.565973540  
## 1286 0.257913522  
## 1287 -0.309574959  
## 1288 2.080815455  
## 1289 1.853232197  
## 1292 -0.815727258  
## 1293 -0.820902457  
## 1294 -0.270409238  
## 1295 -0.270409238  
## 1296 -0.287404499  
## 1297 0.900027909  
## 1298 -0.701935629  
## 1301 -1.838382254  
## 1302 -1.395035800  
## 1303 -0.701935629  
## 1304 -1.065480976  
## 1308 -0.735926151  
## 1309 0.002984604  
## 1310 -0.270409238  
## 1311 0.093136109  
## 1312 0.093136109  
## 1313 2.218247208  
## 1314 -1.208087928  
## 1315 -1.997984467  
## 1316 0.451506257  
## 1317 -1.133462020  
## 1318 -0.309574959  
## 1319 0.747070559  
## 1321 2.542626833  
## 1325 -1.128286821  
## 1327 -1.366220477  
## 1328 -1.100941162  
## 1329 -1.031490453  
## 1330 0.531307363  
## 1334 0.733780834  
## 1346 -0.588144000  
## 1347 0.337714628  
## 1348 -0.355385543  
## 1349 -0.917698825  
## 1350 -0.503167694  
## 1351 1.399535345  
## 1353 -0.474352371  
## 1354 -1.395035800  
## 1361 2.031299335  
## 1362 1.411355407  
## 1366 1.457165992  
## 1368 0.093136109  
## 1369 -0.992324732  
## 1371 0.502492040  
## 1372 0.434510996  
## 1376 1.866521923  
## 1378 0.894852710  
## 1379 -1.208087928  
## 1381 1.820711338  
## 1382 2.150266163  
## 1384 1.917507706  
## 1386 1.650758727  
## 1391 1.321203902  
## 1393 3.984988158  
## 1395 2.894352118  
## 1397 0.467031855  
## 1399 1.241402796  
## 1401 2.269232991  
## 1402 2.872181657  
## 1403 1.689924448  
## 1406 2.411839943  
## 1407 1.144606428  
## 1408 1.519971837  
## 1412 2.048294596  
## 1414 2.218247208  
## 1415 -1.264248910  
## 1416 0.252738322  
## 1417 0.548302625  
## 1418 2.014304074  
## 1420 1.718739772  
## 1422 1.093620645  
## 1425 3.036959070  
## 1427 2.559622094  
## 1428 2.661593661  
## 1429 0.514312102  
## 1430 -0.037650781  
## 1431 0.911847971  
## 1432 1.564312758  
## 1434 1.951498228  
## 1439 2.332038836  
## 1441 3.223906942  
## 1446 2.445830465  
## 1447 -1.107586024  
## 1454 1.882047520  
## 1458 -1.525822690  
## 1460 0.519487301  
## 1467 3.065774393  
## 1468 -1.174097405  
## 1474 -1.002675130  
## 1475 -1.395035800  
## 1476 -0.224598653  
## 1477 -0.764741474  
## 1478 -2.140591419  
## 1479 -2.572117810  
## 1484 -0.968684608

# Predicting more no. of output variable.  
lda.m1.p <- predict(lda.m1, newdata = YeastData[,c(3,4)])  
  
# Confusion Matrix  
cm.m1 <- table(lda.m1.p$class, YeastData[,c(8)])  
cm.m1

##   
## CYT ERL EXC ME1 ME2 ME3 MIT NUC POX VAC  
## CYT 362 2 17 2 5 3 69 320 11 19  
## ERL 0 0 0 0 0 0 0 0 0 0  
## EXC 0 0 0 0 0 0 0 0 0 0  
## ME1 0 0 0 1 2 0 0 1 0 0  
## ME2 0 0 0 0 0 0 0 0 0 0  
## ME3 6 1 4 29 29 138 15 13 0 8  
## MIT 43 2 6 5 6 4 140 40 4 2  
## NUC 52 0 8 7 9 18 20 55 5 1  
## POX 0 0 0 0 0 0 0 0 0 0  
## VAC 0 0 0 0 0 0 0 0 0 0

cm.m2 <- table(lda.m2.p$class, NewYeastData[,c(8)])  
cm.m2

##   
## CYT ERL EXC ME1 ME2 ME3 MIT NUC POX VAC  
## CYT 456 0 0 0 0 22 0 0 0 0  
## ERL 0 0 0 0 0 0 0 0 0 0  
## EXC 0 0 0 0 0 0 0 0 0 0  
## ME1 0 0 0 0 0 0 0 0 0 0  
## ME2 0 0 0 0 0 0 0 0 0 0  
## ME3 7 0 0 0 0 141 0 0 0 0  
## MIT 0 0 0 0 0 0 0 0 0 0  
## NUC 0 0 0 0 0 0 0 0 0 0  
## POX 0 0 0 0 0 0 0 0 0 0  
## VAC 0 0 0 0 0 0 0 0 0 0

### with 4 predictor variables and 2 output variable  
  
lda.m3 <- lda(V10 ~ V2 + V3 + V4 + V5, data = NewYeastData)

## Warning in lda.default(x, grouping, ...): groups ERL EXC ME1 ME2 MIT NUC  
## POX VAC are empty

# predicting  
lda.m3.p <- predict(lda.m3, newdata = NewYeastData[,c(1,2,3,4)])  
lda.m3.p

## $class  
## [1] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [18] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [35] CYT CYT CYT ME3 CYT ME3 ME3 CYT CYT ME3 CYT CYT CYT CYT ME3 CYT CYT  
## [52] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3  
## [69] ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [86] CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [103] CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT CYT CYT  
## [120] ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3 CYT  
## [137] ME3 CYT CYT CYT ME3 CYT ME3 CYT CYT ME3 CYT ME3 CYT ME3 CYT CYT CYT  
## [154] CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3  
## [171] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3  
## [188] ME3 ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3  
## [205] CYT CYT CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3 CYT CYT CYT CYT  
## [222] CYT CYT ME3 CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT ME3 CYT ME3 CYT  
## [239] CYT ME3 CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT  
## [256] ME3 CYT ME3 CYT CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [273] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 ME3 CYT ME3 ME3 CYT  
## [290] ME3 ME3 ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [307] CYT CYT CYT CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT  
## [324] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [341] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [358] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [375] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [392] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [409] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3 ME3  
## [426] ME3 CYT CYT CYT CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT ME3 ME3 CYT ME3  
## [443] CYT CYT ME3 ME3 CYT ME3 CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [460] CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT CYT ME3 ME3 CYT ME3 CYT  
## [477] CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT CYT ME3 CYT ME3 CYT ME3 CYT CYT  
## [494] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [511] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [528] CYT CYT ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [545] CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [562] CYT CYT CYT CYT CYT ME3 CYT CYT ME3 ME3 ME3 CYT CYT CYT CYT ME3 CYT  
## [579] CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3  
## [596] ME3 CYT CYT CYT ME3 ME3 CYT ME3 ME3 ME3 CYT CYT ME3 ME3 ME3 ME3 ME3  
## [613] ME3 CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT  
## Levels: CYT ERL EXC ME1 ME2 ME3 MIT NUC POX VAC  
##   
## $posterior  
## CYT ME3  
## 6 9.992298e-01 7.701774e-04  
## 10 9.997323e-01 2.677061e-04  
## 13 9.966982e-01 3.301790e-03  
## 16 9.937704e-01 6.229592e-03  
## 17 9.857802e-01 1.421981e-02  
## 21 9.779161e-01 2.208391e-02  
## 22 9.089561e-01 9.104389e-02  
## 23 8.200600e-01 1.799400e-01  
## 24 9.902894e-01 9.710626e-03  
## 25 9.917460e-01 8.254023e-03  
## 27 9.981514e-01 1.848580e-03  
## 28 9.999269e-01 7.312260e-05  
## 33 9.997971e-01 2.028647e-04  
## 38 9.986037e-01 1.396318e-03  
## 44 1.001163e-01 8.998837e-01  
## 50 1.696129e-02 9.830387e-01  
## 51 9.864592e-01 1.354080e-02  
## 52 7.346852e-01 2.653148e-01  
## 54 9.996618e-01 3.382397e-04  
## 55 9.996144e-01 3.855712e-04  
## 56 9.996430e-01 3.569795e-04  
## 57 9.951211e-01 4.878941e-03  
## 58 9.831741e-01 1.682591e-02  
## 59 9.876245e-01 1.237553e-02  
## 65 8.863568e-01 1.136432e-01  
## 66 9.129725e-01 8.702751e-02  
## 67 9.984947e-01 1.505309e-03  
## 68 9.985896e-01 1.410379e-03  
## 69 9.997682e-01 2.317919e-04  
## 71 9.899402e-01 1.005979e-02  
## 72 9.782473e-01 2.175269e-02  
## 86 8.247328e-06 9.999918e-01  
## 87 1.777929e-02 9.822207e-01  
## 90 9.578495e-01 4.215046e-02  
## 91 9.992201e-01 7.799066e-04  
## 93 9.974925e-01 2.507503e-03  
## 95 9.535730e-01 4.642699e-02  
## 96 2.392344e-02 9.760766e-01  
## 100 9.997114e-01 2.885538e-04  
## 101 8.051092e-03 9.919489e-01  
## 102 1.057945e-01 8.942055e-01  
## 103 9.319594e-01 6.804061e-02  
## 105 9.974548e-01 2.545217e-03  
## 106 3.891511e-02 9.610849e-01  
## 107 9.954492e-01 4.550836e-03  
## 108 9.902660e-01 9.733980e-03  
## 109 9.982333e-01 1.766698e-03  
## 110 6.647792e-01 3.352208e-01  
## 125 1.752913e-02 9.824709e-01  
## 130 9.978794e-01 2.120578e-03  
## 131 9.994282e-01 5.717633e-04  
## 132 9.658467e-01 3.415326e-02  
## 133 9.996492e-01 3.508048e-04  
## 136 9.190408e-01 8.095922e-02  
## 137 9.297289e-01 7.027106e-02  
## 139 9.982299e-01 1.770053e-03  
## 141 9.977368e-01 2.263194e-03  
## 145 9.927334e-01 7.266643e-03  
## 147 9.938255e-01 6.174501e-03  
## 148 7.993255e-01 2.006745e-01  
## 152 9.948330e-01 5.166985e-03  
## 154 9.787570e-01 2.124303e-02  
## 157 9.987749e-01 1.225139e-03  
## 161 9.999981e-01 1.867255e-06  
## 162 9.999981e-01 1.867255e-06  
## 163 9.787550e-01 2.124502e-02  
## 166 4.354518e-01 5.645482e-01  
## 167 3.634349e-01 6.365651e-01  
## 168 1.095673e-03 9.989043e-01  
## 169 2.184849e-02 9.781515e-01  
## 170 6.586829e-04 9.993413e-01  
## 172 6.863419e-01 3.136581e-01  
## 173 9.948441e-01 5.155876e-03  
## 174 9.867047e-01 1.329531e-02  
## 180 8.847336e-01 1.152664e-01  
## 181 9.999836e-01 1.639963e-05  
## 182 9.915266e-01 8.473378e-03  
## 183 9.958158e-01 4.184181e-03  
## 184 9.519259e-01 4.807411e-02  
## 185 9.998490e-01 1.509633e-04  
## 186 9.653042e-01 3.469577e-02  
## 187 9.268165e-01 7.318347e-02  
## 188 9.592102e-01 4.078979e-02  
## 189 9.950236e-01 4.976391e-03  
## 190 9.781496e-01 2.185037e-02  
## 193 9.997375e-01 2.624654e-04  
## 214 8.652998e-01 1.347002e-01  
## 215 8.740427e-01 1.259573e-01  
## 216 9.999211e-01 7.890177e-05  
## 222 9.027612e-02 9.097239e-01  
## 224 9.998459e-01 1.541105e-04  
## 225 9.997666e-01 2.333671e-04  
## 233 6.168880e-03 9.938311e-01  
## 236 9.992910e-01 7.089657e-04  
## 237 9.999997e-01 2.838188e-07  
## 238 9.999997e-01 2.838188e-07  
## 244 9.980334e-01 1.966604e-03  
## 245 9.392771e-01 6.072291e-02  
## 246 9.988126e-01 1.187440e-03  
## 249 2.238448e-02 9.776155e-01  
## 250 7.322004e-04 9.992678e-01  
## 262 9.991953e-01 8.047013e-04  
## 263 9.990173e-01 9.826695e-04  
## 271 9.953581e-01 4.641900e-03  
## 273 4.611401e-02 9.538860e-01  
## 274 9.990223e-01 9.776564e-04  
## 278 9.895889e-01 1.041114e-02  
## 279 9.827023e-01 1.729771e-02  
## 281 8.704421e-04 9.991296e-01  
## 283 9.982440e-01 1.756024e-03  
## 284 9.914339e-01 8.566124e-03  
## 285 9.861998e-01 1.380019e-02  
## 286 8.053320e-02 9.194668e-01  
## 287 1.153646e-01 8.846354e-01  
## 289 8.349945e-01 1.650055e-01  
## 290 9.510460e-01 4.895405e-02  
## 292 9.431372e-01 5.686282e-02  
## 294 9.043172e-01 9.568279e-02  
## 295 6.397191e-01 3.602809e-01  
## 296 2.602793e-01 7.397207e-01  
## 297 3.552422e-01 6.447578e-01  
## 298 9.944540e-01 5.546046e-03  
## 300 9.673958e-01 3.260424e-02  
## 301 5.646923e-01 4.353077e-01  
## 307 9.180563e-01 8.194367e-02  
## 308 9.346563e-01 6.534372e-02  
## 309 8.528589e-01 1.471411e-01  
## 310 8.277865e-01 1.722135e-01  
## 311 9.152165e-01 8.478352e-02  
## 312 9.963925e-01 3.607480e-03  
## 313 9.922503e-01 7.749696e-03  
## 314 9.994234e-01 5.766093e-04  
## 315 1.302941e-02 9.869706e-01  
## 316 5.746584e-01 4.253416e-01  
## 317 7.625325e-04 9.992375e-01  
## 322 9.980772e-01 1.922840e-03  
## 325 1.898287e-01 8.101713e-01  
## 328 9.988740e-01 1.126021e-03  
## 329 9.995774e-01 4.225656e-04  
## 330 8.853347e-01 1.146653e-01  
## 331 2.822019e-03 9.971780e-01  
## 332 9.932327e-01 6.767334e-03  
## 333 8.855800e-03 9.911442e-01  
## 335 9.956279e-01 4.372068e-03  
## 337 9.990976e-01 9.024113e-04  
## 338 4.955346e-01 5.044654e-01  
## 339 9.979312e-01 2.068777e-03  
## 341 6.875426e-02 9.312457e-01  
## 343 9.584513e-01 4.154866e-02  
## 345 2.029470e-02 9.797053e-01  
## 349 9.893291e-01 1.067087e-02  
## 350 9.236055e-01 7.639446e-02  
## 351 9.038363e-01 9.616374e-02  
## 352 9.676935e-01 3.230646e-02  
## 353 9.937524e-01 6.247648e-03  
## 354 3.218631e-01 6.781369e-01  
## 355 9.658323e-01 3.416767e-02  
## 356 9.578535e-01 4.214645e-02  
## 363 9.999146e-01 8.544319e-05  
## 365 9.915203e-01 8.479653e-03  
## 366 9.970586e-01 2.941440e-03  
## 367 9.580488e-01 4.195121e-02  
## 368 3.439281e-02 9.656072e-01  
## 369 9.934164e-01 6.583563e-03  
## 370 9.612623e-01 3.873771e-02  
## 371 9.936612e-01 6.338794e-03  
## 372 9.701335e-01 2.986651e-02  
## 373 9.976647e-01 2.335333e-03  
## 375 9.975477e-01 2.452267e-03  
## 377 1.870287e-03 9.981297e-01  
## 378 9.987642e-01 1.235758e-03  
## 380 7.649878e-01 2.350122e-01  
## 381 8.171513e-01 1.828487e-01  
## 382 9.201526e-01 7.984735e-02  
## 383 9.993309e-01 6.691188e-04  
## 385 9.617540e-01 3.824596e-02  
## 388 9.715354e-01 2.846457e-02  
## 389 9.926484e-01 7.351552e-03  
## 392 9.998065e-01 1.934942e-04  
## 397 7.645643e-01 2.354357e-01  
## 401 9.408461e-01 5.915392e-02  
## 402 9.857693e-01 1.423074e-02  
## 404 9.563587e-01 4.364134e-02  
## 405 9.988087e-01 1.191271e-03  
## 411 7.905043e-02 9.209496e-01  
## 414 9.994349e-01 5.651415e-04  
## 415 1.503617e-03 9.984964e-01  
## 416 8.181447e-03 9.918186e-01  
## 424 1.155412e-03 9.988446e-01  
## 427 9.902795e-01 9.720519e-03  
## 430 9.983396e-01 1.660436e-03  
## 431 9.993522e-01 6.477872e-04  
## 432 5.006851e-03 9.949931e-01  
## 435 9.886503e-01 1.134973e-02  
## 441 9.173648e-01 8.263519e-02  
## 442 9.416644e-01 5.833560e-02  
## 443 2.812476e-03 9.971875e-01  
## 444 1.649372e-02 9.835063e-01  
## 445 7.444350e-04 9.992556e-01  
## 446 2.088683e-03 9.979113e-01  
## 447 7.662618e-02 9.233738e-01  
## 448 2.362201e-03 9.976378e-01  
## 449 2.362201e-03 9.976378e-01  
## 450 8.493600e-03 9.915064e-01  
## 454 9.999715e-01 2.848324e-05  
## 457 9.942481e-01 5.751861e-03  
## 465 7.104526e-01 2.895474e-01  
## 468 9.996190e-01 3.810359e-04  
## 469 6.441532e-01 3.558468e-01  
## 470 3.525869e-01 6.474131e-01  
## 474 8.164563e-03 9.918354e-01  
## 475 4.812692e-03 9.951873e-01  
## 477 3.765185e-01 6.234815e-01  
## 481 5.429543e-03 9.945705e-01  
## 482 3.896852e-01 6.103148e-01  
## 485 3.477705e-01 6.522295e-01  
## 486 1.593787e-02 9.840621e-01  
## 487 9.998108e-01 1.891905e-04  
## 498 8.279386e-01 1.720614e-01  
## 499 7.802588e-01 2.197412e-01  
## 501 9.560351e-01 4.396490e-02  
## 502 6.532801e-01 3.467199e-01  
## 505 9.921247e-01 7.875280e-03  
## 508 3.319836e-04 9.996680e-01  
## 510 9.963276e-01 3.672398e-03  
## 517 1.010152e-01 8.989848e-01  
## 518 9.979172e-01 2.082827e-03  
## 524 9.369911e-01 6.300888e-02  
## 525 9.837280e-01 1.627200e-02  
## 528 1.181269e-01 8.818731e-01  
## 532 5.138659e-02 9.486134e-01  
## 533 9.600713e-01 3.992869e-02  
## 535 8.691375e-01 1.308625e-01  
## 541 9.999507e-01 4.932807e-05  
## 542 5.049193e-03 9.949508e-01  
## 543 9.980223e-01 1.977719e-03  
## 545 5.049193e-03 9.949508e-01  
## 547 9.990183e-01 9.816694e-04  
## 558 9.758527e-01 2.414728e-02  
## 561 1.777380e-01 8.222620e-01  
## 563 8.007927e-01 1.992073e-01  
## 570 2.436967e-02 9.756303e-01  
## 573 6.824135e-01 3.175865e-01  
## 574 9.017207e-01 9.827933e-02  
## 575 9.916378e-01 8.362235e-03  
## 578 9.750068e-01 2.499324e-02  
## 592 9.999006e-01 9.942294e-05  
## 655 9.701774e-01 2.982258e-02  
## 659 4.719242e-01 5.280758e-01  
## 660 9.833800e-01 1.662002e-02  
## 661 9.708932e-01 2.910676e-02  
## 666 1.237339e-03 9.987627e-01  
## 667 9.982409e-01 1.759096e-03  
## 672 6.813911e-01 3.186089e-01  
## 675 9.880207e-01 1.197928e-02  
## 676 9.202347e-02 9.079765e-01  
## 687 9.978514e-01 2.148608e-03  
## 688 3.420548e-01 6.579452e-01  
## 690 9.889370e-01 1.106303e-02  
## 698 9.878967e-01 1.210326e-02  
## 716 7.699683e-01 2.300317e-01  
## 722 9.939180e-01 6.082009e-03  
## 723 9.991912e-01 8.088246e-04  
## 725 9.816126e-01 1.838739e-02  
## 730 9.998546e-01 1.454131e-04  
## 731 1.016915e-01 8.983085e-01  
## 734 9.961409e-01 3.859111e-03  
## 735 9.992411e-01 7.588681e-04  
## 736 8.883431e-01 1.116569e-01  
## 737 9.913784e-01 8.621572e-03  
## 738 9.969972e-01 3.002832e-03  
## 739 9.682545e-01 3.174551e-02  
## 743 9.423925e-02 9.057607e-01  
## 763 9.898563e-01 1.014367e-02  
## 764 9.841063e-01 1.589366e-02  
## 765 9.678456e-01 3.215439e-02  
## 766 9.998445e-01 1.555044e-04  
## 768 9.926914e-01 7.308628e-03  
## 769 9.488971e-01 5.110289e-02  
## 770 9.923096e-01 7.690360e-03  
## 771 9.915564e-01 8.443645e-03  
## 775 9.828866e-01 1.711342e-02  
## 779 7.068684e-03 9.929313e-01  
## 781 3.550885e-02 9.644911e-01  
## 783 5.219250e-03 9.947808e-01  
## 791 9.686281e-01 3.137187e-02  
## 793 1.358211e-03 9.986418e-01  
## 794 5.576342e-04 9.994424e-01  
## 796 9.981922e-01 1.807789e-03  
## 799 1.339570e-02 9.866043e-01  
## 800 1.330797e-03 9.986692e-01  
## 802 8.132256e-02 9.186774e-01  
## 803 5.671287e-03 9.943287e-01  
## 814 8.483201e-02 9.151680e-01  
## 816 9.946814e-01 5.318591e-03  
## 818 8.394002e-01 1.605998e-01  
## 822 9.983791e-01 1.620916e-03  
## 823 9.942709e-01 5.729083e-03  
## 824 9.703680e-01 2.963201e-02  
## 825 9.988156e-01 1.184425e-03  
## 826 9.991344e-01 8.655928e-04  
## 827 9.994124e-01 5.875703e-04  
## 830 9.905864e-01 9.413612e-03  
## 831 9.828667e-01 1.713330e-02  
## 846 9.906338e-01 9.366215e-03  
## 847 9.882570e-01 1.174304e-02  
## 848 9.985029e-01 1.497138e-03  
## 849 9.314338e-01 6.856618e-02  
## 850 9.215051e-01 7.849487e-02  
## 854 9.970023e-01 2.997707e-03  
## 855 9.530667e-01 4.693331e-02  
## 856 6.354929e-02 9.364507e-01  
## 857 9.991999e-01 8.000678e-04  
## 858 9.841370e-01 1.586302e-02  
## 859 9.988664e-01 1.133634e-03  
## 863 2.037372e-02 9.796263e-01  
## 864 9.688579e-01 3.114209e-02  
## 865 9.644594e-01 3.554057e-02  
## 866 9.936805e-01 6.319531e-03  
## 894 9.716883e-01 2.831170e-02  
## 895 9.599756e-01 4.002436e-02  
## 897 9.993654e-01 6.345952e-04  
## 898 9.993700e-01 6.299902e-04  
## 906 1.872811e-01 8.127189e-01  
## 916 9.090709e-01 9.092906e-02  
## 917 9.929494e-01 7.050607e-03  
## 923 9.801573e-01 1.984273e-02  
## 929 9.991193e-01 8.806520e-04  
## 930 9.992013e-01 7.987029e-04  
## 931 9.994297e-01 5.703243e-04  
## 932 9.983481e-01 1.651908e-03  
## 933 9.983481e-01 1.651908e-03  
## 934 9.994844e-01 5.155874e-04  
## 935 9.994844e-01 5.155874e-04  
## 936 9.890360e-01 1.096395e-02  
## 937 9.890360e-01 1.096395e-02  
## 938 9.996766e-01 3.233892e-04  
## 962 6.530430e-01 3.469570e-01  
## 963 9.999977e-01 2.310267e-06  
## 964 9.999977e-01 2.310267e-06  
## 965 9.937740e-01 6.226001e-03  
## 966 9.937740e-01 6.226001e-03  
## 967 9.851726e-01 1.482742e-02  
## 968 9.851726e-01 1.482742e-02  
## 969 9.999174e-01 8.259787e-05  
## 970 9.996264e-01 3.735741e-04  
## 971 9.996264e-01 3.735741e-04  
## 972 9.882067e-01 1.179329e-02  
## 973 9.761691e-01 2.383093e-02  
## 974 9.997030e-01 2.969876e-04  
## 975 9.999882e-01 1.176180e-05  
## 976 9.999882e-01 1.176180e-05  
## 977 9.998729e-01 1.270623e-04  
## 978 9.988290e-01 1.170984e-03  
## 979 9.062861e-01 9.371386e-02  
## 980 9.062861e-01 9.371386e-02  
## 981 9.999943e-01 5.698963e-06  
## 982 9.999943e-01 5.698963e-06  
## 983 9.878527e-01 1.214727e-02  
## 984 9.862481e-01 1.375190e-02  
## 985 9.996392e-01 3.607540e-04  
## 986 9.996392e-01 3.607540e-04  
## 987 9.998546e-01 1.454088e-04  
## 988 9.998546e-01 1.454088e-04  
## 989 9.999995e-01 5.276078e-07  
## 990 1.000000e+00 4.516659e-11  
## 991 1.000000e+00 4.516659e-11  
## 992 8.874183e-01 1.125817e-01  
## 993 9.151219e-01 8.487813e-02  
## 994 9.950478e-01 4.952184e-03  
## 995 9.962729e-01 3.727105e-03  
## 996 9.996168e-01 3.832274e-04  
## 997 9.638574e-01 3.614259e-02  
## 998 9.981874e-01 1.812570e-03  
## 999 9.996170e-01 3.830292e-04  
## 1000 9.887318e-01 1.126820e-02  
## 1001 9.998798e-01 1.201583e-04  
## 1006 7.710191e-01 2.289809e-01  
## 1007 9.999158e-01 8.417685e-05  
## 1008 9.999158e-01 8.417685e-05  
## 1009 9.861020e-01 1.389796e-02  
## 1010 9.861020e-01 1.389796e-02  
## 1011 9.841340e-01 1.586600e-02  
## 1012 9.959451e-01 4.054892e-03  
## 1013 9.959451e-01 4.054892e-03  
## 1014 9.999679e-01 3.211633e-05  
## 1015 9.988857e-01 1.114337e-03  
## 1016 9.988857e-01 1.114337e-03  
## 1017 9.981019e-01 1.898069e-03  
## 1018 9.981019e-01 1.898069e-03  
## 1019 9.298321e-01 7.016791e-02  
## 1020 9.298321e-01 7.016791e-02  
## 1021 9.996755e-01 3.244877e-04  
## 1022 9.983630e-01 1.637015e-03  
## 1023 9.999306e-01 6.940404e-05  
## 1024 9.999529e-01 4.705753e-05  
## 1025 9.997093e-01 2.907038e-04  
## 1026 9.997093e-01 2.907038e-04  
## 1027 9.994658e-01 5.341546e-04  
## 1028 9.994658e-01 5.341546e-04  
## 1032 9.995196e-01 4.804491e-04  
## 1033 9.193454e-01 8.065458e-02  
## 1034 5.932028e-01 4.067972e-01  
## 1035 9.758953e-01 2.410469e-02  
## 1036 9.911219e-01 8.878139e-03  
## 1038 9.984653e-01 1.534731e-03  
## 1039 9.448950e-01 5.510501e-02  
## 1041 9.970612e-01 2.938790e-03  
## 1042 6.077367e-03 9.939226e-01  
## 1049 9.872024e-01 1.279763e-02  
## 1050 9.885104e-01 1.148958e-02  
## 1053 9.994032e-01 5.967707e-04  
## 1054 9.919947e-01 8.005310e-03  
## 1055 9.966040e-01 3.395992e-03  
## 1056 9.995251e-01 4.748891e-04  
## 1057 9.724668e-01 2.753324e-02  
## 1058 9.524245e-01 4.757548e-02  
## 1060 9.601918e-01 3.980816e-02  
## 1062 9.069556e-01 9.304441e-02  
## 1063 9.869467e-01 1.305333e-02  
## 1064 9.994187e-01 5.812771e-04  
## 1065 6.581112e-03 9.934189e-01  
## 1066 9.847826e-01 1.521742e-02  
## 1067 3.440509e-02 9.655949e-01  
## 1068 5.591264e-02 9.440874e-01  
## 1069 3.329169e-01 6.670831e-01  
## 1070 9.981179e-01 1.882102e-03  
## 1073 9.997225e-01 2.775002e-04  
## 1074 9.720815e-01 2.791849e-02  
## 1075 9.999170e-01 8.304922e-05  
## 1078 3.439102e-01 6.560898e-01  
## 1079 7.100620e-03 9.928994e-01  
## 1082 9.940964e-01 5.903631e-03  
## 1089 9.384381e-01 6.156192e-02  
## 1091 9.998602e-01 1.397941e-04  
## 1100 9.996897e-01 3.103119e-04  
## 1103 9.064060e-04 9.990936e-01  
## 1106 9.832326e-01 1.676738e-02  
## 1107 9.233721e-02 9.076628e-01  
## 1109 2.565729e-02 9.743427e-01  
## 1111 9.991451e-01 8.548804e-04  
## 1112 1.313468e-02 9.868653e-01  
## 1118 9.887156e-01 1.128442e-02  
## 1119 9.988678e-01 1.132181e-03  
## 1120 2.559625e-05 9.999744e-01  
## 1121 9.519725e-06 9.999905e-01  
## 1122 9.532866e-01 4.671337e-02  
## 1124 5.649433e-02 9.435057e-01  
## 1125 8.810825e-01 1.189175e-01  
## 1131 5.937229e-02 9.406277e-01  
## 1132 9.959145e-01 4.085500e-03  
## 1137 9.997001e-01 2.999303e-04  
## 1138 9.997001e-01 2.999303e-04  
## 1139 9.892495e-01 1.075052e-02  
## 1167 9.623549e-01 3.764511e-02  
## 1168 9.999621e-01 3.785015e-05  
## 1169 9.867098e-01 1.329021e-02  
## 1170 9.886793e-01 1.132072e-02  
## 1171 9.366913e-01 6.330869e-02  
## 1172 9.987644e-01 1.235610e-03  
## 1173 9.919796e-01 8.020442e-03  
## 1174 9.899151e-01 1.008489e-02  
## 1175 9.855311e-01 1.446894e-02  
## 1176 9.919796e-01 8.020442e-03  
## 1177 9.972078e-01 2.792159e-03  
## 1178 9.972078e-01 2.792159e-03  
## 1181 9.707010e-01 2.929895e-02  
## 1184 6.757556e-05 9.999324e-01  
## 1185 6.834396e-06 9.999932e-01  
## 1187 6.059518e-01 3.940482e-01  
## 1188 5.968175e-01 4.031825e-01  
## 1191 1.121870e-04 9.998878e-01  
## 1192 6.284568e-02 9.371543e-01  
## 1193 9.998506e-01 1.494264e-04  
## 1194 3.841444e-01 6.158556e-01  
## 1195 9.906349e-01 9.365062e-03  
## 1197 9.932470e-01 6.753014e-03  
## 1199 4.428440e-02 9.557156e-01  
## 1203 5.915113e-02 9.408489e-01  
## 1205 8.750668e-01 1.249332e-01  
## 1212 9.999723e-01 2.768779e-05  
## 1213 9.982026e-01 1.797406e-03  
## 1214 9.996588e-01 3.412412e-04  
## 1215 1.879317e-01 8.120683e-01  
## 1216 9.973366e-01 2.663366e-03  
## 1217 6.942685e-01 3.057315e-01  
## 1218 2.123117e-01 7.876883e-01  
## 1219 9.846816e-01 1.531840e-02  
## 1227 3.096466e-02 9.690353e-01  
## 1228 9.891315e-01 1.086854e-02  
## 1229 1.260272e-03 9.987397e-01  
## 1231 7.312439e-01 2.687561e-01  
## 1232 8.722968e-01 1.277032e-01  
## 1233 9.791308e-01 2.086916e-02  
## 1234 9.936716e-01 6.328435e-03  
## 1235 9.624704e-01 3.752965e-02  
## 1236 9.244767e-01 7.552331e-02  
## 1237 9.903281e-01 9.671908e-03  
## 1238 9.584076e-01 4.159244e-02  
## 1239 9.705789e-01 2.942110e-02  
## 1240 9.749344e-01 2.506560e-02  
## 1243 9.907398e-01 9.260180e-03  
## 1244 9.907398e-01 9.260180e-03  
## 1245 9.924769e-01 7.523057e-03  
## 1246 9.976543e-01 2.345743e-03  
## 1254 9.995592e-01 4.407866e-04  
## 1255 9.964220e-01 3.578034e-03  
## 1256 9.976242e-01 2.375823e-03  
## 1257 9.521724e-01 4.782761e-02  
## 1258 9.996693e-01 3.306576e-04  
## 1259 9.521724e-01 4.782761e-02  
## 1260 9.994676e-01 5.324363e-04  
## 1261 9.721804e-01 2.781960e-02  
## 1262 9.228622e-01 7.713781e-02  
## 1263 9.981455e-01 1.854496e-03  
## 1264 9.831628e-01 1.683717e-02  
## 1265 9.830250e-01 1.697498e-02  
## 1267 9.910691e-01 8.930883e-03  
## 1270 9.957980e-01 4.201982e-03  
## 1271 9.941515e-01 5.848455e-03  
## 1279 9.289134e-01 7.108659e-02  
## 1280 9.710179e-01 2.898210e-02  
## 1281 9.973298e-01 2.670224e-03  
## 1282 9.956077e-01 4.392300e-03  
## 1283 9.999998e-01 2.326494e-07  
## 1284 9.999998e-01 2.469340e-07  
## 1285 9.978861e-01 2.113888e-03  
## 1286 9.540141e-01 4.598586e-02  
## 1287 9.697250e-01 3.027498e-02  
## 1288 9.722180e-02 9.027782e-01  
## 1289 2.151535e-01 7.848465e-01  
## 1292 9.988433e-01 1.156662e-03  
## 1293 9.869076e-01 1.309242e-02  
## 1294 9.926790e-01 7.320995e-03  
## 1295 9.708134e-01 2.918663e-02  
## 1296 9.835421e-01 1.645792e-02  
## 1297 8.067601e-01 1.932399e-01  
## 1298 9.996611e-01 3.388712e-04  
## 1301 9.998699e-01 1.301485e-04  
## 1302 9.997555e-01 2.444541e-04  
## 1303 9.969195e-01 3.080494e-03  
## 1304 9.993590e-01 6.409503e-04  
## 1308 9.990399e-01 9.601043e-04  
## 1309 9.726176e-01 2.738235e-02  
## 1310 9.913137e-01 8.686341e-03  
## 1311 9.460064e-01 5.399362e-02  
## 1312 9.581846e-01 4.181545e-02  
## 1313 2.350078e-02 9.764992e-01  
## 1314 9.990456e-01 9.544300e-04  
## 1315 9.998605e-01 1.395271e-04  
## 1316 9.375596e-01 6.244037e-02  
## 1317 9.824264e-01 1.757355e-02  
## 1318 9.098623e-01 9.013774e-02  
## 1319 6.288459e-01 3.711541e-01  
## 1321 8.444543e-03 9.915555e-01  
## 1325 9.986344e-01 1.365571e-03  
## 1327 9.991508e-01 8.492350e-04  
## 1328 9.970950e-01 2.904969e-03  
## 1329 9.989846e-01 1.015450e-03  
## 1330 8.668569e-01 1.331431e-01  
## 1334 7.777468e-01 2.222532e-01  
## 1346 9.938052e-01 6.194764e-03  
## 1347 9.741550e-01 2.584504e-02  
## 1348 9.744128e-01 2.558719e-02  
## 1349 9.807337e-01 1.926633e-02  
## 1350 9.974563e-01 2.543747e-03  
## 1351 4.112519e-01 5.887481e-01  
## 1353 9.881006e-01 1.189937e-02  
## 1354 9.994798e-01 5.201797e-04  
## 1361 6.553376e-02 9.344662e-01  
## 1362 1.358059e-01 8.641941e-01  
## 1366 2.775586e-01 7.224414e-01  
## 1368 9.661184e-01 3.388158e-02  
## 1369 9.981483e-01 1.851689e-03  
## 1371 5.988169e-01 4.011831e-01  
## 1372 8.730464e-01 1.269536e-01  
## 1376 1.725575e-02 9.827442e-01  
## 1378 5.823756e-01 4.176244e-01  
## 1379 9.917145e-01 8.285492e-03  
## 1381 1.770375e-01 8.229625e-01  
## 1382 4.327902e-03 9.956721e-01  
## 1384 5.901520e-02 9.409848e-01  
## 1386 1.353303e-01 8.646697e-01  
## 1391 2.373993e-01 7.626007e-01  
## 1393 8.564708e-04 9.991435e-01  
## 1395 4.245159e-03 9.957548e-01  
## 1397 9.411411e-01 5.885890e-02  
## 1399 1.020000e-01 8.980000e-01  
## 1401 6.284460e-02 9.371554e-01  
## 1402 2.027794e-03 9.979722e-01  
## 1403 4.658726e-01 5.341274e-01  
## 1406 9.032562e-03 9.909674e-01  
## 1407 5.561752e-01 4.438248e-01  
## 1408 6.828883e-02 9.317112e-01  
## 1412 1.048894e-02 9.895111e-01  
## 1414 4.467114e-02 9.553289e-01  
## 1415 9.997757e-01 2.242821e-04  
## 1416 9.176646e-01 8.233539e-02  
## 1417 7.122907e-01 2.877093e-01  
## 1418 3.057142e-02 9.694286e-01  
## 1420 5.984617e-02 9.401538e-01  
## 1422 7.741581e-01 2.258419e-01  
## 1425 8.838847e-03 9.911612e-01  
## 1427 4.925072e-03 9.950749e-01  
## 1428 5.218581e-03 9.947814e-01  
## 1429 8.572924e-01 1.427076e-01  
## 1430 6.702988e-01 3.297012e-01  
## 1431 2.784660e-01 7.215340e-01  
## 1432 2.486451e-01 7.513549e-01  
## 1434 7.862856e-02 9.213714e-01  
## 1439 2.728486e-02 9.727151e-01  
## 1441 4.883211e-03 9.951168e-01  
## 1446 2.775207e-02 9.722479e-01  
## 1447 9.980824e-01 1.917607e-03  
## 1454 2.059434e-02 9.794057e-01  
## 1458 9.995414e-01 4.586486e-04  
## 1460 7.497378e-01 2.502622e-01  
## 1467 9.211112e-04 9.990789e-01  
## 1468 9.968029e-01 3.197102e-03  
## 1474 9.992142e-01 7.857802e-04  
## 1475 9.992597e-01 7.402661e-04  
## 1476 9.973467e-01 2.653254e-03  
## 1477 9.986610e-01 1.338996e-03  
## 1478 9.998294e-01 1.706213e-04  
## 1479 9.999492e-01 5.082438e-05  
## 1484 9.994736e-01 5.263554e-04  
##   
## $x  
## LD1  
## 6 -1.378727961  
## 10 -1.738351935  
## 13 -0.882735025  
## 16 -0.665787990  
## 17 -0.382303050  
## 21 -0.229837692  
## 22 0.276864585  
## 23 0.543614878  
## 24 -0.513596013  
## 25 -0.569378057  
## 27 -1.080536757  
## 28 -2.179855620  
## 33 -1.832716158  
## 38 -1.176131286  
## 44 1.806505874  
## 50 2.440481334  
## 51 -0.399180749  
## 52 0.713090164  
## 54 -1.658777422  
## 55 -1.614210739  
## 56 -1.640428603  
## 57 -0.749378100  
## 58 -0.324160000  
## 59 -0.430191657  
## 65 0.360848639  
## 66 0.260017919  
## 67 -1.150528392  
## 68 -1.172718300  
## 69 -1.787363431  
## 71 -0.501459731  
## 72 -0.235093306  
## 86 5.041275478  
## 87 2.424176691  
## 90 -0.002909959  
## 91 -1.374454586  
## 93 -0.976609078  
## 95 0.031483266  
## 96 2.321075662  
## 100 -1.712835921  
## 101 2.697009248  
## 102 1.785587438  
## 103 0.169297420  
## 105 -0.971518261  
## 106 2.150316910  
## 107 -0.773170934  
## 108 -0.512770898  
## 109 -1.095975541  
## 110 0.826654247  
## 125 2.429083288  
## 130 -1.033750586  
## 131 -1.480126402  
## 132 -0.077302593  
## 133 -1.646365858  
## 136 0.233178443  
## 137 0.181084302  
## 139 -1.095329115  
## 141 -1.011561849  
## 145 -0.613054488  
## 147 -0.668828354  
## 148 0.589423533  
## 152 -0.729767886  
## 154 -0.243334973  
## 157 -1.220676646  
## 161 -3.427457164  
## 162 -3.427457164  
## 163 -0.243302405  
## 166 1.147865582  
## 167 1.250199624  
## 168 3.377805346  
## 169 2.352659261  
## 170 3.551053095  
## 172 0.793180773  
## 173 -0.730503839  
## 174 -0.405488726  
## 180 0.366296529  
## 181 -2.688366000  
## 182 -0.560381014  
## 183 -0.801869253  
## 184 0.043930102  
## 185 -1.933250638  
## 186 -0.071750740  
## 187 0.195965074  
## 188 -0.014554536  
## 189 -0.742617629  
## 190 -0.233535306  
## 193 -1.745078668  
## 214 0.426849489  
## 215 0.400602490  
## 216 -2.153979344  
## 222 1.845397438  
## 224 -1.926231099  
## 225 -1.785059019  
## 233 2.788234232  
## 236 -1.406918360  
## 237 -4.068272912  
## 238 -4.068272912  
## 244 -1.059444178  
## 245 0.127932830  
## 246 -1.231320851  
## 249 2.344228770  
## 250 3.515035564  
## 262 -1.363800305  
## 263 -1.295776099  
## 271 -0.766400387  
## 273 2.090023382  
## 274 -1.297517531  
## 278 -0.489661604  
## 279 -0.314589902  
## 281 3.456159630  
## 283 -1.098040673  
## 284 -0.556646228  
## 285 -0.392636701  
## 286 1.887867955  
## 287 1.752470232  
## 289 0.508003323  
## 290 0.050414486  
## 292 0.104196534  
## 294 0.295509642  
## 295 0.864248414  
## 296 1.414845443  
## 297 1.262305237  
## 298 -0.705556660  
## 300 -0.093636232  
## 301 0.971029169  
## 307 0.237654290  
## 308 0.154557418  
## 309 0.461825116  
## 310 0.525495992  
## 311 0.250296956  
## 312 -0.852511697  
## 313 -0.590996809  
## 314 -1.477253904  
## 315 2.531546490  
## 316 0.957200011  
## 317 3.501218017  
## 322 -1.067114324  
## 325 1.553154736  
## 328 -1.249407533  
## 329 -1.583033500  
## 330 0.364286822  
## 331 3.055401383  
## 332 -0.637440222  
## 333 2.664328322  
## 335 -0.786863681  
## 337 -1.324785476  
## 338 1.065622960  
## 339 -1.042180712  
## 341 1.945986979  
## 343 -0.008015092  
## 345 2.378293188  
## 349 -0.481190368  
## 350 0.211752087  
## 351 0.297396084  
## 352 -0.096861929  
## 353 -0.664797329  
## 354 1.313038743  
## 355 -0.077154011  
## 356 -0.002943697  
## 363 -2.126884373  
## 365 -0.560127055  
## 366 -0.922168246  
## 367 -0.004592394  
## 368 2.193934846  
## 369 -0.646868015  
## 370 -0.032839753  
## 371 -0.659839488  
## 372 -0.124430716  
## 373 -1.000864118  
## 375 -0.984204742  
## 377 3.195652543  
## 378 -1.217737477  
## 380 0.658087887  
## 381 0.550278010  
## 382 0.228063234  
## 383 -1.426608390  
## 385 -0.037359414  
## 388 -0.141275847  
## 389 -0.609073779  
## 392 -1.848805913  
## 397 0.658888612  
## 401 0.118460437  
## 402 -0.382037845  
## 404 0.009443475  
## 405 -1.230223888  
## 411 1.894737377  
## 414 -1.484091122  
## 415 3.270005544  
## 416 2.691501209  
## 424 3.359726841  
## 427 -0.513246249  
## 430 -1.117112299  
## 431 -1.437636463  
## 432 2.859625572  
## 435 -0.459977228  
## 441 0.240769138  
## 442 0.113426214  
## 443 3.056556840  
## 444 2.450151841  
## 445 3.509394548  
## 446 3.158010707  
## 447 1.906226485  
## 448 3.116057820  
## 449 3.116057820  
## 450 2.678657360  
## 454 -2.500576784  
## 457 -0.693091571  
## 465 0.754229181  
## 468 -1.618237161  
## 469 0.857686477  
## 470 1.266255276  
## 474 2.692209702  
## 475 2.873145345  
## 477 1.231105141  
## 481 2.831912198  
## 482 1.212152963  
## 485 1.273455040  
## 486 2.462005029  
## 487 -1.856458536  
## 498 0.525133082  
## 499 0.628510563  
## 501 0.012071222  
## 502 0.844062377  
## 505 -0.585485700  
## 508 3.784224033  
## 510 -0.846422790  
## 517 1.803125456  
## 518 -1.039873595  
## 524 0.141331985  
## 525 -0.335737906  
## 528 1.743357736  
## 532 2.051312604  
## 533 -0.022117632  
## 535 0.415512397  
## 541 -2.313763914  
## 542 2.856746571  
## 543 -1.057523269  
## 545 2.856746571  
## 547 -1.296122794  
## 558 -0.198735722  
## 561 1.580579684  
## 563 0.586303717  
## 570 2.314633922  
## 573 0.799367019  
## 574 0.305595472  
## 575 -0.564910387  
## 578 -0.186727813  
## 592 -2.075335463  
## 655 -0.124946812  
## 659 1.097787791  
## 660 -0.328419059  
## 661 -0.133461862  
## 666 3.336396156  
## 667 -1.097445125  
## 672 0.800970367  
## 675 -0.441397671  
## 676 1.838222450  
## 687 -1.029274375  
## 688 1.282060039  
## 690 -0.468778805  
## 698 -0.437852456  
## 716 0.648594172  
## 722 -0.673994019  
## 723 -1.362060407  
## 725 -0.293432186  
## 730 -1.945994078  
## 731 1.800599653  
## 734 -0.829490031  
## 735 -1.383763718  
## 736 0.354089337  
## 737 -0.554432513  
## 738 -0.915120883  
## 739 -0.103017142  
## 743 1.829297972  
## 763 -0.498606655  
## 764 -0.343870988  
## 765 -0.098520337  
## 766 -1.923167878  
## 768 -0.611080417  
## 769 0.065796675  
## 770 -0.593631562  
## 771 -0.561586928  
## 775 -0.318297228  
## 779 2.741611568  
## 781 2.182678740  
## 783 2.845420725  
## 791 -0.107175792  
## 793 3.304650830  
## 794 3.607736636  
## 796 -1.088140597  
## 799 2.521989537  
## 800 3.311595885  
## 802 1.884257969  
## 803 2.817012003  
## 814 1.868584649  
## 816 -0.719879057  
## 818 0.497007454  
## 822 -1.125319863  
## 823 -0.694449137  
## 824 -0.127194265  
## 825 -1.232186712  
## 826 -1.338967467  
## 827 -1.470844731  
## 830 -0.524264610  
## 831 -0.317895473  
## 846 -0.525997865  
## 847 -0.448253948  
## 848 -1.152382630  
## 849 0.172106682  
## 850 0.221752572  
## 854 -0.915703649  
## 855 0.035353489  
## 856 1.974660907  
## 857 -1.365766199  
## 858 -0.344537949  
## 859 -1.247112833  
## 863 2.376943799  
## 864 -0.109757020  
## 865 -0.063269793  
## 866 -0.660881392  
## 894 -0.143161119  
## 895 -0.021269659  
## 897 -1.444639648  
## 898 -1.447118568  
## 906 1.558818609  
## 916 0.276392303  
## 917 -0.623394641  
## 923 -0.267016957  
## 929 -1.333095348  
## 930 -1.366347431  
## 931 -1.480984086  
## 932 -1.118866877  
## 933 -1.118866877  
## 934 -1.515323785  
## 935 -1.515323785  
## 936 -0.471873060  
## 937 -0.471873060  
## 938 -1.674054842  
## 962 0.844418400  
## 963 -3.355040135  
## 964 -3.355040135  
## 965 -0.665985354  
## 966 -0.665985354  
## 967 -0.367860457  
## 968 -0.367860457  
## 969 -2.138405685  
## 970 -1.624966963  
## 971 -1.624966963  
## 972 -0.446784363  
## 973 -0.203331765  
## 974 -1.703033550  
## 975 -2.801436095  
## 976 -2.801436095  
## 977 -1.991887657  
## 978 -1.236073514  
## 979 0.287697191  
## 980 0.287697191  
## 981 -3.047905415  
## 982 -3.047905415  
## 983 -0.436602728  
## 984 -0.393845684  
## 985 -1.636849650  
## 986 -1.636849650  
## 987 -1.946004154  
## 988 -1.946004154  
## 989 -3.857370527  
## 990 -7.043182160  
## 991 -7.043182160  
## 992 0.357249534  
## 993 0.250711492  
## 994 -0.744284578  
## 995 -0.841374253  
## 996 -1.616285583  
## 997 -0.057343784  
## 998 -1.087240634  
## 999 -1.616461625  
## 1000 -0.462457683  
## 1001 -2.010893783  
## 1006 0.646572854  
## 1007 -2.131963944  
## 1008 -2.131963944  
## 1009 -0.390201595  
## 1010 -0.390201595  
## 1011 -0.344473177  
## 1012 -0.812589840  
## 1013 -0.812589840  
## 1014 -2.459740284  
## 1015 -1.252959390  
## 1016 -1.252959390  
## 1017 -1.071533212  
## 1018 -1.071533212  
## 1019 0.180546884  
## 1020 0.180546884  
## 1021 -1.672900919  
## 1022 -1.121952590  
## 1023 -2.197610426  
## 1024 -2.329793641  
## 1025 -1.710310117  
## 1026 -1.710310117  
## 1027 -1.503283308  
## 1028 -1.503283308  
## 1032 -1.539345823  
## 1033 0.231783341  
## 1034 0.931233038  
## 1035 -0.199351057  
## 1036 -0.544369540  
## 1038 -1.143933887  
## 1039 0.092881934  
## 1041 -0.922475732  
## 1042 2.793349441  
## 1049 -0.418637777  
## 1050 -0.455763517  
## 1053 -1.465556549  
## 1054 -0.579870610  
## 1055 -0.873133894  
## 1056 -1.543307109  
## 1057 -0.152917355  
## 1058 0.040205391  
## 1060 -0.023188669  
## 1062 0.285007377  
## 1063 -0.411820346  
## 1064 -1.474509778  
## 1065 2.766089673  
## 1066 -0.358894448  
## 1067 2.193809121  
## 1068 2.020972091  
## 1069 1.295962509  
## 1070 -1.074412214  
## 1073 -1.726126125  
## 1074 -0.148056106  
## 1075 -2.136551811  
## 1078 1.279259318  
## 1079 2.740067275  
## 1082 -0.684180622  
## 1089 0.132904564  
## 1091 -1.959401026  
## 1100 -1.688100422  
## 1103 3.442375822  
## 1106 -0.325365549  
## 1107 1.836947161  
## 1109 2.296670505  
## 1111 -1.343207103  
## 1112 2.528772866  
## 1118 -0.461962909  
## 1119 -1.247549477  
## 1120 4.656024219  
## 1121 4.992470694  
## 1122 0.033677193  
## 1124 2.017241908  
## 1125 0.378310274  
## 1131 1.999301348  
## 1132 -0.810021393  
## 1137 -1.699678693  
## 1138 -1.699678693  
## 1139 -0.478633531  
## 1167 -0.042958151  
## 1168 -2.403860901  
## 1169 -0.405620955  
## 1170 -0.460857768  
## 1171 0.143055530  
## 1172 -1.217778222  
## 1173 -0.579223072  
## 1174 -0.500603582  
## 1175 -0.376309201  
## 1176 -0.579223072  
## 1177 -0.939935833  
## 1178 -0.939935833  
## 1181 -0.131155915  
## 1184 4.325786847  
## 1185 5.105198416  
## 1187 0.913168848  
## 1188 0.926130610  
## 1191 4.153339823  
## 1192 1.978703543  
## 1193 -1.936731830  
## 1194 1.220098391  
## 1195 -0.526040145  
## 1197 -0.638165677  
## 1199 2.104446187  
## 1203 2.000650737  
## 1205 0.397427249  
## 1212 -2.510211654  
## 1213 -1.090103422  
## 1214 -1.655771159  
## 1215 1.557366548  
## 1216 -0.956043476  
## 1217 0.780568027  
## 1218 1.505506944  
## 1219 -0.356609823  
## 1227 2.230856944  
## 1228 -0.474878958  
## 1229 3.330141704  
## 1231 0.719070869  
## 1232 0.405965155  
## 1233 -0.249504865  
## 1234 -0.660399399  
## 1235 -0.044043868  
## 1236 0.207530200  
## 1237 -0.514968258  
## 1238 -0.007641300  
## 1239 -0.129697941  
## 1240 -0.185719264  
## 1243 -0.529907160  
## 1244 -0.529907160  
## 1245 -0.601170631  
## 1246 -0.999347650  
## 1254 -1.568667289  
## 1255 -0.855309713  
## 1256 -0.995003245  
## 1257 0.042093368  
## 1258 -1.666491746  
## 1259 0.042093368  
## 1260 -1.504379908  
## 1261 -0.149297657  
## 1262 0.215319794  
## 1263 -1.079447971  
## 1264 -0.323928533  
## 1265 -0.321108025  
## 1267 -0.542336612  
## 1270 -0.800419091  
## 1271 -0.687393596  
## 1279 0.185307724  
## 1280 -0.134965549  
## 1281 -0.955166370  
## 1282 -0.785286258  
## 1283 -4.135896897  
## 1284 -4.115627534  
## 1285 -1.034827763  
## 1286 0.028078456  
## 1287 -0.119666807  
## 1288 1.817577396  
## 1289 1.499754657  
## 1292 -1.240264368  
## 1293 -0.410789689  
## 1294 -0.610501084  
## 1295 -0.132501870  
## 1296 -0.331809189  
## 1297 0.573433017  
## 1298 -1.658142664  
## 1301 -1.983723542  
## 1302 -1.769267037  
## 1303 -0.906408833  
## 1304 -1.441247984  
## 1308 -1.303685889  
## 1309 -0.154839435  
## 1310 -0.551864430  
## 1311 0.085551476  
## 1312 -0.005743248  
## 1313 2.327286299  
## 1314 -1.305704138  
## 1315 -1.960051269  
## 1316 0.138042629  
## 1317 -0.309112896  
## 1318 0.273123156  
## 1319 0.880193581  
## 1321 2.680644576  
## 1325 -1.183715703  
## 1327 -1.345462733  
## 1328 -0.926424601  
## 1329 -1.284603017  
## 1330 0.422282944  
## 1334 0.633473755  
## 1346 -0.667707000  
## 1347 -0.175030881  
## 1348 -0.178531495  
## 1349 -0.277244305  
## 1350 -0.971715261  
## 1351 1.181592229  
## 1353 -0.443701719  
## 1354 -1.512305913  
## 1361 1.963479648  
## 1362 1.689028924  
## 1366 1.384941210  
## 1368 -0.080114924  
## 1369 -1.079964067  
## 1371 0.923301925  
## 1372 0.403670455  
## 1376 2.434524657  
## 1378 0.946434076  
## 1379 -0.568072847  
## 1381 1.582212531  
## 1382 2.909426547  
## 1384 2.001482495  
## 1386 1.690409345  
## 1391 1.456505524  
## 1393 3.461668417  
## 1395 2.916021051  
## 1397 0.116653081  
## 1399 1.799452233  
## 1401 1.978709821  
## 1402 3.168095001  
## 1403 1.106053849  
## 1406 2.657544993  
## 1407 0.982789760  
## 1408 1.948467434  
## 1412 2.606196517  
## 1414 2.101350762  
## 1415 -1.798569080  
## 1416 0.239421648  
## 1417 0.751184073  
## 1418 2.235342502  
## 1420 1.996425780  
## 1422 0.640495558  
## 1425 2.664985936  
## 1427 2.865255342  
## 1428 2.845464539  
## 1429 0.449654731  
## 1430 0.818194258  
## 1431 1.383403420  
## 1432 1.435708454  
## 1434 1.896713346  
## 1439 2.275180913  
## 1441 2.868173190  
## 1446 2.269242123  
## 1447 -1.068043038  
## 1454 2.373203541  
## 1458 -1.555149051  
## 1460 0.686323636  
## 1467 3.436896533  
## 1468 -0.893730529  
## 1474 -1.371900454  
## 1475 -1.392212096  
## 1476 -0.957340874  
## 1477 -1.190409868  
## 1478 -1.891605601  
## 1479 -2.303598633  
## 1484 -1.508289202

lda.m3.p$class

## [1] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [18] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [35] CYT CYT CYT ME3 CYT ME3 ME3 CYT CYT ME3 CYT CYT CYT CYT ME3 CYT CYT  
## [52] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3  
## [69] ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [86] CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 ME3 CYT  
## [103] CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT CYT CYT  
## [120] ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3 CYT  
## [137] ME3 CYT CYT CYT ME3 CYT ME3 CYT CYT ME3 CYT ME3 CYT ME3 CYT CYT CYT  
## [154] CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3  
## [171] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3  
## [188] ME3 ME3 CYT CYT CYT ME3 CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3  
## [205] CYT CYT CYT CYT CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 ME3 CYT CYT CYT CYT  
## [222] CYT CYT ME3 CYT ME3 CYT CYT CYT ME3 ME3 CYT CYT CYT ME3 CYT ME3 CYT  
## [239] CYT ME3 CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT ME3 CYT CYT CYT  
## [256] ME3 CYT ME3 CYT CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [273] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 ME3 CYT ME3 ME3 CYT  
## [290] ME3 ME3 ME3 ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [307] CYT CYT CYT CYT CYT ME3 CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT  
## [324] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [341] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [358] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [375] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [392] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [409] ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT ME3 CYT ME3 ME3  
## [426] ME3 CYT CYT CYT CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT ME3 ME3 CYT ME3  
## [443] CYT CYT ME3 ME3 CYT ME3 CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [460] CYT CYT CYT CYT CYT CYT CYT CYT ME3 ME3 CYT CYT ME3 ME3 CYT ME3 CYT  
## [477] CYT ME3 ME3 CYT CYT CYT CYT ME3 CYT CYT ME3 CYT ME3 CYT ME3 CYT CYT  
## [494] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [511] CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [528] CYT CYT ME3 ME3 CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT CYT  
## [545] CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT ME3 CYT CYT CYT CYT CYT CYT  
## [562] CYT CYT CYT CYT CYT ME3 CYT CYT ME3 ME3 ME3 CYT CYT CYT CYT ME3 CYT  
## [579] CYT ME3 ME3 ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3 ME3 ME3 ME3 CYT ME3 ME3  
## [596] ME3 CYT CYT CYT ME3 ME3 CYT ME3 ME3 ME3 CYT CYT ME3 ME3 ME3 ME3 ME3  
## [613] ME3 CYT ME3 CYT CYT ME3 CYT CYT CYT CYT CYT CYT CYT CYT  
## Levels: CYT ERL EXC ME1 ME2 ME3 MIT NUC POX VAC

# confusion matrix  
cm.m3 <- table(lda.m3.p$class, NewYeastData[,c(8)])

\***Does the number of predictor variables for LDA make a difference? Try for a range of models using differing numbers of predictor variables.** Trying different number of predictor variable for LDA does make a difference. After trying for 2, 4 and all predictor variable, it can be concluded that, for 2 pedictor variable the accuracy was more that that of 4 or all predictor variable. The 2 peditor just misplaced around 39 of 626, which is less when compared to other predictors.

\***What determines the number of linear discriminants in LDA.** A linear discriminant is a line that separates (i.e. discriminates) between two classes. For two or more than a linear combination of features that characterizes or separates two or  
more classes of objects or events.A predictor variable is a variable used in regression to predict another variable. Thus we can say that the no. of discriminants depends on difference in predictor values.

\***Does scaling, normalization or leaving the data unscaled make a difference for LDA?** The yeast data looks properly mixed and also doesnt seem to be requiring scaling or shuffling as the columns range from 0.00 to 1.00. The data has to be normalized as without normalization there was infinity, not a number and or applicable error.