Autism Spectrum Disorder Screening

The goal of the Autism Screening and Assessment Clinic is to provide identification of Autism Spectrum Disorder (ASD) to inform intensive behavioral treatment, while addressing specific skill deficits and enhancing community inclusion.

Objective is to predict the likelihood of a person having autism using survey and demographic variables. The target variable is Class_ASD. It is a classification problem. Number of Instances (records in the data set): 704 (rows) Number of Attributes (fields within each record): 21 (columns)

I divided the provided data into scaled and unscaled categories for this dataset using PCA, a feature engineering technique, and I tested each category's performance. Prior to performing PCA, I first removed the target column. Once the PCA was scaled, two graphs were drawn, with the first principle component explaining 4.9% of the variance and the second principle component explaining 2.6%. First principle component accounts for 89.6% of the variance in the unscaled PCA plot, while second principle component accounts for 6.5% of the variance. The overall variance was 96.1%. We can conclude that unscaled PCA perform better than scaled PCA at reducing the dimensions of the data.

loading required libraries

```
library('dplyr')
```

```
## Warning: package 'dplyr' was built under R version 4.2.2
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library('tidyr')
```

```
## Warning: package 'tidyr' was built under R version 4.2.2
```

```
library('ggplot2')
```

```
## Warning: package 'ggplot2' was built under R version 4.2.2
```

```
library('caret')
```

```
## Warning: package 'caret' was built under R version 4.2.2
```

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

```
library('e1071')
```

```
## Warning: package 'e1071' was built under R version 4.2.2
```

```
library('rpart')
library('neuralnet')
```

```
## Warning: package 'neuralnet' was built under R version 4.2.2
```

```
##
## Attaching package: 'neuralnet'
```

```
## The following object is masked from 'package:dplyr':
##
##      compute
```

```
library('caretEnsemble')
```

```
## Warning: package 'caretEnsemble' was built under R version 4.2.2
```

```
##
## Attaching package: 'caretEnsemble'
```

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

Data import

```
# reading the autism dataset
autism_data <- read.csv("/Users/hp/Desktop/DA5030/Gayathri/Project/autism_screening.csv")
```

exploratory data plots -

Visualizing datasets using head(), dim(), str(), summary(), length(), colsums() selecting the columns-selectif() 1. table(), hist(), ggplots after the feature selection 2. checking unique values - unique() 3. correlation/collinearity/chi-squared analysis - cor(), 4. evaluation of distribution - barplots, histograms.

```
# visualising first few rows of the dataset
# checking the dimension of the dataset
# the datset has 704 rows and 21 columns
head(autism_data)
```

```
##   A1_Score A2_Score A3_Score A4_Score A5_Score A6_Score A7_Score A8_Score
## 1        1        1        1        1        0        0        1        1
## 2        1        1        0        1        0        0        0        1
## 3        1        1        0        1        1        0        1        1
## 4        1        1        0        1        0        0        1        1
## 5        1        0        0        0        0        0        0        1
## 6        1        1        1        1        1        0        1        1
##   A9_Score A10_Score age gender      ethnicity jundice austim contry_of_res
## 1        0         0  26      f White-European      no     no United States
## 2        0         1  24      m         Latino      no    yes        Brazil
## 3        1         1  27      m         Latino     yes    yes         Spain
## 4        0         1  35      f White-European      no    yes United States
## 5        0         0  40      f              ?      no     no         Egypt
## 6        1         1  36      m         Others     yes     no United States
##   used_app_before result  age_desc relation Class.ASD
## 1              no      6 18 and more     Self        NO
## 2              no      5 18 and more     Self        NO
## 3              no      8 18 and more   Parent       YES
## 4              no      6 18 and more     Self        NO
## 5              no      2 18 and more        ?        NO
## 6              no      9 18 and more     Self       YES
```

```
dim(autism_data)
```

```
## [1] 704  21
```

```
str(autism_data)
```

```
## 'data.frame':    704 obs. of  21 variables:
##  $ A1_Score       : int  1 1 1 1 1 1 0 1 1 1 ...
##  $ A2_Score       : int  1 1 1 1 0 1 1 1 1 1 ...
##  $ A3_Score       : int  1 0 0 0 0 1 0 1 0 1 ...
##  $ A4_Score       : int  1 1 1 1 0 1 0 1 0 1 ...
##  $ A5_Score       : int  0 0 1 0 0 1 0 0 1 0 ...
##  $ A6_Score       : int  0 0 0 0 0 0 0 0 0 1 ...
##  $ A7_Score       : int  1 0 1 1 0 1 0 0 0 1 ...
##  $ A8_Score       : int  1 1 1 1 1 1 1 0 1 1 ...
##  $ A9_Score       : int  0 0 1 0 0 1 0 1 1 1 ...
##  $ A10_Score      : int  0 1 1 1 0 1 0 0 1 0 ...
##  $ age            : num  26 24 27 35 40 36 17 64 29 17 ...
##  $ gender         : chr  "f" "m" "m" "f" ...
##  $ ethnicity      : chr  "White-European" "Latino" "Latino" "White-European" ...
##  $ jundice        : chr  "no" "no" "yes" "no" ...
##  $ austim         : chr  "no" "yes" "yes" "yes" ...
##  $ contry_of_res  : chr  "United States" "Brazil" "Spain" "United States" ...
##  $ used_app_before: chr  "no" "no" "no" "no" ...
##  $ result         : num  6 5 8 6 2 9 2 5 6 8 ...
```

```
## $ age_desc        : chr  "18 and more" "18 and more" "18 and more" "18 and more" ...
## $ relation        : chr  "Self" "Self" "Parent" "Self" ...
## $ Class.ASD        : chr  "NO" "NO" "YES" "NO" ...
```

```
# summary of all the variables
summary(autism_data)
```

```
##    A1_Score          A2_Score          A3_Score          A4_Score
## Min.   :0.0000   Min.   :0.0000   Min.   :0.0000   Min.    :0.0000
## 1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000
## Median :1.0000   Median :0.0000   Median :0.0000   Median :0.0000
## Mean   :0.7216   Mean   :0.4531   Mean   :0.4574   Mean    :0.4957
## 3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:1.0000
## Max.   :1.0000   Max.   :1.0000   Max.   :1.0000   Max.    :1.0000
##
##    A5_Score          A6_Score          A7_Score          A8_Score
## Min.   :0.0000   Min.   :0.0000   Min.   :0.0000   Min.    :0.0000
## 1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000
## Median :0.0000   Median :0.0000   Median :0.0000   Median :1.0000
## Mean   :0.4986   Mean   :0.2841   Mean   :0.4176   Mean    :0.6491
## 3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:1.0000
## Max.   :1.0000   Max.   :1.0000   Max.   :1.0000   Max.    :1.0000
##
##    A9_Score          A10_Score            age             gender
## Min.   :0.0000   Min.   :0.0000   Min.    : 17.0   Length:704
## 1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.: 21.0   Class :character
## Median :0.0000   Median :1.0000   Median : 27.0   Mode  :character
## Mean   :0.3239   Mean   :0.5739   Mean    : 29.7
## 3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.: 35.0
## Max.   :1.0000   Max.   :1.0000   Max.    :383.0
##                                   NA's    :2
##   ethnicity          jundice            austim           contry_of_res
## Length:704        Length:704        Length:704        Length:704
## Class :character  Class :character  Class :character  Class :character
## Mode  :character  Mode  :character  Mode  :character  Mode  :character
##
##
##
##
## used_app_before       result          age_desc           relation
## Length:704        Min.    : 0.000  Length:704        Length:704
## Class :character  1st Qu.: 3.000  Class :character  Class :character
## Mode  :character  Median : 4.000  Mode  :character  Mode  :character
##                   Mean    : 4.875
##                   3rd Qu.: 7.000
##                   Max.    :10.000
##
##   Class.ASD
## Length:704
## Class :character
## Mode  :character
##
##
##
```

```
##
```

remove the row with age = 383,since the max value is 383

```
rownames(autism_data[autism_data$age == 383,])
```

```
## [1] "53"    "NA"    "NA.1"
```

```
autism_data <- autism_data[-53,]
autism_data <- as.data.frame(autism_data)
max(autism_data$age, na.rm = TRUE)
```

```
## [1] 64
```

```
# maximum value for age is now 64
```

```
# numerical columns count
length(select_if(autism_data,is.numeric))
```

```
## [1] 12
```

```
# categorical columns count
length(select_if(autism_data,is.character))
```

```
## [1] 9
```

checking for missing values in the dataset

```
colSums(is.na(autism_data))
```

```
##         A1_Score         A2_Score        A3_Score         A4_Score         A5_Score
##                0                0               0                0                0
##         A6_Score         A7_Score        A8_Score         A9_Score        A10_Score
##                0                0               0                0                0
##              age           gender       ethnicity          jundice           austim
##                2                0               0                0                0
##    contry_of_res used_app_before          result         age_desc         relation
##                0                0               0                0                0
##        Class.ASD
##                0
```

```
# there are 2 missing values in the age column
```

```
# checking for the distribution of age column
hist(autism_data$age, main = 'Histogram of age', xlab = "Age")
```

Histogram of age
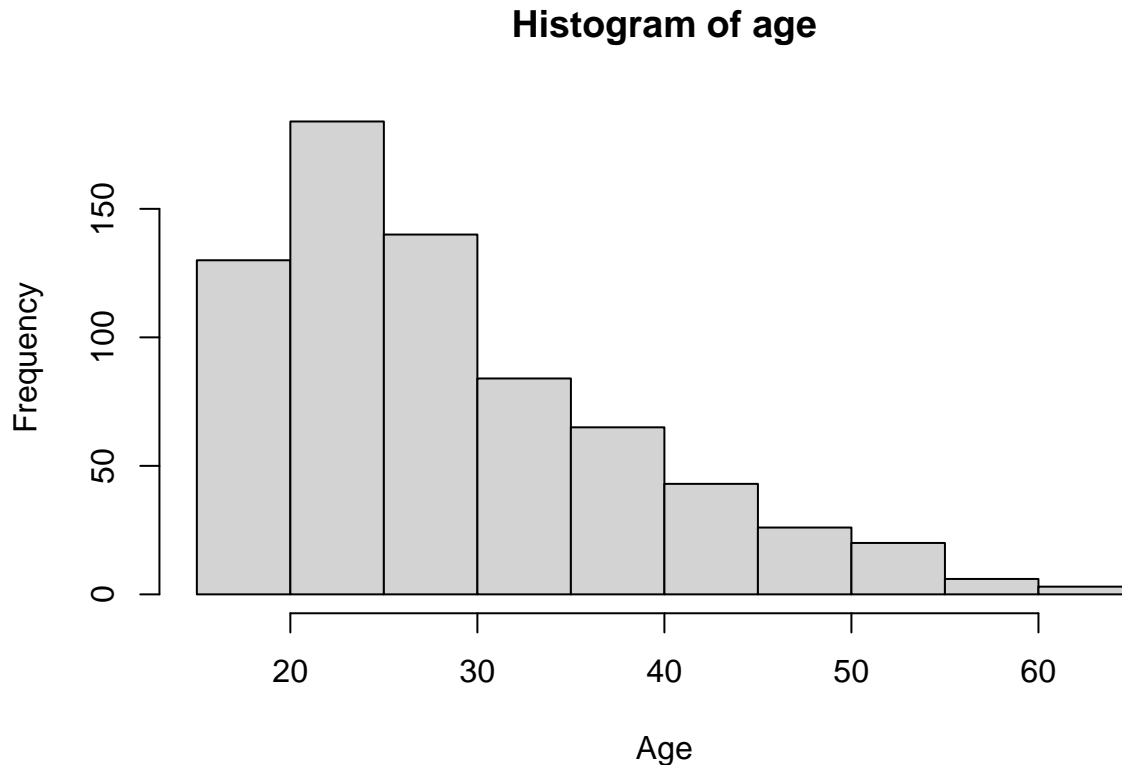

```
# Because the age distribution is positively skewed, we will use the median to impute the values.

autism_data$age[is.na(autism_data$age)] <- median(autism_data$age, na.rm = TRUE)
sum(is.na(autism_data$age))
```

```
## [1] 0
```

```
# selecting the continous columns
# selecting the categorical columns
# checking for count of unique values in categorical variables
numerical_aut_data <- select_if(autism_data, is.numeric) # Check if an Object is of Type Numeric
catgl_autism_data <- select_if(autism_data, is.character) # Check if character
catgl_autism_data %>% summarise_all(n_distinct)
```

```
##   gender ethnicity jundice austim contry_of_res used_app_before age_desc
## 1      2        12       2      2            67               2        1
##   relation Class.ASD
## 1        6         2
```

```r
# There are 9 columns with unique count values:
# gender - 2, etnicity - 12, jundice - 2, autism - 2, country_of_res - 67, used_app_before - 2, age_des

# Age desc can be removed because it only has one unique value and is therefore useless.
catgl_autism_data <- catgl_autism_data[,-7]

# further checking unique values in each column
unique(catgl_autism_data$gender)
```

```
## [1] "f" "m"
```

```r
# There is a "?" in the ethnicity column, which is an invalid value, and "Other" and "others" are treat
unique(catgl_autism_data$ethnicity)
```

```
##  [1] "White-European"  "Latino"          "?"               "Others"
##  [5] "Black"           "Asian"           "Middle Eastern " "Pasifika"
##  [9] "South Asian"     "Hispanic"        "Turkish"         "others"
```

```r
# replacing '?' and 'other' with 'Others'
catgl_autism_data$ethnicity[catgl_autism_data$ethnicity == "?"] <- "Others"
catgl_autism_data$ethnicity[catgl_autism_data$ethnicity == "others"] <- "Others"
unique(catgl_autism_data$ethnicity)
```

```
##  [1] "White-European"  "Latino"          "Others"          "Black"
##  [5] "Asian"           "Middle Eastern " "Pasifika"        "South Asian"
##  [9] "Hispanic"        "Turkish"
```

```r
unique(catgl_autism_data$jundice)
```

```
## [1] "no"  "yes"
```

```r
unique(catgl_autism_data$austim)
```

```
## [1] "no"  "yes"
```

```r
unique(catgl_autism_data$contry_of_res)
```

```
##  [1] "United States"        "Brazil"          "Spain"
##  [4] "Egypt"                "New Zealand"      "Bahamas"
##  [7] "Burundi"              "Austria"          "Argentina"
## [10] "Jordan"               "Ireland"          "United Arab Emirates"
## [13] "Afghanistan"          "Lebanon"          "United Kingdom"
## [16] "South Africa"         "Italy"            "Pakistan"
## [19] "Bangladesh"           "Chile"            "France"
## [22] "China"                "Australia"        "Canada"
## [25] "Saudi Arabia"         "Netherlands"      "Romania"
## [28] "Sweden"               "Tonga"            "Oman"
## [31] "India"                "Philippines"      "Sri Lanka"
## [34] "Sierra Leone"         "Ethiopia"         "Viet Nam"
```

```
## [37] "Iran"              "Costa Rica"          "Germany"
## [40] "Mexico"            "Russia"              "Armenia"
## [43] "Iceland"           "Nicaragua"           "Hong Kong"
## [46] "Japan"             "Ukraine"             "Kazakhstan"
## [49] "AmericanSamoa"     "Uruguay"             "Serbia"
## [52] "Portugal"          "Malaysia"            "Ecuador"
## [55] "Niger"             "Belgium"             "Bolivia"
## [58] "Aruba"             "Finland"             "Turkey"
## [61] "Nepal"             "Indonesia"           "Angola"
## [64] "Azerbaijan"        "Iraq"                "Czech Republic"
## [67] "Cyprus"
```

```
unique(catgl_autism_data$used_app_before)
```

```
## [1] "no"  "yes"
```

```
unique(catgl_autism_data$relation)
```

```
## [1] "Self"               "Parent"
## [3] "?"                  "Health care professional"
## [5] "Relative"           "Others"
```

```
# relation column also has invalid value which is "?"
# replacing this "?" with "Others"
catgl_autism_data$relation[catgl_autism_data$relation == "?"] <- "Others"
unique(catgl_autism_data$relation)
```

```
## [1] "Self"               "Parent"
## [3] "Others"             "Health care professional"
## [5] "Relative"
```

```
unique(catgl_autism_data$Class.ASD)
```

```
## [1] "NO"  "YES"
```

```
# checking for the count of Autism Spectrum Disorder (ASD)
table(catgl_autism_data$Class.ASD)
```

```
##
##  NO YES
## 514 189
```

```
barplot(table(catgl_autism_data$Class.ASD), main = "Histogram for ASD", ylab = "Frequency")
```

Histogram for ASD
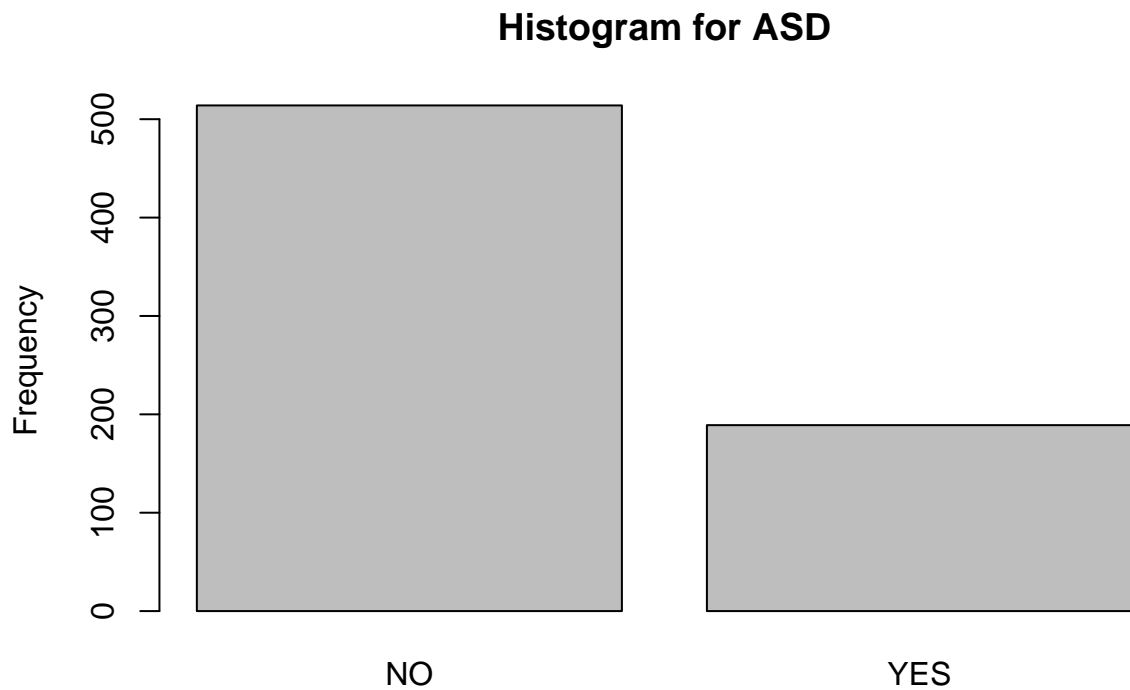
there are 189 ASD patients and 514 normal patients

```
# checking the distribution of male and female in the data
table(catgl_autism_data$gender)
```

```
##
##   f   m
## 336 367
```

there are 336 females and 367 males

```
# plotting he histogram
barplot(table(catgl_autism_data$gender), main = "Histogram for Gender", ylab = "Frequency")
```

Histogram for Gender


```
# plotting distribution of ASD with ethnicity
table <- with(catgl_autism_data, table(ethnicity, Class.ASD))
ggplot(as.data.frame(table), aes(factor(Class.ASD), Freq, fill = ethnicity)) +
  geom_col(position = 'dodge') + xlab("ASD") + ylab("Frequency")
```
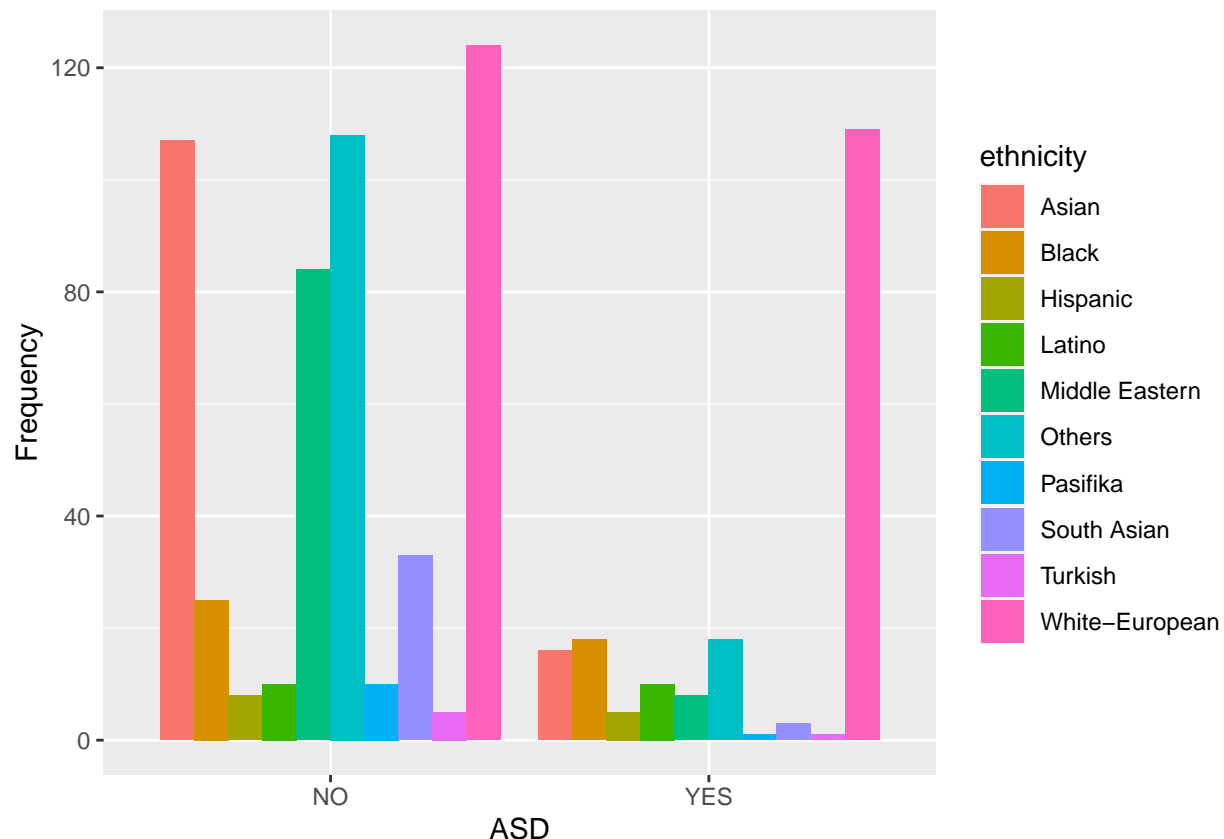
We can see from the plot that White Europeans and Pacificans have the most ASD patients, while Turkish and Pacificanos have the least. Turkish people, on the other hand, have the fewest normal people, while White Europeans have the greatest proportion of normal people.

```r
# label encoding the binary categorical variables
catgl_autism_data$gender <- ifelse(catgl_autism_data$gender == "m", 1, 0)
catgl_autism_data$jundice <- ifelse(catgl_autism_data$jundice == "yes", 1, 0)
catgl_autism_data$austim <- ifelse(catgl_autism_data$austim == "yes", 1, 0)
catgl_autism_data$used_app_before <- ifelse(catgl_autism_data$used_app_before == "yes", 1, 0)
catgl_autism_data$Class.ASD <- ifelse(catgl_autism_data$Class.ASD == "YES", 1, 0)
```

```r
# One hot encoding for rest of the categorical variables
dummy <- dummyVars(" ~ .", data = catgl_autism_data, sep = "_")
catgl_autism_data <- data.frame(predict(dummy, newdata = catgl_autism_data))
head(catgl_autism_data)
```

```
##   gender ethnicityAsian ethnicityBlack ethnicityHispanic ethnicityLatino
## 1      0              0              0                 0               0
## 2      1              0              0                 0               1
## 3      1              0              0                 0               1
## 4      0              0              0                 0               0
## 5      0              0              0                 0               0
## 6      1              0              0                 0               0
##   ethnicityMiddle.Eastern. ethnicityOthers ethnicityPasifika
## 1                        0               0                 0
## 2                        0               0                 0
```

```
## 3                          0                0                0
## 4                          0                0                0
## 5                          0                1                0
## 6                          0                1                0
##   ethnicitySouth.Asian ethnicityTurkish ethnicityWhite.European jundice austim
## 1                    0                0                       1       0      0
## 2                    0                0                       0       0      1
## 3                    0                0                       0       1      1
## 4                    0                0                       1       0      1
## 5                    0                0                       0       0      0
## 6                    0                0                       0       1      0
##   contry_of_resAfghanistan contry_of_resAmericanSamoa contry_of_resAngola
## 1                        0                          0                   0
## 2                        0                          0                   0
## 3                        0                          0                   0
## 4                        0                          0                   0
## 5                        0                          0                   0
## 6                        0                          0                   0
##   contry_of_resArgentina contry_of_resArmenia contry_of_resAruba
## 1                      0                    0                  0
## 2                      0                    0                  0
## 3                      0                    0                  0
## 4                      0                    0                  0
## 5                      0                    0                  0
## 6                      0                    0                  0
##   contry_of_resAustralia contry_of_resAustria contry_of_resAzerbaijan
## 1                      0                    0                       0
## 2                      0                    0                       0
## 3                      0                    0                       0
## 4                      0                    0                       0
## 5                      0                    0                       0
## 6                      0                    0                       0
##   contry_of_resBahamas contry_of_resBangladesh contry_of_resBelgium
## 1                    0                        0                    0
## 2                    0                        0                    0
## 3                    0                        0                    0
## 4                    0                        0                    0
## 5                    0                        0                    0
## 6                    0                        0                    0
##   contry_of_resBolivia contry_of_resBrazil contry_of_resBurundi
## 1                    0                   0                    0
## 2                    0                   1                    0
## 3                    0                   0                    0
## 4                    0                   0                    0
## 5                    0                   0                    0
## 6                    0                   0                    0
##   contry_of_resCanada contry_of_resChile contry_of_resChina
## 1                   0                  0                  0
## 2                   0                  0                  0
## 3                   0                  0                  0
## 4                   0                  0                  0
## 5                   0                  0                  0
## 6                   0                  0                  0
##   contry_of_resCosta.Rica contry_of_resCyprus contry_of_resCzech.Republic
```

```
## 1                    0                0                      0
## 2                    0                0                      0
## 3                    0                0                      0
## 4                    0                0                      0
## 5                    0                0                      0
## 6                    0                0                      0
##   contry_of_resEcuador contry_of_resEgypt contry_of_resEthiopia
## 1                    0                  0                     0
## 2                    0                  0                     0
## 3                    0                  0                     0
## 4                    0                  0                     0
## 5                    0                  1                     0
## 6                    0                  0                     0
##   contry_of_resFinland contry_of_resFrance contry_of_resGermany
## 1                    0                   0                    0
## 2                    0                   0                    0
## 3                    0                   0                    0
## 4                    0                   0                    0
## 5                    0                   0                    0
## 6                    0                   0                    0
##   contry_of_resHong.Kong contry_of_resIceland contry_of_resIndia
## 1                      0                     0                  0
## 2                      0                     0                  0
## 3                      0                     0                  0
## 4                      0                     0                  0
## 5                      0                     0                  0
## 6                      0                     0                  0
##   contry_of_resIndonesia contry_of_resIran contry_of_resIraq
## 1                      0                 0                 0
## 2                      0                 0                 0
## 3                      0                 0                 0
## 4                      0                 0                 0
## 5                      0                 0                 0
## 6                      0                 0                 0
##   contry_of_resIreland contry_of_resItaly contry_of_resJapan
## 1                    0                  0                  0
## 2                    0                  0                  0
## 3                    0                  0                  0
## 4                    0                  0                  0
## 5                    0                  0                  0
## 6                    0                  0                  0
##   contry_of_resJordan contry_of_resKazakhstan contry_of_resLebanon
## 1                   0                       0                    0
## 2                   0                       0                    0
## 3                   0                       0                    0
## 4                   0                       0                    0
## 5                   0                       0                    0
## 6                   0                       0                    0
##   contry_of_resMalaysia contry_of_resMexico contry_of_resNepal
## 1                     0                   0                  0
## 2                     0                   0                  0
## 3                     0                   0                  0
## 4                     0                   0                  0
## 5                     0                   0                  0
```

```
## 6                    0                  0                    0
##   contry_of_resNetherlands contry_of_resNew.Zealand contry_of_resNicaragua
## 1                         0                        0                      0
## 2                         0                        0                      0
## 3                         0                        0                      0
## 4                         0                        0                      0
## 5                         0                        0                      0
## 6                         0                        0                      0
##   contry_of_resNiger contry_of_resOman contry_of_resPakistan
## 1                  0                 0                      0
## 2                  0                 0                      0
## 3                  0                 0                      0
## 4                  0                 0                      0
## 5                  0                 0                      0
## 6                  0                 0                      0
##   contry_of_resPhilippines contry_of_resPortugal contry_of_resRomania
## 1                         0                     0                    0
## 2                         0                     0                    0
## 3                         0                     0                    0
## 4                         0                     0                    0
## 5                         0                     0                    0
## 6                         0                     0                    0
##   contry_of_resRussia contry_of_resSaudi.Arabia contry_of_resSerbia
## 1                   0                         0                   0
## 2                   0                         0                   0
## 3                   0                         0                   0
## 4                   0                         0                   0
## 5                   0                         0                   0
## 6                   0                         0                   0
##   contry_of_resSierra.Leone contry_of_resSouth.Africa contry_of_resSpain
## 1                         0                         0                  0
## 2                         0                         0                  0
## 3                         0                         0                  1
## 4                         0                         0                  0
## 5                         0                         0                  0
## 6                         0                         0                  0
##   contry_of_resSri.Lanka contry_of_resSweden contry_of_resTonga
## 1                      0                   0                  0
## 2                      0                   0                  0
## 3                      0                   0                  0
## 4                      0                   0                  0
## 5                      0                   0                  0
## 6                      0                   0                  0
##   contry_of_resTurkey contry_of_resUkraine contry_of_resUnited.Arab.Emirates
## 1                   0                    0                                  0
## 2                   0                    0                                  0
## 3                   0                    0                                  0
## 4                   0                    0                                  0
## 5                   0                    0                                  0
## 6                   0                    0                                  0
##   contry_of_resUnited.Kingdom contry_of_resUnited.States contry_of_resUruguay
## 1                           0                          1                    0
## 2                           0                          0                    0
## 3                           0                          0                    0
```

```
## 4                                  0                    1                      0
## 5                                  0                    0                      0
## 6                                  0                    1                      0
##   contry_of_resViet.Nam used_app_before relationHealth.care.professional
## 1                     0               0                                0
## 2                     0               0                                0
## 3                     0               0                                0
## 4                     0               0                                0
## 5                     0               0                                0
## 6                     0               0                                0
##   relationOthers relationParent relationRelative relationSelf Class.ASD
## 1              0              0                0            1         0
## 2              0              0                0            1         0
## 3              0              1                0            0         1
## 4              0              0                0            1         0
## 5              1              0                0            0         0
## 6              0              0                0            1         1
```

```r
# finding correaltion between variables, using only numerical variables
num_cor_mat <- cor(cbind(numerical_aut_data, catgl_autism_data$Class.ASD))
num_cor_mat
```

```
##                                A1_Score    A2_Score   A3_Score    A4_Score
## A1_Score                    1.000000000  0.01235387 0.07497267 0.128815732
## A2_Score                    0.012353866  1.00000000 0.22299723 0.157917566
## A3_Score                    0.074972671  0.22299723 1.00000000 0.411962183
## A4_Score                    0.128815732  0.15791757 0.41196218 1.000000000
## A5_Score                    0.170417460  0.15272770 0.26397007 0.305830076
## A6_Score                    0.110817604  0.18520946 0.26826005 0.294552941
## A7_Score                    0.218457514 -0.04291160 0.07719548 0.150223778
## A8_Score                    0.149078792  0.03371085 0.01602520 0.006711761
## A9_Score                    0.146153846  0.20471525 0.31450483 0.327036547
## A10_Score                   0.119585715  0.06748434 0.16719877 0.209678422
## age                         0.008118375  0.08257822 0.09855214 0.107580359
## result                      0.399616880  0.39143303 0.55160565 0.585248791
## catgl_autism_data$Class.ASD 0.298322602  0.31086167 0.44066179 0.469541685
##                                A5_Score   A6_Score     A7_Score     A8_Score
## A1_Score                    0.170417460 0.11081760  0.218457514  0.149078792
## A2_Score                    0.152727704 0.18520946 -0.042911599  0.033710848
## A3_Score                    0.263970068 0.26826005  0.077195477  0.016025203
## A4_Score                    0.305830076 0.29455294  0.150223778  0.006711761
## A5_Score                    1.000000000 0.39184869  0.237677618  0.100360028
## A6_Score                    0.391848692 1.00000000  0.174868958  0.099062640
## A7_Score                    0.237677618 0.17486896  1.000000000  0.083918040
## A8_Score                    0.100360028 0.09906264  0.083918040  1.000000000
## A9_Score                    0.396015052 0.47910011  0.188806572  0.100560301
## A10_Score                   0.266358390 0.29375943  0.251077229  0.098761041
## age                         0.009127665 0.09221083 -0.001250767 -0.064874480
## result                      0.639051620 0.62987828  0.453988107  0.321994223
## catgl_autism_data$Class.ASD 0.536664716 0.59186965  0.350969527  0.236361328
##                              A9_Score  A10_Score         age     result
## A1_Score                    0.1461538 0.11958571 0.008118375 0.39961688
## A2_Score                    0.2047153 0.06748434 0.082578217 0.39143303
## A3_Score                    0.3145048 0.16719877 0.098552145 0.55160565
```

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```
## A4_Score                      0.3270365 0.20967842  0.107580359 0.58524879
## A5_Score                      0.3960151 0.26635839  0.009127665 0.63905162
## A6_Score                      0.4791001 0.29375943  0.092210833 0.62987828
## A7_Score                      0.1888066 0.25107723 -0.001250767 0.45398811
## A8_Score                      0.1005603 0.09876104 -0.064874480 0.32199422
## A9_Score                      1.0000000 0.28256438  0.128297891 0.66103481
## A10_Score                     0.2825644 1.00000000  0.046652646 0.53607543
## age                           0.1282979 0.04665265  1.000000000 0.09825975
## result                        0.6610348 0.53607543  0.098259748 1.00000000
## catgl_autism_data$Class.ASD   0.6353617 0.38538689  0.132590609 0.82172939
##                               catgl_autism_data$Class.ASD
## A1_Score                                        0.2983226
## A2_Score                                        0.3108617
## A3_Score                                        0.4406618
## A4_Score                                        0.4695417
## A5_Score                                        0.5366647
## A6_Score                                        0.5918696
## A7_Score                                        0.3509695
## A8_Score                                        0.2363613
## A9_Score                                        0.6353617
## A10_Score                                       0.3853869
## age                                             0.1325906
## result                                          0.8217294
## catgl_autism_data$Class.ASD                     1.0000000
```

The variable result exhibits a strong correlation with the intended variable, Class.ASD, of 0.8217294. None of the other variables exhibit strong correlations between one another.

```
# using only encoded categorical variables
cat_corr<- cor(catgl_autism_data)
cat_corr
```

```
##                               gender ethnicityAsian ethnicityBlack
## gender                    1.000000000    0.058373388  -0.0290918945
## ethnicityAsian            0.058373388    1.000000000  -0.1175440956
## ethnicityBlack           -0.029091894   -0.117544096   1.0000000000
## ethnicityHispanic         0.089060712   -0.063209985  -0.0350355864
## ethnicityLatino           0.026704382   -0.078803082  -0.0436784186
## ethnicityMiddle.Eastern.  0.050422601   -0.178694781  -0.0990456870
## ethnicityOthers          -0.020626540   -0.215196857  -0.1192778016
## ethnicityPasifika         0.005907810   -0.058060645  -0.0321814461
## ethnicitySouth.Asian     -0.036093138   -0.106985986  -0.0592994402
## ethnicityTurkish          0.026861802   -0.042726547  -0.0236821701
## ethnicityWhite.European  -0.076450264   -0.324240746  -0.1797178819
## jundice                  -0.019347383   -0.063833052  -0.0243507262
## austim                   -0.089127192   -0.121810618  -0.0100110693
## contry_of_resAfghanistan  0.004510164   -0.007629473  -0.0350355864
## contry_of_resAmericanSamoa 0.051108437  -0.024597703   0.0978148879
## contry_of_resAngola       0.036113373   -0.017380810  -0.0096337130
```

```
## contry_of_resArgentina        -0.002357681   -0.024597703   -0.0136338418
## contry_of_resArmenia           0.051108437   -0.024597703   -0.0136338418
## contry_of_resAruba             0.036113373    0.081958289   -0.0096337130
## contry_of_resAustralia        -0.031048802   -0.092033745   -0.0510118171
## contry_of_resAustria          -0.003339031   -0.034836135   -0.0193087281
## contry_of_resAzerbaijan        0.036113373   -0.017380810   -0.0096337130
## contry_of_resBahamas          -0.002357681    0.045695732   -0.0136338418
## contry_of_resBangladesh       -0.024732656    0.027287910   -0.0167099006
## contry_of_resBelgium           0.062639490   -0.030147421   -0.0167099006
## contry_of_resBolivia          -0.039445261   -0.017380810   -0.0096337130
## contry_of_resBrazil            0.007638924   -0.052442100    0.0765362181
## contry_of_resBurundi          -0.039445261   -0.017380810   -0.0096337130
## contry_of_resCanada           -0.055784116   -0.042088137    0.0855450792
## contry_of_resChile            -0.039445261   -0.017380810   -0.0096337130
## contry_of_resChina            -0.039445261    0.081958289   -0.0096337130
## contry_of_resCosta.Rica        0.036113373   -0.017380810   -0.0096337130
## contry_of_resCyprus           -0.039445261   -0.017380810   -0.0096337130
## contry_of_resCzech.Republic   -0.039445261   -0.017380810   -0.0096337130
## contry_of_resEcuador           0.036113373   -0.017380810   -0.0096337130
## contry_of_resEgypt            -0.024732656   -0.030147421   -0.0167099006
## contry_of_resEthiopia          0.051108437   -0.024597703    0.2092636176
## contry_of_resFinland           0.036113373   -0.017380810   -0.0096337130
## contry_of_resFrance           -0.062929600   -0.058060645    0.3504579890
## contry_of_resGermany          -0.003339031   -0.034836135   -0.0193087281
## contry_of_resHong.Kong        -0.039445261   -0.017380810   -0.0096337130
## contry_of_resIceland          -0.002357681    0.045695732   -0.0136338418
## contry_of_resIndia             0.050963760    0.467022997   -0.0921105928
## contry_of_resIndonesia         0.036113373    0.081958289   -0.0096337130
## contry_of_resIran              0.009914024   -0.046183087   -0.0255980369
## contry_of_resIraq              0.036113373   -0.017380810   -0.0096337130
## contry_of_resIreland           0.013207943   -0.038975873   -0.0216032729
## contry_of_resItaly            -0.054567121   -0.038975873   -0.0216032729
## contry_of_resJapan             0.036113373   -0.017380810   -0.0096337130
## contry_of_resJordan           -0.006114175   -0.123263805   -0.0683217952
## contry_of_resKazakhstan        0.018953417   -0.030147421   -0.0167099006
## contry_of_resLebanon           0.036113373   -0.017380810   -0.0096337130
## contry_of_resMalaysia         -0.088454653    0.139235760   -0.0216032729
## contry_of_resMexico            0.048960738   -0.049407303    0.0285792520
## contry_of_resNepal             0.036113373   -0.017380810    0.1478662925
## contry_of_resNetherlands       0.018746115   -0.055318697   -0.0306616585
## contry_of_resNew.Zealand       0.055921506    0.141508964   -0.0353901858
## contry_of_resNicaragua         0.036113373   -0.017380810   -0.0096337130
## contry_of_resNiger             0.036113373   -0.017380810    0.1478662925
## contry_of_resOman              0.036113373   -0.017380810   -0.0096337130
## contry_of_resPakistan          0.018953417    0.027287910   -0.0167099006
## contry_of_resPhilippines      -0.041199333    0.114491932   -0.0193087281
## contry_of_resPortugal          0.036113373   -0.017380810   -0.0096337130
## contry_of_resRomania          -0.068418729   -0.030147421   -0.0167099006
## contry_of_resRussia           -0.018767288   -0.046183087   -0.0255980369
## contry_of_resSaudi.Arabia      0.034521271   -0.034836135   -0.0193087281
## contry_of_resSerbia           -0.039445261   -0.017380810   -0.0096337130
## contry_of_resSierra.Leone      0.036113373    0.081958289   -0.0096337130
## contry_of_resSouth.Africa     -0.055823798   -0.024597703   -0.0136338418
## contry_of_resSpain            -0.024732656   -0.030147421    0.1654150629
```

```
## contry_of_resSri.Lanka                0.014091589    0.282740550   -0.0363845214
## contry_of_resSweden                   -0.055823798   -0.024597703   -0.0136338418
## contry_of_resTonga                    -0.039445261   -0.017380810   -0.0096337130
## contry_of_resTurkey                   -0.039445261   -0.017380810   -0.0096337130
## contry_of_resUkraine                  -0.055823798   -0.024597703   -0.0136338418
## contry_of_resUnited.Arab.Emirates     -0.024911034   -0.144012585   -0.0002893568
## contry_of_resUnited.Kingdom           -0.001802933   -0.137532485   -0.0134915492
## contry_of_resUnited.States            -0.007687142   -0.160761581    0.0499100954
## contry_of_resUruguay                   0.036113373   -0.017380810   -0.0096337130
## contry_of_resViet.Nam                 -0.020679589    0.139235760   -0.0216032729
## used_app_before                       -0.027801578   -0.031782152    0.0121900578
## relationHealth.care.professional       0.034521271    0.014939887    0.0596100851
## relationOthers                        -0.009822501   -0.176815547   -0.1039450001
## relationParent                        -0.012213987   -0.025465003    0.1372197700
## relationRelative                       0.092944243   -0.074646866    0.0390761242
## relationSelf                          -0.032423111    0.186705450   -0.0253106894
## Class.ASD                             -0.081361471   -0.144133867    0.0862167876
##                                       ethnicityHispanic ethnicityLatino
## gender                                    0.089060712      0.026704382
## ethnicityAsian                           -0.063209985     -0.078803082
## ethnicityBlack                           -0.035035586     -0.043678419
## ethnicityHispanic                         1.000000000     -0.023488310
## ethnicityLatino                          -0.023488310      1.000000000
## ethnicityMiddle.Eastern.                 -0.053262364     -0.066401510
## ethnicityOthers                          -0.064142295     -0.079965381
## ethnicityPasifika                        -0.017305750     -0.021574858
## ethnicitySouth.Asian                     -0.031888601     -0.039755112
## ethnicityTurkish                         -0.012735218     -0.015876833
## ethnicityWhite.European                  -0.096644282     -0.120485193
## jundice                                  -0.009793464      0.058579882
## austim                                   -0.021475763      0.137917302
## contry_of_resAfghanistan                 -0.018840580     -0.023488310
## contry_of_resAmericanSamoa              -0.007331674     -0.009140304
## contry_of_resAngola                      -0.005180582     -0.006458566
## contry_of_resArgentina                   -0.007331674     -0.009140304
## contry_of_resArmenia                     -0.007331674     -0.009140304
## contry_of_resAruba                       -0.005180582     -0.006458566
## contry_of_resAustralia                   -0.027431886     -0.034198982
## contry_of_resAustria                     -0.010383375     -0.012944821
## contry_of_resAzerbaijan                  -0.005180582     -0.006458566
## contry_of_resBahamas                     -0.007331674     -0.009140304
## contry_of_resBangladesh                  -0.008985841     -0.011202534
## contry_of_resBelgium                     -0.008985841     -0.011202534
## contry_of_resBolivia                     -0.005180582      0.220560023
## contry_of_resBrazil                      -0.015631068      0.437159555
## contry_of_resBurundi                     -0.005180582     -0.006458566
## contry_of_resCanada                      -0.020267423     -0.025267138
## contry_of_resChile                       -0.005180582      0.220560023
## contry_of_resChina                       -0.005180582     -0.006458566
## contry_of_resCosta.Rica                  -0.005180582      0.220560023
## contry_of_resCyprus                      -0.005180582     -0.006458566
## contry_of_resCzech.Republic              -0.005180582     -0.006458566
## contry_of_resEcuador                     -0.005180582      0.220560023
## contry_of_resEgypt                       -0.008985841     -0.011202534
```

```
## contry_of_resEthiopia                    -0.007331674     -0.009140304
## contry_of_resFinland                      -0.005180582     -0.006458566
## contry_of_resFrance                       -0.017305750     -0.021574858
## contry_of_resGermany                      -0.010383375     -0.012944821
## contry_of_resHong.Kong                    -0.005180582     -0.006458566
## contry_of_resIceland                      -0.007331674     -0.009140304
## contry_of_resIndia                        -0.049532979     -0.061752133
## contry_of_resIndonesia                    -0.005180582     -0.006458566
## contry_of_resIran                         -0.013765485     -0.017161255
## contry_of_resIraq                         -0.005180582     -0.006458566
## contry_of_resIreland                      -0.011617279     -0.014483114
## contry_of_resItaly                        -0.011617279      0.087333175
## contry_of_resJapan                        -0.005180582     -0.006458566
## contry_of_resJordan                       -0.036740422     -0.045803815
## contry_of_resKazakhstan                   -0.008985841     -0.011202534
## contry_of_resLebanon                      -0.005180582     -0.006458566
## contry_of_resMalaysia                     -0.011617279     -0.014483114
## contry_of_resMexico                        0.084819011      0.465638946
## contry_of_resNepal                        -0.005180582     -0.006458566
## contry_of_resNetherlands                  -0.016488476     -0.020555973
## contry_of_resNew.Zealand                  -0.049186747     -0.061320490
## contry_of_resNicaragua                     0.274969367     -0.006458566
## contry_of_resNiger                        -0.005180582     -0.006458566
## contry_of_resOman                         -0.005180582     -0.006458566
## contry_of_resPakistan                     -0.008985841     -0.011202534
## contry_of_resPhilippines                  -0.010383375     -0.012944821
## contry_of_resPortugal                     -0.005180582     -0.006458566
## contry_of_resRomania                      -0.008985841     -0.011202534
## contry_of_resRussia                       -0.013765485     -0.017161255
## contry_of_resSaudi.Arabia                 -0.010383375     -0.012944821
## contry_of_resSerbia                       -0.005180582     -0.006458566
## contry_of_resSierra.Leone                 -0.005180582     -0.006458566
## contry_of_resSouth.Africa                 -0.007331674     -0.009140304
## contry_of_resSpain                        -0.008985841      0.120053818
## contry_of_resSri.Lanka                    -0.019565977     -0.024392654
## contry_of_resSweden                       -0.007331674     -0.009140304
## contry_of_resTonga                        -0.005180582     -0.006458566
## contry_of_resTurkey                       -0.005180582     -0.006458566
## contry_of_resUkraine                      -0.007331674     -0.009140304
## contry_of_resUnited.Arab.Emirates         -0.049877911     -0.062182155
## contry_of_resUnited.Kingdom               -0.048139916     -0.032618770
## contry_of_resUnited.States                 0.256147605     -0.051593862
## contry_of_resUruguay                      -0.005180582     -0.006458566
## contry_of_resViet.Nam                     -0.011617279     -0.014483114
## used_app_before                            0.063425143      0.043503680
## relationHealth.care.professional          -0.010383375     -0.012944821
## relationOthers                            -0.055896997     -0.069686073
## relationParent                             0.003096978      0.052512731
## relationRelative                           0.026035899      0.008899791
## relationSelf                               0.032917016      0.023006494
## Class.ASD                                  0.035840741      0.089216576
##                              ethnicityMiddle.Eastern. ethnicityOthers
## gender                                  0.0504226010    -0.020626540
## ethnicityAsian                         -0.1786947805    -0.215196857
```

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```
## ethnicityBlack                      -0.0990456870    -0.119277802
## ethnicityHispanic                   -0.0532623641    -0.064142295
## ethnicityLatino                     -0.0664015098    -0.079965381
## ethnicityMiddle.Eastern.             1.0000000000    -0.181330423
## ethnicityOthers                     -0.1813304229     1.000000000
## ethnicityPasifika                   -0.0489233969    -0.058917005
## ethnicitySouth.Asian                -0.0901491512    -0.108563966
## ethnicityTurkish                    -0.0360024905    -0.043356738
## ethnicityWhite.European             -0.2732136165    -0.329023106
## jundice                             -0.0004234826    -0.004574855
## austim                              -0.0365495796    -0.091810418
## contry_of_resAfghanistan             0.1345809903     0.045972561
## contry_of_resAmericanSamoa           0.0584626951    -0.024960504
## contry_of_resAngola                 -0.0146455185    -0.017637166
## contry_of_resArgentina              -0.0207266588     0.114303262
## contry_of_resArmenia                 0.0584626951    -0.024960504
## contry_of_resAruba                  -0.0146455185    -0.017637166
## contry_of_resAustralia              -0.0775500072    -0.074092539
## contry_of_resAustria                -0.0293538261     0.013957618
## contry_of_resAzerbaijan             -0.0146455185     0.080767023
## contry_of_resBahamas                -0.0207266588     0.044671379
## contry_of_resBangladesh             -0.0254029946    -0.030592078
## contry_of_resBelgium                -0.0254029946    -0.030592078
## contry_of_resBolivia                -0.0146455185    -0.017637166
## contry_of_resBrazil                 -0.0441890666    -0.020225679
## contry_of_resBurundi                 0.0972653459    -0.017637166
## contry_of_resCanada                 -0.0281082820     0.007995232
## contry_of_resChile                  -0.0146455185    -0.017637166
## contry_of_resChina                  -0.0146455185    -0.017637166
## contry_of_resCosta.Rica             -0.0146455185    -0.017637166
## contry_of_resCyprus                 -0.0146455185    -0.017637166
## contry_of_resCzech.Republic         -0.0146455185    -0.017637166
## contry_of_resEcuador                -0.0146455185    -0.017637166
## contry_of_resEgypt                   0.1040050141     0.026302712
## contry_of_resEthiopia               -0.0207266588    -0.024960504
## contry_of_resFinland                -0.0146455185    -0.017637166
## contry_of_resFrance                  0.0190472514    -0.058917005
## contry_of_resGermany                -0.0293538261    -0.035349948
## contry_of_resHong.Kong              -0.0146455185     0.080767023
## contry_of_resIceland                 0.0584626951    -0.024960504
## contry_of_resIndia                  -0.1268198419    -0.122171123
## contry_of_resIndonesia              -0.0146455185    -0.017637166
## contry_of_resIran                    0.0460454597     0.139902038
## contry_of_resIraq                   -0.0146455185     0.080767023
## contry_of_resIreland                -0.0328420758    -0.039550744
## contry_of_resItaly                  -0.0328420758    -0.039550744
## contry_of_resJapan                  -0.0146455185     0.080767023
## contry_of_resJordan                 -0.0194327004     0.498553280
## contry_of_resKazakhstan             -0.0254029946     0.140092292
## contry_of_resLebanon                -0.0146455185     0.080767023
## contry_of_resMalaysia               -0.0328420758    -0.039550744
## contry_of_resMexico                 -0.0416318682    -0.050136032
## contry_of_resNepal                  -0.0146455185    -0.017637166
## contry_of_resNetherlands            -0.0466129610    -0.024815064
```

```
## contry_of_resNew.Zealand                -0.0460795538   -0.050668453
## contry_of_resNicaragua                  -0.0146455185   -0.017637166
## contry_of_resNiger                      -0.0146455185   -0.017637166
## contry_of_resOman                       -0.0146455185   -0.017637166
## contry_of_resPakistan                   -0.0254029946    0.026302712
## contry_of_resPhilippines                -0.0293538261    0.013957618
## contry_of_resPortugal                   -0.0146455185   -0.017637166
## contry_of_resRomania                    -0.0254029946   -0.030592078
## contry_of_resRussia                     -0.0389150604    0.177255297
## contry_of_resSaudi.Arabia                0.0827969333    0.063265184
## contry_of_resSerbia                     -0.0146455185   -0.017637166
## contry_of_resSierra.Leone               -0.0146455185   -0.017637166
## contry_of_resSouth.Africa               -0.0207266588   -0.024960504
## contry_of_resSpain                      -0.0254029946   -0.030592078
## contry_of_resSri.Lanka                  -0.0553130639   -0.066611893
## contry_of_resSweden                     -0.0207266588   -0.024960504
## contry_of_resTonga                      -0.0146455185   -0.017637166
## contry_of_resTurkey                     -0.0146455185   -0.017637166
## contry_of_resUkraine                    -0.0207266588    0.044671379
## contry_of_resUnited.Arab.Emirates        0.5554033431    0.038162455
## contry_of_resUnited.Kingdom             -0.1090808065   -0.128264860
## contry_of_resUnited.States              -0.1124014235   -0.113629992
## contry_of_resUruguay                    -0.0146455185   -0.017637166
## contry_of_resViet.Nam                   -0.0328420758    0.004582864
## used_app_before                          0.0465502370    0.024314845
## relationHealth.care.professional        -0.0293538261    0.013957618
## relationOthers                          -0.1580209442    0.818365368
## relationParent                           0.1387700508   -0.114878971
## relationRelative                         0.0935124729   -0.095175353
## relationSelf                             0.0078758742   -0.545101302
## Class.ASD                               -0.1591944913   -0.132794031
##                                 ethnicityPasifika ethnicitySouth.Asian
## gender                                0.005907810         -0.036093138
## ethnicityAsian                       -0.058060645         -0.106985986
## ethnicityBlack                       -0.032181446         -0.059299440
## ethnicityHispanic                    -0.017305750         -0.031888601
## ethnicityLatino                      -0.021574858         -0.039755112
## ethnicityMiddle.Eastern.             -0.048923397         -0.090149151
## ethnicityOthers                      -0.058917005         -0.108563966
## ethnicityPasifika                     1.000000000         -0.029290827
## ethnicitySouth.Asian                 -0.029290827          1.000000000
## ethnicityTurkish                     -0.011697755         -0.021554977
## ethnicityWhite.European              -0.088771248         -0.163575164
## jundice                              -0.003068806         -0.076642251
## austim                                0.019670220         -0.051136504
## contry_of_resAfghanistan             -0.017305750         -0.031888601
## contry_of_resAmericanSamoa           -0.006734406         -0.012409215
## contry_of_resAngola                  -0.004758551         -0.008768388
## contry_of_resArgentina               -0.006734406         -0.012409215
## contry_of_resArmenia                 -0.006734406         -0.012409215
## contry_of_resAruba                   -0.004758551         -0.008768388
## contry_of_resAustralia                0.034444621         -0.046429806
## contry_of_resAustria                 -0.009537503         -0.017574369
## contry_of_resAzerbaijan              -0.004758551         -0.008768388
```

```
## contry_of_resBahamas                    -0.006734406       -0.012409215
## contry_of_resBangladesh                 -0.008253818        0.083790185
## contry_of_resBelgium                    -0.008253818       -0.015208975
## contry_of_resBolivia                    -0.004758551       -0.008768388
## contry_of_resBrazil                     -0.014357698       -0.026456345
## contry_of_resBurundi                    -0.004758551       -0.008768388
## contry_of_resCanada                     -0.018616357        0.010354606
## contry_of_resChile                      -0.004758551       -0.008768388
## contry_of_resChina                      -0.004758551       -0.008768388
## contry_of_resCosta.Rica                 -0.004758551       -0.008768388
## contry_of_resCyprus                     -0.004758551       -0.008768388
## contry_of_resCzech.Republic             -0.004758551       -0.008768388
## contry_of_resEcuador                    -0.004758551       -0.008768388
## contry_of_resEgypt                      -0.008253818       -0.015208975
## contry_of_resEthiopia                   -0.006734406       -0.012409215
## contry_of_resFinland                    -0.004758551       -0.008768388
## contry_of_resFrance                     -0.015895954       -0.029290827
## contry_of_resGermany                    -0.009537503       -0.017574369
## contry_of_resHong.Kong                  -0.004758551       -0.008768388
## contry_of_resIceland                    -0.006734406       -0.012409215
## contry_of_resIndia                      -0.045497823        0.340609314
## contry_of_resIndonesia                  -0.004758551       -0.008768388
## contry_of_resIran                       -0.012644093       -0.023298756
## contry_of_resIraq                       -0.004758551       -0.008768388
## contry_of_resIreland                    -0.010670889       -0.019662812
## contry_of_resItaly                      -0.010670889       -0.019662812
## contry_of_resJapan                      -0.004758551       -0.008768388
## contry_of_resJordan                     -0.033747399       -0.062184958
## contry_of_resKazakhstan                 -0.008253818       -0.015208975
## contry_of_resLebanon                    -0.004758551       -0.008768388
## contry_of_resMalaysia                   -0.010670889       -0.019662812
## contry_of_resMexico                     -0.013526825       -0.024925330
## contry_of_resNepal                      -0.004758551       -0.008768388
## contry_of_resNetherlands                -0.015145258       -0.027907550
## contry_of_resNew.Zealand                 0.171375181        0.099641005
## contry_of_resNicaragua                  -0.004758551       -0.008768388
## contry_of_resNiger                      -0.004758551       -0.008768388
## contry_of_resOman                        0.299356125       -0.008768388
## contry_of_resPakistan                   -0.008253818        0.083790185
## contry_of_resPhilippines                -0.009537503       -0.017574369
## contry_of_resPortugal                   -0.004758551       -0.008768388
## contry_of_resRomania                    -0.008253818       -0.015208975
## contry_of_resRussia                     -0.012644093       -0.023298756
## contry_of_resSaudi.Arabia               -0.009537503       -0.017574369
## contry_of_resSerbia                     -0.004758551       -0.008768388
## contry_of_resSierra.Leone               -0.004758551       -0.008768388
## contry_of_resSouth.Africa               -0.006734406       -0.012409215
## contry_of_resSpain                      -0.008253818       -0.015208975
## contry_of_resSri.Lanka                  -0.017972053        0.013075710
## contry_of_resSweden                     -0.006734406       -0.012409215
## contry_of_resTonga                       0.299356125       -0.008768388
## contry_of_resTurkey                     -0.004758551       -0.008768388
## contry_of_resUkraine                    -0.006734406       -0.012409215
## contry_of_resUnited.Arab.Emirates       -0.010107668       -0.064316524
```

```
## contry_of_resUnited.Kingdom                 -0.044218244      -0.081479157
## contry_of_resUnited.States                  -0.023970613      -0.084101874
## contry_of_resUruguay                        -0.004758551      -0.008768388
## contry_of_resViet.Nam                       -0.010670889      -0.019662812
## used_app_before                             -0.016614791      -0.030615400
## relationHealth.care.professional            -0.009537503      -0.017574369
## relationOthers                              -0.051343402      -0.094608396
## relationParent                              -0.034887649      -0.039178776
## relationRelative                             0.091542348      -0.047316811
## relationSelf                                 0.022184126       0.122578104
## Class.ASD                                   -0.050600707      -0.097209558
##                                    ethnicityTurkish ethnicityWhite.European
## gender                                       0.026861802      -0.0764502640
## ethnicityAsian                              -0.042726547      -0.3242407464
## ethnicityBlack                              -0.023682170      -0.1797178819
## ethnicityHispanic                           -0.012735218      -0.0966442816
## ethnicityLatino                             -0.015876833      -0.1204851930
## ethnicityMiddle.Eastern.                    -0.036002491      -0.2732136165
## ethnicityOthers                             -0.043356738      -0.3290231058
## ethnicityPasifika                           -0.011697755      -0.0887712483
## ethnicitySouth.Asian                        -0.021554977      -0.1635751642
## ethnicityTurkish                             1.000000000      -0.0653263311
## ethnicityWhite.European                     -0.065326331       1.0000000000
## jundice                                     -0.030608296       0.0927409012
## austim                                       0.010287533       0.1785901509
## contry_of_resAfghanistan                    -0.012735218      -0.0742141298
## contry_of_resAmericanSamoa                  -0.004955817      -0.0376084141
## contry_of_resAngola                         -0.003501795       0.0536046435
## contry_of_resArgentina                      -0.004955817      -0.0376084141
## contry_of_resArmenia                         0.285372439      -0.0376084141
## contry_of_resAruba                          -0.003501795      -0.0265742169
## contry_of_resAustralia                       0.061922719       0.2366707543
## contry_of_resAustria                        -0.007018602       0.0672637367
## contry_of_resAzerbaijan                     -0.003501795      -0.0265742169
## contry_of_resBahamas                        -0.004955817      -0.0376084141
## contry_of_resBangladesh                     -0.006073945       0.0002637688
## contry_of_resBelgium                        -0.006073945       0.0929785086
## contry_of_resBolivia                        -0.003501795      -0.0265742169
## contry_of_resBrazil                         -0.010565760      -0.0801808306
## contry_of_resBurundi                        -0.003501795      -0.0265742169
## contry_of_resCanada                         -0.013699687       0.0215065902
## contry_of_resChile                          -0.003501795      -0.0265742169
## contry_of_resChina                          -0.003501795      -0.0265742169
## contry_of_resCosta.Rica                     -0.003501795      -0.0265742169
## contry_of_resCyprus                         -0.003501795       0.0536046435
## contry_of_resCzech.Republic                 -0.003501795       0.0536046435
## contry_of_resEcuador                        -0.003501795      -0.0265742169
## contry_of_resEgypt                          -0.006073945      -0.0460936011
## contry_of_resEthiopia                       -0.004955817      -0.0376084141
## contry_of_resFinland                        -0.003501795       0.0536046435
## contry_of_resFrance                         -0.011697755      -0.0644223651
## contry_of_resGermany                        -0.007018602       0.1074391036
## contry_of_resHong.Kong                      -0.003501795      -0.0265742169
## contry_of_resIceland                        -0.004955817      -0.0376084141
```

```
## contry_of_resIndia                    -0.033481627         -0.2446190843
## contry_of_resIndonesia                -0.003501795         -0.0265742169
## contry_of_resIran                      -0.009304727         -0.0706111739
## contry_of_resIraq                      -0.003501795         -0.0265742169
## contry_of_resIreland                   -0.007852655          0.1202065850
## contry_of_resItaly                     -0.007852655          0.0842469130
## contry_of_resJapan                     -0.003501795         -0.0265742169
## contry_of_resJordan                    -0.024834547         -0.1884629743
## contry_of_resKazakhstan                -0.006073945         -0.0460936011
## contry_of_resLebanon                   -0.003501795         -0.0265742169
## contry_of_resMalaysia                  -0.007852655         -0.0236321031
## contry_of_resMexico                    -0.009954325         -0.0755408075
## contry_of_resNepal                     -0.003501795         -0.0265742169
## contry_of_resNetherlands               -0.011145322          0.1450910560
## contry_of_resNew.Zealand               -0.033247593         -0.0715096586
## contry_of_resNicaragua                 -0.003501795         -0.0265742169
## contry_of_resNiger                     -0.003501795         -0.0265742169
## contry_of_resOman                      -0.003501795         -0.0265742169
## contry_of_resPakistan                  -0.006073945         -0.0460936011
## contry_of_resPhilippines               -0.007018602         -0.0532623641
## contry_of_resPortugal                  -0.003501795          0.0536046435
## contry_of_resRomania                   -0.006073945          0.0929785086
## contry_of_resRussia                    -0.009304727         -0.0401760695
## contry_of_resSaudi.Arabia              -0.007018602         -0.0532623641
## contry_of_resSerbia                    -0.003501795          0.0536046435
## contry_of_resSierra.Leone              -0.003501795         -0.0265742169
## contry_of_resSouth.Africa              -0.004955817          0.0758624663
## contry_of_resSpain                     -0.006073945         -0.0460936011
## contry_of_resSri.Lanka                 -0.013225547         -0.1003652656
## contry_of_resSweden                    -0.004955817          0.0758624663
## contry_of_resTonga                     -0.003501795         -0.0265742169
## contry_of_resTurkey                     0.406791817         -0.0265742169
## contry_of_resUkraine                   -0.004955817          0.0191270261
## contry_of_resUnited.Arab.Emirates       0.062632746         -0.2558527903
## contry_of_resUnited.Kingdom            -0.032539991          0.3820024649
## contry_of_resUnited.States              0.001497210          0.2677829269
## contry_of_resUruguay                   -0.003501795          0.0536046435
## contry_of_resViet.Nam                  -0.007852655         -0.0595917751
## used_app_before                        -0.012226744         -0.0461273244
## relationHealth.care.professional       -0.007018602         -0.0130869972
## relationOthers                          0.006486144         -0.2607749711
## relationParent                         -0.025673652         -0.0419931285
## relationRelative                       -0.018896717          0.0420271651
## relationSelf                            0.019534533          0.2160807837
## Class.ASD                              -0.021383205          0.3159693883
##                                          jundice       austim
## gender                              -0.0193473832 -0.089127192
## ethnicityAsian                      -0.0638330524 -0.121810618
## ethnicityBlack                      -0.0243507262 -0.010011069
## ethnicityHispanic                   -0.0097934641 -0.021475763
## ethnicityLatino                      0.0585798822  0.137917302
## ethnicityMiddle.Eastern.            -0.0004234826 -0.036549580
## ethnicityOthers                     -0.0045748552 -0.091810418
## ethnicityPasifika                   -0.0030688062  0.019670220
```

```
## ethnicitySouth.Asian            -0.0766422507 -0.051136504
## ethnicityTurkish                -0.0306082960  0.010287533
## ethnicityWhite.European          0.0927409012  0.178590151
## jundice                          1.0000000000  0.157641237
## austim                           0.1576412369  1.000000000
## contry_of_resAfghanistan         0.0611839095  0.072883372
## contry_of_resAmericanSamoa      -0.0176212172 -0.020596858
## contry_of_resAngola              0.1144067181 -0.014553801
## contry_of_resArgentina          -0.0176212172 -0.020596858
## contry_of_resArmenia             0.0721448387  0.058961335
## contry_of_resAruba              -0.0124512043 -0.014553801
## contry_of_resAustralia           0.0087058404  0.077283906
## contry_of_resAustria            -0.0249557901 -0.029169998
## contry_of_resAzerbaijan         -0.0124512043 -0.014553801
## contry_of_resBahamas             0.0721448387  0.058961335
## contry_of_resBangladesh         -0.0215969053  0.039761467
## contry_of_resBelgium            -0.0215969053  0.039761467
## contry_of_resBolivia            -0.0124512043 -0.014553801
## contry_of_resBrazil             -0.0375682907  0.144551463
## contry_of_resBurundi            -0.0124512043 -0.014553801
## contry_of_resCanada             -0.0487114802  0.031033923
## contry_of_resChile              -0.0124512043 -0.014553801
## contry_of_resChina              -0.0124512043 -0.014553801
## contry_of_resCosta.Rica          0.1144067181  0.097878309
## contry_of_resCyprus             -0.0124512043 -0.014553801
## contry_of_resCzech.Republic      0.1144067181 -0.014553801
## contry_of_resEcuador            -0.0124512043 -0.014553801
## contry_of_resEgypt              -0.0215969053  0.039761467
## contry_of_resEthiopia           -0.0176212172 -0.020596858
## contry_of_resFinland            -0.0124512043 -0.014553801
## contry_of_resFrance             -0.0415932840  0.019670220
## contry_of_resGermany            -0.0249557901 -0.029169998
## contry_of_resHong.Kong          -0.0124512043 -0.014553801
## contry_of_resIceland            -0.0176212172 -0.020596858
## contry_of_resIndia              -0.0591519415 -0.112609839
## contry_of_resIndonesia          -0.0124512043 -0.014553801
## contry_of_resIran               -0.0330844803 -0.038671355
## contry_of_resIraq               -0.0124512043 -0.014553801
## contry_of_resIreland            -0.0279214011  0.017788632
## contry_of_resItaly               0.0289735119  0.017788632
## contry_of_resJapan              -0.0124512043 -0.014553801
## contry_of_resJordan              0.0074062588 -0.069284476
## contry_of_resKazakhstan         -0.0215969053 -0.025243908
## contry_of_resLebanon            -0.0124512043 -0.014553801
## contry_of_resMalaysia            0.0289735119  0.017788632
## contry_of_resMexico              0.0096821181 -0.001420713
## contry_of_resNepal              -0.0124512043 -0.014553801
## contry_of_resNetherlands         0.0007466337  0.096816079
## contry_of_resNew.Zealand        -0.0579949888 -0.098149731
## contry_of_resNicaragua           0.1144067181 -0.014553801
## contry_of_resNiger              -0.0124512043 -0.014553801
## contry_of_resOman               -0.0124512043 -0.014553801
## contry_of_resPakistan           -0.0215969053 -0.025243908
## contry_of_resPhilippines        -0.0249557901 -0.029169998
```

```
## contry_of_resPortugal                 -0.0124512043 -0.014553801
## contry_of_resRomania                   -0.0215969053  0.039761467
## contry_of_resRussia                    -0.0330844803  0.004006765
## contry_of_resSaudi.Arabia              -0.0249557901 -0.029169998
## contry_of_resSerbia                    -0.0124512043 -0.014553801
## contry_of_resSierra.Leone               0.1144067181 -0.014553801
## contry_of_resSouth.Africa               0.0721448387 -0.020596858
## contry_of_resSpain                      0.0517491064  0.039761467
## contry_of_resSri.Lanka                 -0.0470255976 -0.054966666
## contry_of_resSweden                    -0.0176212172  0.138519528
## contry_of_resTonga                     -0.0124512043 -0.014553801
## contry_of_resTurkey                    -0.0124512043 -0.014553801
## contry_of_resUkraine                   -0.0176212172 -0.020596858
## contry_of_resUnited.Arab.Emirates      -0.0156151294 -0.100518989
## contry_of_resUnited.Kingdom             0.1445558077  0.095422222
## contry_of_resUnited.States              0.0118322260  0.096595884
## contry_of_resUruguay                    0.1144067181  0.097878309
## contry_of_resViet.Nam                  -0.0279214011 -0.032636402
## used_app_before                         0.0303479261  0.014611796
## relationHealth.care.professional        0.0386091390  0.027166564
## relationOthers                          0.0025311362 -0.072113622
## relationParent                          0.0947266676  0.107616796
## relationRelative                        0.0550529808  0.051474147
## relationSelf                           -0.0888121326 -0.033287786
## Class.ASD                               0.1019019786  0.177147712
##                                        contry_of_resAfghanistan
## gender                                             0.004510164
## ethnicityAsian                                    -0.007629473
## ethnicityBlack                                    -0.035035586
## ethnicityHispanic                                 -0.018840580
## ethnicityLatino                                   -0.023488310
## ethnicityMiddle.Eastern.                           0.134580990
## ethnicityOthers                                    0.045972561
## ethnicityPasifika                                 -0.017305750
## ethnicitySouth.Asian                              -0.031888601
## ethnicityTurkish                                  -0.012735218
## ethnicityWhite.European                           -0.074214130
## jundice                                            0.061183910
## austim                                             0.072883372
## contry_of_resAfghanistan                           1.000000000
## contry_of_resAmericanSamoa                        -0.007331674
## contry_of_resAngola                               -0.005180582
## contry_of_resArgentina                            -0.007331674
## contry_of_resArmenia                              -0.007331674
## contry_of_resAruba                                -0.005180582
## contry_of_resAustralia                            -0.027431886
## contry_of_resAustria                              -0.010383375
## contry_of_resAzerbaijan                           -0.005180582
## contry_of_resBahamas                              -0.007331674
## contry_of_resBangladesh                           -0.008985841
## contry_of_resBelgium                              -0.008985841
## contry_of_resBolivia                              -0.005180582
## contry_of_resBrazil                               -0.015631068
## contry_of_resBurundi                              -0.005180582
```

```
## contry_of_resCanada                      -0.020267423
## contry_of_resChile                       -0.005180582
## contry_of_resChina                       -0.005180582
## contry_of_resCosta.Rica                  -0.005180582
## contry_of_resCyprus                      -0.005180582
## contry_of_resCzech.Republic              -0.005180582
## contry_of_resEcuador                     -0.005180582
## contry_of_resEgypt                       -0.008985841
## contry_of_resEthiopia                    -0.007331674
## contry_of_resFinland                     -0.005180582
## contry_of_resFrance                      -0.017305750
## contry_of_resGermany                     -0.010383375
## contry_of_resHong.Kong                   -0.005180582
## contry_of_resIceland                     -0.007331674
## contry_of_resIndia                       -0.049532979
## contry_of_resIndonesia                   -0.005180582
## contry_of_resIran                        -0.013765485
## contry_of_resIraq                        -0.005180582
## contry_of_resIreland                     -0.011617279
## contry_of_resItaly                       -0.011617279
## contry_of_resJapan                       -0.005180582
## contry_of_resJordan                      -0.036740422
## contry_of_resKazakhstan                  -0.008985841
## contry_of_resLebanon                     -0.005180582
## contry_of_resMalaysia                    -0.011617279
## contry_of_resMexico                      -0.014726506
## contry_of_resNepal                       -0.005180582
## contry_of_resNetherlands                 -0.016488476
## contry_of_resNew.Zealand                 -0.049186747
## contry_of_resNicaragua                   -0.005180582
## contry_of_resNiger                       -0.005180582
## contry_of_resOman                        -0.005180582
## contry_of_resPakistan                    -0.008985841
## contry_of_resPhilippines                 -0.010383375
## contry_of_resPortugal                    -0.005180582
## contry_of_resRomania                     -0.008985841
## contry_of_resRussia                      -0.013765485
## contry_of_resSaudi.Arabia                -0.010383375
## contry_of_resSerbia                      -0.005180582
## contry_of_resSierra.Leone                -0.005180582
## contry_of_resSouth.Africa                -0.007331674
## contry_of_resSpain                       -0.008985841
## contry_of_resSri.Lanka                   -0.019565977
## contry_of_resSweden                      -0.007331674
## contry_of_resTonga                       -0.005180582
## contry_of_resTurkey                      -0.005180582
## contry_of_resUkraine                     -0.007331674
## contry_of_resUnited.Arab.Emirates        -0.049877911
## contry_of_resUnited.Kingdom              -0.048139916
## contry_of_resUnited.States               -0.060070375
## contry_of_resUruguay                     -0.005180582
## contry_of_resViet.Nam                    -0.011617279
## used_app_before                          -0.018088341
## relationHealth.care.professional          0.129991868
```

```
## relationOthers                           0.034785131
## relationParent                           0.085254533
## relationRelative                        -0.027955950
## relationSelf                            -0.087607266
## Class.ASD                               -0.035603610
##                              contry_of_resAmericanSamoa
## gender                                   0.051108437
## ethnicityAsian                          -0.024597703
## ethnicityBlack                           0.097814888
## ethnicityHispanic                       -0.007331674
## ethnicityLatino                         -0.009140304
## ethnicityMiddle.Eastern.                 0.058462695
## ethnicityOthers                         -0.024960504
## ethnicityPasifika                       -0.006734406
## ethnicitySouth.Asian                    -0.012409215
## ethnicityTurkish                        -0.004955817
## ethnicityWhite.European                 -0.037608414
## jundice                                 -0.017621217
## austim                                  -0.020596858
## contry_of_resAfghanistan                -0.007331674
## contry_of_resAmericanSamoa               1.000000000
## contry_of_resAngola                     -0.002015986
## contry_of_resArgentina                  -0.002853067
## contry_of_resArmenia                    -0.002853067
## contry_of_resAruba                      -0.002015986
## contry_of_resAustralia                  -0.010674917
## contry_of_resAustria                    -0.004040614
## contry_of_resAzerbaijan                 -0.002015986
## contry_of_resBahamas                    -0.002853067
## contry_of_resBangladesh                 -0.003496774
## contry_of_resBelgium                    -0.003496774
## contry_of_resBolivia                    -0.002015986
## contry_of_resBrazil                     -0.006082716
## contry_of_resBurundi                    -0.002015986
## contry_of_resCanada                     -0.007886919
## contry_of_resChile                      -0.002015986
## contry_of_resChina                      -0.002015986
## contry_of_resCosta.Rica                 -0.002015986
## contry_of_resCyprus                     -0.002015986
## contry_of_resCzech.Republic             -0.002015986
## contry_of_resEcuador                    -0.002015986
## contry_of_resEgypt                      -0.003496774
## contry_of_resEthiopia                   -0.002853067
## contry_of_resFinland                    -0.002015986
## contry_of_resFrance                     -0.006734406
## contry_of_resGermany                    -0.004040614
## contry_of_resHong.Kong                  -0.002015986
## contry_of_resIceland                    -0.002853067
## contry_of_resIndia                      -0.019275396
## contry_of_resIndonesia                  -0.002015986
## contry_of_resIran                       -0.005356738
## contry_of_resIraq                       -0.002015986
## contry_of_resIreland                    -0.004520779
## contry_of_resItaly                      -0.004520779
```

```
## contry_of_resJapan                           -0.002015986
## contry_of_resJordan                          -0.014297266
## contry_of_resKazakhstan                      -0.003496774
## contry_of_resLebanon                         -0.002015986
## contry_of_resMalaysia                        -0.004520779
## contry_of_resMexico                          -0.005730712
## contry_of_resNepal                           -0.002015986
## contry_of_resNetherlands                     -0.006416370
## contry_of_resNew.Zealand                     -0.019140662
## contry_of_resNicaragua                       -0.002015986
## contry_of_resNiger                           -0.002015986
## contry_of_resOman                            -0.002015986
## contry_of_resPakistan                        -0.003496774
## contry_of_resPhilippines                     -0.004040614
## contry_of_resPortugal                        -0.002015986
## contry_of_resRomania                         -0.003496774
## contry_of_resRussia                          -0.005356738
## contry_of_resSaudi.Arabia                    -0.004040614
## contry_of_resSerbia                          -0.002015986
## contry_of_resSierra.Leone                    -0.002015986
## contry_of_resSouth.Africa                    -0.002853067
## contry_of_resSpain                           -0.003496774
## contry_of_resSri.Lanka                       -0.007613957
## contry_of_resSweden                          -0.002853067
## contry_of_resTonga                           -0.002015986
## contry_of_resTurkey                          -0.002015986
## contry_of_resUkraine                         -0.002853067
## contry_of_resUnited.Arab.Emirates            -0.019409624
## contry_of_resUnited.Kingdom                  -0.018733296
## contry_of_resUnited.States                   -0.023375947
## contry_of_resUruguay                         -0.002015986
## contry_of_resViet.Nam                        -0.004520779
## used_app_before                              -0.007038945
## relationHealth.care.professional             -0.004040614
## relationOthers                               -0.021751907
## relationParent                               -0.014780339
## relationRelative                             -0.010878853
## relationSelf                                  0.031569872
## Class.ASD                                     0.027848185
##                              contry_of_resAngola contry_of_resArgentina
## gender                               0.036113373            -0.002357681
## ethnicityAsian                      -0.017380810            -0.024597703
## ethnicityBlack                      -0.009633713            -0.013633842
## ethnicityHispanic                   -0.005180582            -0.007331674
## ethnicityLatino                     -0.006458566            -0.009140304
## ethnicityMiddle.Eastern.            -0.014645519            -0.020726659
## ethnicityOthers                     -0.017637166             0.114303262
## ethnicityPasifika                   -0.004758551            -0.006734406
## ethnicitySouth.Asian                -0.008768388            -0.012409215
## ethnicityTurkish                    -0.003501795            -0.004955817
## ethnicityWhite.European              0.053604644            -0.037608414
## jundice                              0.114406718            -0.017621217
## austim                              -0.014553801            -0.020596858
## contry_of_resAfghanistan            -0.005180582            -0.007331674
```

```
## contry_of_resAmericanSamoa         -0.002015986         -0.002853067
## contry_of_resAngola                 1.000000000         -0.002015986
## contry_of_resArgentina             -0.002015986          1.000000000
## contry_of_resArmenia               -0.002015986         -0.002853067
## contry_of_resAruba                 -0.001424501         -0.002015986
## contry_of_resAustralia             -0.007542928         -0.010674917
## contry_of_resAustria               -0.002855110         -0.004040614
## contry_of_resAzerbaijan            -0.001424501         -0.002015986
## contry_of_resBahamas               -0.002015986         -0.002853067
## contry_of_resBangladesh            -0.002470831         -0.003496774
## contry_of_resBelgium               -0.002470831         -0.003496774
## contry_of_resBolivia               -0.001424501         -0.002015986
## contry_of_resBrazil                -0.004298065         -0.006082716
## contry_of_resBurundi               -0.001424501         -0.002015986
## contry_of_resCanada                -0.005572921         -0.007886919
## contry_of_resChile                 -0.001424501         -0.002015986
## contry_of_resChina                 -0.001424501         -0.002015986
## contry_of_resCosta.Rica            -0.001424501         -0.002015986
## contry_of_resCyprus                -0.001424501         -0.002015986
## contry_of_resCzech.Republic        -0.001424501         -0.002015986
## contry_of_resEcuador               -0.001424501         -0.002015986
## contry_of_resEgypt                 -0.002470831         -0.003496774
## contry_of_resEthiopia              -0.002015986         -0.002853067
## contry_of_resFinland               -0.001424501         -0.002015986
## contry_of_resFrance                -0.004758551         -0.006734406
## contry_of_resGermany               -0.002855110         -0.004040614
## contry_of_resHong.Kong             -0.001424501         -0.002015986
## contry_of_resIceland               -0.002015986         -0.002853067
## contry_of_resIndia                 -0.013620052         -0.019275396
## contry_of_resIndonesia             -0.001424501         -0.002015986
## contry_of_resIran                  -0.003785087         -0.005356738
## contry_of_resIraq                  -0.001424501         -0.002015986
## contry_of_resIreland               -0.003194396         -0.004520779
## contry_of_resItaly                 -0.003194396         -0.004520779
## contry_of_resJapan                 -0.001424501         -0.002015986
## contry_of_resJordan                -0.010102491         -0.014297266
## contry_of_resKazakhstan            -0.002470831         -0.003496774
## contry_of_resLebanon               -0.001424501         -0.002015986
## contry_of_resMalaysia              -0.003194396         -0.004520779
## contry_of_resMexico                -0.004049338         -0.005730712
## contry_of_resNepal                 -0.001424501         -0.002015986
## contry_of_resNetherlands           -0.004533826         -0.006416370
## contry_of_resNew.Zealand           -0.013524849         -0.019140662
## contry_of_resNicaragua             -0.001424501         -0.002015986
## contry_of_resNiger                 -0.001424501         -0.002015986
## contry_of_resOman                  -0.001424501         -0.002015986
## contry_of_resPakistan              -0.002470831         -0.003496774
## contry_of_resPhilippines           -0.002855110         -0.004040614
## contry_of_resPortugal              -0.001424501         -0.002015986
## contry_of_resRomania               -0.002470831         -0.003496774
## contry_of_resRussia                -0.003785087         -0.005356738
## contry_of_resSaudi.Arabia          -0.002855110         -0.004040614
## contry_of_resSerbia                -0.001424501         -0.002015986
## contry_of_resSierra.Leone          -0.001424501         -0.002015986
```

```
## contry_of_resSouth.Africa             -0.002015986          -0.002853067
## contry_of_resSpain                    -0.002470831          -0.003496774
## contry_of_resSri.Lanka                -0.005380044          -0.007613957
## contry_of_resSweden                   -0.002015986          -0.002853067
## contry_of_resTonga                    -0.001424501          -0.002015986
## contry_of_resTurkey                   -0.001424501          -0.002015986
## contry_of_resUkraine                  -0.002015986          -0.002853067
## contry_of_resUnited.Arab.Emirates     -0.013714898          -0.019409624
## contry_of_resUnited.Kingdom           -0.013237002          -0.018733296
## contry_of_resUnited.States            -0.016517513          -0.023375947
## contry_of_resUruguay                  -0.001424501          -0.002015986
## contry_of_resViet.Nam                 -0.003194396          -0.004520779
## used_app_before                       -0.004973740          -0.007038945
## relationHealth.care.professional      -0.002855110          -0.004040614
## relationOthers                        -0.015369962           0.131163998
## relationParent                         0.136396439          -0.014780339
## relationRelative                      -0.007687030          -0.010878853
## relationSelf                          -0.063857897          -0.090373095
## Class.ASD                             -0.022886574           0.027848185
##                              contry_of_resArmenia contry_of_resAruba
## gender                                 0.051108437           0.036113373
## ethnicityAsian                        -0.024597703           0.081958289
## ethnicityBlack                        -0.013633842          -0.009633713
## ethnicityHispanic                     -0.007331674          -0.005180582
## ethnicityLatino                       -0.009140304          -0.006458566
## ethnicityMiddle.Eastern.               0.058462695          -0.014645519
## ethnicityOthers                       -0.024960504          -0.017637166
## ethnicityPasifika                     -0.006734406          -0.004758551
## ethnicitySouth.Asian                  -0.012409215          -0.008768388
## ethnicityTurkish                       0.285372439          -0.003501795
## ethnicityWhite.European               -0.037608414          -0.026574217
## jundice                                0.072144839          -0.012451204
## austim                                 0.058961335          -0.014553801
## contry_of_resAfghanistan              -0.007331674          -0.005180582
## contry_of_resAmericanSamoa            -0.002853067          -0.002015986
## contry_of_resAngola                   -0.002015986          -0.001424501
## contry_of_resArgentina                -0.002853067          -0.002015986
## contry_of_resArmenia                   1.000000000          -0.002015986
## contry_of_resAruba                    -0.002015986           1.000000000
## contry_of_resAustralia                -0.010674917          -0.007542928
## contry_of_resAustria                  -0.004040614          -0.002855110
## contry_of_resAzerbaijan               -0.002015986          -0.001424501
## contry_of_resBahamas                  -0.002853067          -0.002015986
## contry_of_resBangladesh               -0.003496774          -0.002470831
## contry_of_resBelgium                  -0.003496774          -0.002470831
## contry_of_resBolivia                  -0.002015986          -0.001424501
## contry_of_resBrazil                   -0.006082716          -0.004298065
## contry_of_resBurundi                  -0.002015986          -0.001424501
## contry_of_resCanada                   -0.007886919          -0.005572921
## contry_of_resChile                    -0.002015986          -0.001424501
## contry_of_resChina                    -0.002015986          -0.001424501
## contry_of_resCosta.Rica               -0.002015986          -0.001424501
## contry_of_resCyprus                   -0.002015986          -0.001424501
## contry_of_resCzech.Republic           -0.002015986          -0.001424501
```

```
## contry_of_resEcuador                     -0.002015986    -0.001424501
## contry_of_resEgypt                       -0.003496774    -0.002470831
## contry_of_resEthiopia                    -0.002853067    -0.002015986
## contry_of_resFinland                     -0.002015986    -0.001424501
## contry_of_resFrance                      -0.006734406    -0.004758551
## contry_of_resGermany                     -0.004040614    -0.002855110
## contry_of_resHong.Kong                   -0.002015986    -0.001424501
## contry_of_resIceland                     -0.002853067    -0.002015986
## contry_of_resIndia                       -0.019275396    -0.013620052
## contry_of_resIndonesia                   -0.002015986    -0.001424501
## contry_of_resIran                        -0.005356738    -0.003785087
## contry_of_resIraq                        -0.002015986    -0.001424501
## contry_of_resIreland                     -0.004520779    -0.003194396
## contry_of_resItaly                       -0.004520779    -0.003194396
## contry_of_resJapan                       -0.002015986    -0.001424501
## contry_of_resJordan                      -0.014297266    -0.010102491
## contry_of_resKazakhstan                  -0.003496774    -0.002470831
## contry_of_resLebanon                     -0.002015986    -0.001424501
## contry_of_resMalaysia                    -0.004520779    -0.003194396
## contry_of_resMexico                      -0.005730712    -0.004049338
## contry_of_resNepal                       -0.002015986    -0.001424501
## contry_of_resNetherlands                 -0.006416370    -0.004533826
## contry_of_resNew.Zealand                 -0.019140662    -0.013524849
## contry_of_resNicaragua                   -0.002015986    -0.001424501
## contry_of_resNiger                       -0.002015986    -0.001424501
## contry_of_resOman                        -0.002015986    -0.001424501
## contry_of_resPakistan                    -0.003496774    -0.002470831
## contry_of_resPhilippines                 -0.004040614    -0.002855110
## contry_of_resPortugal                    -0.002015986    -0.001424501
## contry_of_resRomania                     -0.003496774    -0.002470831
## contry_of_resRussia                      -0.005356738    -0.003785087
## contry_of_resSaudi.Arabia                -0.004040614    -0.002855110
## contry_of_resSerbia                      -0.002015986    -0.001424501
## contry_of_resSierra.Leone                -0.002015986    -0.001424501
## contry_of_resSouth.Africa                -0.002853067    -0.002015986
## contry_of_resSpain                       -0.003496774    -0.002470831
## contry_of_resSri.Lanka                   -0.007613957    -0.005380044
## contry_of_resSweden                      -0.002853067    -0.002015986
## contry_of_resTonga                       -0.002015986    -0.001424501
## contry_of_resTurkey                      -0.002015986    -0.001424501
## contry_of_resUkraine                     -0.002853067    -0.002015986
## contry_of_resUnited.Arab.Emirates        -0.019409624    -0.013714898
## contry_of_resUnited.Kingdom              -0.018733296    -0.013237002
## contry_of_resUnited.States               -0.023375947    -0.016517513
## contry_of_resUruguay                     -0.002015986    -0.001424501
## contry_of_resViet.Nam                    -0.004520779    -0.003194396
## used_app_before                           0.199143493    -0.004973740
## relationHealth.care.professional         -0.004040614    -0.002855110
## relationOthers                           -0.021751907    -0.015369962
## relationParent                           -0.014780339    -0.010443831
## relationRelative                          0.125689608    -0.007687030
## relationSelf                             -0.029401612     0.022307365
## Class.ASD                                -0.032389581    -0.022886574
##                                 contry_of_resAustralia contry_of_resAustria
```

```
## gender                          -0.031048802        -0.003339031
## ethnicityAsian                   -0.092033745        -0.034836135
## ethnicityBlack                   -0.051011817        -0.019308728
## ethnicityHispanic                -0.027431886        -0.010383375
## ethnicityLatino                  -0.034198982        -0.012944821
## ethnicityMiddle.Eastern.         -0.077550007        -0.029353826
## ethnicityOthers                  -0.074092539         0.013957618
## ethnicityPasifika                 0.034444621        -0.009537503
## ethnicitySouth.Asian             -0.046429806        -0.017574369
## ethnicityTurkish                  0.061922719        -0.007018602
## ethnicityWhite.European           0.236670754         0.067263737
## jundice                           0.008705840        -0.024955790
## austim                            0.077283906        -0.029169998
## contry_of_resAfghanistan         -0.027431886        -0.010383375
## contry_of_resAmericanSamoa       -0.010674917        -0.004040614
## contry_of_resAngola              -0.007542928        -0.002855110
## contry_of_resArgentina           -0.010674917        -0.004040614
## contry_of_resArmenia             -0.010674917        -0.004040614
## contry_of_resAruba               -0.007542928        -0.002855110
## contry_of_resAustralia            1.000000000        -0.015118195
## contry_of_resAustria             -0.015118195         1.000000000
## contry_of_resAzerbaijan          -0.007542928        -0.002855110
## contry_of_resBahamas             -0.010674917        -0.004040614
## contry_of_resBangladesh          -0.013083386        -0.004952255
## contry_of_resBelgium             -0.013083386        -0.004952255
## contry_of_resBolivia             -0.007542928        -0.002855110
## contry_of_resBrazil              -0.022758836        -0.008614557
## contry_of_resBurundi             -0.007542928        -0.002855110
## contry_of_resCanada              -0.029509370        -0.011169734
## contry_of_resChile               -0.007542928        -0.002855110
## contry_of_resChina               -0.007542928        -0.002855110
## contry_of_resCosta.Rica          -0.007542928        -0.002855110
## contry_of_resCyprus              -0.007542928        -0.002855110
## contry_of_resCzech.Republic      -0.007542928        -0.002855110
## contry_of_resEcuador             -0.007542928        -0.002855110
## contry_of_resEgypt               -0.013083386        -0.004952255
## contry_of_resEthiopia            -0.010674917        -0.004040614
## contry_of_resFinland             -0.007542928        -0.002855110
## contry_of_resFrance              -0.025197174        -0.009537503
## contry_of_resGermany             -0.015118195        -0.005722461
## contry_of_resHong.Kong           -0.007542928        -0.002855110
## contry_of_resIceland             -0.010674917        -0.004040614
## contry_of_resIndia               -0.072120022        -0.027298496
## contry_of_resIndonesia           -0.007542928        -0.002855110
## contry_of_resIran                -0.020042548        -0.007586401
## contry_of_resIraq                -0.007542928        -0.002855110
## contry_of_resIreland             -0.016914759        -0.006402487
## contry_of_resItaly               -0.016914759        -0.006402487
## contry_of_resJapan               -0.007542928        -0.002855110
## contry_of_resJordan              -0.053494058        -0.020248293
## contry_of_resKazakhstan          -0.013083386        -0.004952255
## contry_of_resLebanon             -0.007542928        -0.002855110
## contry_of_resMalaysia            -0.016914759        -0.006402487
## contry_of_resMexico              -0.021441794        -0.008116037
```

```
## contry_of_resNepal                          -0.007542928          -0.002855110
## contry_of_resNetherlands                    -0.024007222          -0.009087089
## contry_of_resNew.Zealand                     -0.071615908          -0.027107682
## contry_of_resNicaragua                        -0.007542928          -0.002855110
## contry_of_resNiger                            -0.007542928          -0.002855110
## contry_of_resOman                             -0.007542928          -0.002855110
## contry_of_resPakistan                         -0.013083386          -0.004952255
## contry_of_resPhilippines                      -0.015118195          -0.005722461
## contry_of_resPortugal                         -0.007542928          -0.002855110
## contry_of_resRomania                          -0.013083386          -0.004952255
## contry_of_resRussia                           -0.020042548          -0.007586401
## contry_of_resSaudi.Arabia                     -0.015118195          -0.005722461
## contry_of_resSerbia                           -0.007542928          -0.002855110
## contry_of_resSierra.Leone                     -0.007542928          -0.002855110
## contry_of_resSouth.Africa                     -0.010674917          -0.004040614
## contry_of_resSpain                            -0.013083386          -0.004952255
## contry_of_resSri.Lanka                        -0.028488064          -0.010783154
## contry_of_resSweden                           -0.010674917          -0.004040614
## contry_of_resTonga                            -0.007542928          -0.002855110
## contry_of_resTurkey                           -0.007542928          -0.002855110
## contry_of_resUkraine                          -0.010674917          -0.004040614
## contry_of_resUnited.Arab.Emirates             -0.072622243          -0.027488594
## contry_of_resUnited.Kingdom                   -0.070091722          -0.026530755
## contry_of_resUnited.States                    -0.087462472          -0.033105841
## contry_of_resUruguay                          -0.007542928          -0.002855110
## contry_of_resViet.Nam                         -0.016914759          -0.006402487
## used_app_before                               -0.026336626          -0.009968803
## relationHealth.care.professional              -0.015118195          -0.005722461
## relationOthers                                -0.081386033           0.023335407
## relationParent                                 0.002293988          -0.020932438
## relationRelative                              -0.002853578          -0.015407016
## relationSelf                                   0.067425330           0.001535384
## Class.ASD                                      0.079153044           0.082095008
##                                   contry_of_resAzerbaijan contry_of_resBahamas
## gender                                         0.036113373          -0.002357681
## ethnicityAsian                                -0.017380810           0.045695732
## ethnicityBlack                                -0.009633713          -0.013633842
## ethnicityHispanic                             -0.005180582          -0.007331674
## ethnicityLatino                               -0.006458566          -0.009140304
## ethnicityMiddle.Eastern.                      -0.014645519          -0.020726659
## ethnicityOthers                                0.080767023           0.044671379
## ethnicityPasifika                             -0.004758551          -0.006734406
## ethnicitySouth.Asian                          -0.008768388          -0.012409215
## ethnicityTurkish                              -0.003501795          -0.004955817
## ethnicityWhite.European                       -0.026574217          -0.037608414
## jundice                                       -0.012451204           0.072144839
## austim                                        -0.014553801           0.058961335
## contry_of_resAfghanistan                      -0.005180582          -0.007331674
## contry_of_resAmericanSamoa                    -0.002015986          -0.002853067
## contry_of_resAngola                           -0.001424501          -0.002015986
## contry_of_resArgentina                        -0.002015986          -0.002853067
## contry_of_resArmenia                          -0.002015986          -0.002853067
## contry_of_resAruba                            -0.001424501          -0.002015986
## contry_of_resAustralia                        -0.007542928          -0.010674917
```

```
## contry_of_resAustria                -0.002855110        -0.004040614
## contry_of_resAzerbaijan               1.000000000        -0.002015986
## contry_of_resBahamas                 -0.002015986         1.000000000
## contry_of_resBangladesh              -0.002470831        -0.003496774
## contry_of_resBelgium                 -0.002470831        -0.003496774
## contry_of_resBolivia                 -0.001424501        -0.002015986
## contry_of_resBrazil                  -0.004298065        -0.006082716
## contry_of_resBurundi                 -0.001424501        -0.002015986
## contry_of_resCanada                  -0.005572921        -0.007886919
## contry_of_resChile                   -0.001424501        -0.002015986
## contry_of_resChina                   -0.001424501        -0.002015986
## contry_of_resCosta.Rica              -0.001424501        -0.002015986
## contry_of_resCyprus                  -0.001424501        -0.002015986
## contry_of_resCzech.Republic          -0.001424501        -0.002015986
## contry_of_resEcuador                 -0.001424501        -0.002015986
## contry_of_resEgypt                   -0.002470831        -0.003496774
## contry_of_resEthiopia                -0.002015986        -0.002853067
## contry_of_resFinland                 -0.001424501        -0.002015986
## contry_of_resFrance                  -0.004758551        -0.006734406
## contry_of_resGermany                 -0.002855110        -0.004040614
## contry_of_resHong.Kong               -0.001424501        -0.002015986
## contry_of_resIceland                 -0.002015986        -0.002853067
## contry_of_resIndia                   -0.013620052        -0.019275396
## contry_of_resIndonesia               -0.001424501        -0.002015986
## contry_of_resIran                    -0.003785087        -0.005356738
## contry_of_resIraq                    -0.001424501        -0.002015986
## contry_of_resIreland                 -0.003194396        -0.004520779
## contry_of_resItaly                   -0.003194396        -0.004520779
## contry_of_resJapan                   -0.001424501        -0.002015986
## contry_of_resJordan                  -0.010102491        -0.014297266
## contry_of_resKazakhstan              -0.002470831        -0.003496774
## contry_of_resLebanon                 -0.001424501        -0.002015986
## contry_of_resMalaysia                -0.003194396        -0.004520779
## contry_of_resMexico                  -0.004049338        -0.005730712
## contry_of_resNepal                   -0.001424501        -0.002015986
## contry_of_resNetherlands             -0.004533826        -0.006416370
## contry_of_resNew.Zealand             -0.013524849        -0.019140662
## contry_of_resNicaragua               -0.001424501        -0.002015986
## contry_of_resNiger                   -0.001424501        -0.002015986
## contry_of_resOman                    -0.001424501        -0.002015986
## contry_of_resPakistan                -0.002470831        -0.003496774
## contry_of_resPhilippines             -0.002855110        -0.004040614
## contry_of_resPortugal                -0.001424501        -0.002015986
## contry_of_resRomania                 -0.002470831        -0.003496774
## contry_of_resRussia                  -0.003785087        -0.005356738
## contry_of_resSaudi.Arabia            -0.002855110        -0.004040614
## contry_of_resSerbia                  -0.001424501        -0.002015986
## contry_of_resSierra.Leone            -0.001424501        -0.002015986
## contry_of_resSouth.Africa            -0.002015986        -0.002853067
## contry_of_resSpain                   -0.002470831        -0.003496774
## contry_of_resSri.Lanka               -0.005380044        -0.007613957
## contry_of_resSweden                  -0.002015986        -0.002853067
## contry_of_resTonga                   -0.001424501        -0.002015986
## contry_of_resTurkey                  -0.001424501        -0.002015986
```

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## contry_of_resUkraine                           -0.002015986          -0.002853067
## contry_of_resUnited.Arab.Emirates              -0.013714898          -0.019409624
## contry_of_resUnited.Kingdom                     -0.013237002          -0.018733296
## contry_of_resUnited.States                      -0.016517513          -0.023375947
## contry_of_resUruguay                            -0.001424501          -0.002015986
## contry_of_resViet.Nam                           -0.003194396          -0.004520779
## used_app_before                                 -0.004973740          -0.007038945
## relationHealth.care.professional                -0.002855110           0.351028367
## relationOthers                                   0.092680870           0.054706045
## relationParent                                  -0.010443831          -0.014780339
## relationRelative                                -0.007687030          -0.010878853
## relationSelf                                    -0.063857897          -0.090373095
## Class.ASD                                       -0.022886574           0.027848185
##                                   contry_of_resBangladesh contry_of_resBelgium
## gender                                          -0.0247326558           0.062639490
## ethnicityAsian                                   0.0272879096          -0.030147421
## ethnicityBlack                                  -0.0167099006          -0.016709901
## ethnicityHispanic                               -0.0089858412          -0.008985841
## ethnicityLatino                                 -0.0112025336          -0.011202534
## ethnicityMiddle.Eastern.                        -0.0254029946          -0.025402995
## ethnicityOthers                                 -0.0305920777          -0.030592078
## ethnicityPasifika                               -0.0082538183          -0.008253818
## ethnicitySouth.Asian                             0.0837901853          -0.015208975
## ethnicityTurkish                                -0.0060739448          -0.006073945
## ethnicityWhite.European                          0.0002637688           0.092978509
## jundice                                         -0.0215969053          -0.021596905
## austim                                           0.0397614672           0.039761467
## contry_of_resAfghanistan                        -0.0089858412          -0.008985841
## contry_of_resAmericanSamoa                      -0.0034967743          -0.003496774
## contry_of_resAngola                             -0.0024708311          -0.002470831
## contry_of_resArgentina                          -0.0034967743          -0.003496774
## contry_of_resArmenia                            -0.0034967743          -0.003496774
## contry_of_resAruba                              -0.0024708311          -0.002470831
## contry_of_resAustralia                          -0.0130833856          -0.013083386
## contry_of_resAustria                            -0.0049522552          -0.004952255
## contry_of_resAzerbaijan                         -0.0024708311          -0.002470831
## contry_of_resBahamas                            -0.0034967743          -0.003496774
## contry_of_resBangladesh                          1.0000000000          -0.004285714
## contry_of_resBelgium                            -0.0042857143           1.000000000
## contry_of_resBolivia                            -0.0024708311          -0.002470831
## contry_of_resBrazil                             -0.0074550941          -0.007455094
## contry_of_resBurundi                            -0.0024708311          -0.002470831
## contry_of_resCanada                             -0.0096663612          -0.009666361
## contry_of_resChile                              -0.0024708311          -0.002470831
## contry_of_resChina                              -0.0024708311          -0.002470831
## contry_of_resCosta.Rica                         -0.0024708311          -0.002470831
## contry_of_resCyprus                             -0.0024708311          -0.002470831
## contry_of_resCzech.Republic                     -0.0024708311          -0.002470831
## contry_of_resEcuador                            -0.0024708311          -0.002470831
## contry_of_resEgypt                              -0.0042857143          -0.004285714
## contry_of_resEthiopia                           -0.0034967743          -0.003496774
## contry_of_resFinland                            -0.0024708311          -0.002470831
## contry_of_resFrance                             -0.0082538183          -0.008253818
## contry_of_resGermany                            -0.0049522552          -0.004952255
```

```
## contry_of_resHong.Kong                        -0.0024708311           -0.002470831
## contry_of_resIceland                          -0.0034967743           -0.003496774
## contry_of_resIndia                            -0.0236242987           -0.023624299
## contry_of_resIndonesia                        -0.0024708311           -0.002470831
## contry_of_resIran                             -0.0065653216           -0.006565322
## contry_of_resIraq                             -0.0024708311           -0.002470831
## contry_of_resIreland                          -0.0055407544           -0.005540754
## contry_of_resItaly                            -0.0055407544           -0.005540754
## contry_of_resJapan                            -0.0024708311           -0.002470831
## contry_of_resJordan                           -0.0175230063           -0.017523006
## contry_of_resKazakhstan                       -0.0042857143           -0.004285714
## contry_of_resLebanon                          -0.0024708311           -0.002470831
## contry_of_resMalaysia                         -0.0055407544           -0.005540754
## contry_of_resMexico                           -0.0070236716           -0.007023672
## contry_of_resNepal                            -0.0024708311           -0.002470831
## contry_of_resNetherlands                      -0.0078640269           -0.007864027
## contry_of_resNew.Zealand                      -0.0234591665           -0.023459166
## contry_of_resNicaragua                        -0.0024708311           -0.002470831
## contry_of_resNiger                            -0.0024708311           -0.002470831
## contry_of_resOman                             -0.0024708311           -0.002470831
## contry_of_resPakistan                         -0.0042857143           -0.004285714
## contry_of_resPhilippines                      -0.0049522552           -0.004952255
## contry_of_resPortugal                         -0.0024708311           -0.002470831
## contry_of_resRomania                          -0.0042857143           -0.004285714
## contry_of_resRussia                           -0.0065653216           -0.006565322
## contry_of_resSaudi.Arabia                     -0.0049522552           -0.004952255
## contry_of_resSerbia                           -0.0024708311           -0.002470831
## contry_of_resSierra.Leone                     -0.0024708311           -0.002470831
## contry_of_resSouth.Africa                     -0.0034967743           -0.003496774
## contry_of_resSpain                            -0.0042857143           -0.004285714
## contry_of_resSri.Lanka                        -0.0093318127           -0.009331813
## contry_of_resSweden                           -0.0034967743           -0.003496774
## contry_of_resTonga                            -0.0024708311           -0.002470831
## contry_of_resTurkey                           -0.0024708311           -0.002470831
## contry_of_resUkraine                          -0.0034967743           -0.003496774
## contry_of_resUnited.Arab.Emirates             -0.0237888109           -0.023788811
## contry_of_resUnited.Kingdom                   -0.0229598900           -0.022959890
## contry_of_resUnited.States                    -0.0286500130           -0.028650013
## contry_of_resUruguay                          -0.0024708311           -0.002470831
## contry_of_resViet.Nam                         -0.0055407544           -0.005540754
## used_app_before                               -0.0086270677           -0.008627068
## relationHealth.care.professional              -0.0049522552           -0.004952255
## relationOthers                                -0.0266595584           -0.026659558
## relationParent                                -0.0181150701           -0.018115070
## relationRelative                              -0.0133333333           -0.013333333
## relationSelf                                   0.0386926469            0.038692647
## Class.ASD                                      0.0095217505            0.009521751
##                                   contry_of_resBolivia contry_of_resBrazil
## gender                                    -0.039445261          0.007638924
## ethnicityAsian                            -0.017380810         -0.052442100
## ethnicityBlack                            -0.009633713          0.076536218
## ethnicityHispanic                         -0.005180582         -0.015631068
## ethnicityLatino                            0.220560023          0.437159555
## ethnicityMiddle.Eastern.                  -0.014645519         -0.044189067
```

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## ethnicityOthers                      -0.017637166    -0.020225679
## ethnicityPasifika                     -0.004758551    -0.014357698
## ethnicitySouth.Asian                  -0.008768388    -0.026456345
## ethnicityTurkish                      -0.003501795    -0.010565760
## ethnicityWhite.European               -0.026574217    -0.080180831
## jundice                               -0.012451204    -0.037568291
## austim                                -0.014553801     0.144551463
## contry_of_resAfghanistan              -0.005180582    -0.015631068
## contry_of_resAmericanSamoa            -0.002015986    -0.006082716
## contry_of_resAngola                   -0.001424501    -0.004298065
## contry_of_resArgentina                -0.002015986    -0.006082716
## contry_of_resArmenia                  -0.002015986    -0.006082716
## contry_of_resAruba                    -0.001424501    -0.004298065
## contry_of_resAustralia                -0.007542928    -0.022758836
## contry_of_resAustria                  -0.002855110    -0.008614557
## contry_of_resAzerbaijan               -0.001424501    -0.004298065
## contry_of_resBahamas                  -0.002015986    -0.006082716
## contry_of_resBangladesh               -0.002470831    -0.007455094
## contry_of_resBelgium                  -0.002470831    -0.007455094
## contry_of_resBolivia                   1.000000000    -0.004298065
## contry_of_resBrazil                   -0.004298065     1.000000000
## contry_of_resBurundi                  -0.001424501    -0.004298065
## contry_of_resCanada                   -0.005572921    -0.016814847
## contry_of_resChile                    -0.001424501    -0.004298065
## contry_of_resChina                    -0.001424501    -0.004298065
## contry_of_resCosta.Rica               -0.001424501    -0.004298065
## contry_of_resCyprus                   -0.001424501    -0.004298065
## contry_of_resCzech.Republic           -0.001424501    -0.004298065
## contry_of_resEcuador                  -0.001424501    -0.004298065
## contry_of_resEgypt                    -0.002470831    -0.007455094
## contry_of_resEthiopia                 -0.002015986    -0.006082716
## contry_of_resFinland                  -0.001424501    -0.004298065
## contry_of_resFrance                   -0.004758551    -0.014357698
## contry_of_resGermany                  -0.002855110    -0.008614557
## contry_of_resHong.Kong                -0.001424501    -0.004298065
## contry_of_resIceland                  -0.002015986    -0.006082716
## contry_of_resIndia                    -0.013620052    -0.041094986
## contry_of_resIndonesia                -0.001424501    -0.004298065
## contry_of_resIran                     -0.003785087    -0.011420521
## contry_of_resIraq                     -0.001424501    -0.004298065
## contry_of_resIreland                  -0.003194396    -0.009638264
## contry_of_resItaly                    -0.003194396    -0.009638264
## contry_of_resJapan                    -0.001424501    -0.004298065
## contry_of_resJordan                   -0.010102491    -0.030481654
## contry_of_resKazakhstan               -0.002470831    -0.007455094
## contry_of_resLebanon                  -0.001424501    -0.004298065
## contry_of_resMalaysia                 -0.003194396    -0.009638264
## contry_of_resMexico                   -0.004049338    -0.012217831
## contry_of_resNepal                    -0.001424501    -0.004298065
## contry_of_resNetherlands              -0.004533826    -0.013679647
## contry_of_resNew.Zealand              -0.013524849    -0.040807735
## contry_of_resNicaragua                -0.001424501    -0.004298065
## contry_of_resNiger                    -0.001424501    -0.004298065
## contry_of_resOman                     -0.001424501    -0.004298065
```

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## contry_of_resPakistan                   -0.002470831    -0.007455094
## contry_of_resPhilippines                 -0.002855110    -0.008614557
## contry_of_resPortugal                    -0.001424501    -0.004298065
## contry_of_resRomania                     -0.002470831    -0.007455094
## contry_of_resRussia                      -0.003785087    -0.011420521
## contry_of_resSaudi.Arabia                -0.002855110    -0.008614557
## contry_of_resSerbia                      -0.001424501    -0.004298065
## contry_of_resSierra.Leone                -0.001424501    -0.004298065
## contry_of_resSouth.Africa                -0.002015986    -0.006082716
## contry_of_resSpain                       -0.002470831    -0.007455094
## contry_of_resSri.Lanka                   -0.005380044    -0.016232893
## contry_of_resSweden                      -0.002015986    -0.006082716
## contry_of_resTonga                       -0.001424501    -0.004298065
## contry_of_resTurkey                      -0.001424501    -0.004298065
## contry_of_resUkraine                     -0.002015986    -0.006082716
## contry_of_resUnited.Arab.Emirates        -0.013714898    -0.041381159
## contry_of_resUnited.Kingdom              -0.013237002    -0.039939233
## contry_of_resUnited.States               -0.016517513    -0.049837326
## contry_of_resUruguay                     -0.001424501    -0.004298065
## contry_of_resViet.Nam                    -0.003194396    -0.009638264
## used_app_before                          -0.004973740     0.180361590
## relationHealth.care.professional         -0.002855110    -0.008614557
## relationOthers                           -0.015369962    -0.010150947
## relationParent                           -0.010443831     0.017716500
## relationRelative                          0.185312329    -0.023193626
## relationSelf                             -0.063857897     0.009533062
## Class.ASD                                -0.022886574     0.073641704
##                                 contry_of_resBurundi contry_of_resCanada
## gender                                   -0.039445261    -0.055784116
## ethnicityAsian                           -0.017380810    -0.042088137
## ethnicityBlack                           -0.009633713     0.085545079
## ethnicityHispanic                        -0.005180582    -0.020267423
## ethnicityLatino                          -0.006458566    -0.025267138
## ethnicityMiddle.Eastern.                  0.097265346    -0.028108282
## ethnicityOthers                          -0.017637166     0.007995232
## ethnicityPasifika                        -0.004758551    -0.018616357
## ethnicitySouth.Asian                     -0.008768388     0.010354606
## ethnicityTurkish                         -0.003501795    -0.013699687
## ethnicityWhite.European                  -0.026574217     0.021506590
## jundice                                  -0.012451204    -0.048711480
## austim                                   -0.014553801     0.031033923
## contry_of_resAfghanistan                 -0.005180582    -0.020267423
## contry_of_resAmericanSamoa               -0.002015986    -0.007886919
## contry_of_resAngola                      -0.001424501    -0.005572921
## contry_of_resArgentina                   -0.002015986    -0.007886919
## contry_of_resArmenia                     -0.002015986    -0.007886919
## contry_of_resAruba                       -0.001424501    -0.005572921
## contry_of_resAustralia                   -0.007542928    -0.029509370
## contry_of_resAustria                     -0.002855110    -0.011169734
## contry_of_resAzerbaijan                  -0.001424501    -0.005572921
## contry_of_resBahamas                     -0.002015986    -0.007886919
## contry_of_resBangladesh                  -0.002470831    -0.009666361
## contry_of_resBelgium                     -0.002470831    -0.009666361
## contry_of_resBolivia                     -0.001424501    -0.005572921
```

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## contry_of_resBrazil                     -0.004298065   -0.016814847
## contry_of_resBurundi                     1.000000000   -0.005572921
## contry_of_resCanada                     -0.005572921    1.000000000
## contry_of_resChile                      -0.001424501   -0.005572921
## contry_of_resChina                      -0.001424501   -0.005572921
## contry_of_resCosta.Rica                 -0.001424501   -0.005572921
## contry_of_resCyprus                     -0.001424501   -0.005572921
## contry_of_resCzech.Republic             -0.001424501   -0.005572921
## contry_of_resEcuador                    -0.001424501   -0.005572921
## contry_of_resEgypt                      -0.002470831   -0.009666361
## contry_of_resEthiopia                   -0.002015986   -0.007886919
## contry_of_resFinland                    -0.001424501   -0.005572921
## contry_of_resFrance                     -0.004758551   -0.018616357
## contry_of_resGermany                    -0.002855110   -0.011169734
## contry_of_resHong.Kong                  -0.001424501   -0.005572921
## contry_of_resIceland                    -0.002015986   -0.007886919
## contry_of_resIndia                      -0.013620052   -0.053284234
## contry_of_resIndonesia                  -0.001424501   -0.005572921
## contry_of_resIran                       -0.003785087   -0.014807980
## contry_of_resIraq                       -0.001424501   -0.005572921
## contry_of_resIreland                    -0.003194396   -0.012497084
## contry_of_resItaly                      -0.003194396   -0.012497084
## contry_of_resJapan                      -0.001424501   -0.005572921
## contry_of_resJordan                     -0.010102491   -0.039522865
## contry_of_resKazakhstan                 -0.002470831   -0.009666361
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## contry_of_resMexico                     -0.004049338   -0.015841781
## contry_of_resNepal                      -0.001424501   -0.005572921
## contry_of_resNetherlands                -0.004533826   -0.017737189
## contry_of_resNew.Zealand                -0.013524849   -0.052911781
## contry_of_resNicaragua                  -0.001424501   -0.005572921
## contry_of_resNiger                      -0.001424501   -0.005572921
## contry_of_resOman                       -0.001424501   -0.005572921
## contry_of_resPakistan                   -0.002470831   -0.009666361
## contry_of_resPhilippines                -0.002855110   -0.011169734
## contry_of_resPortugal                   -0.001424501   -0.005572921
## contry_of_resRomania                    -0.002470831   -0.009666361
## contry_of_resRussia                     -0.003785087   -0.014807980
## contry_of_resSaudi.Arabia               -0.002855110   -0.011169734
## contry_of_resSerbia                     -0.001424501   -0.005572921
## contry_of_resSierra.Leone               -0.001424501   -0.005572921
## contry_of_resSouth.Africa               -0.002015986   -0.007886919
## contry_of_resSpain                      -0.002470831   -0.009666361
## contry_of_resSri.Lanka                  -0.005380044   -0.021047757
## contry_of_resSweden                     -0.002015986   -0.007886919
## contry_of_resTonga                      -0.001424501   -0.005572921
## contry_of_resTurkey                     -0.001424501   -0.005572921
## contry_of_resUkraine                    -0.002015986   -0.007886919
## contry_of_resUnited.Arab.Emirates       -0.013714898   -0.053655289
## contry_of_resUnited.Kingdom             -0.013237002   -0.051785671
## contry_of_resUnited.States              -0.016517513   -0.064619654
## contry_of_resUruguay                    -0.001424501   -0.005572921
## contry_of_resViet.Nam                   -0.003194396   -0.012497084
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## used_app_before                            -0.004973740         0.056536926
## relationHealth.care.professional           -0.002855110        -0.011169734
## relationOthers                             -0.015369962        -0.060130215
## relationParent                              0.136396439        -0.002560451
## relationRelative                           -0.007687030        -0.030073124
## relationSelf                               -0.063857897         0.064797663
## Class.ASD                                  -0.022886574         0.132488949
##                                  contry_of_resChile contry_of_resChina
## gender                                     -0.039445261        -0.039445261
## ethnicityAsian                             -0.017380810         0.081958289
## ethnicityBlack                             -0.009633713        -0.009633713
## ethnicityHispanic                          -0.005180582        -0.005180582
## ethnicityLatino                             0.220560023        -0.006458566
## ethnicityMiddle.Eastern.                   -0.014645519        -0.014645519
## ethnicityOthers                            -0.017637166        -0.017637166
## ethnicityPasifika                          -0.004758551        -0.004758551
## ethnicitySouth.Asian                       -0.008768388        -0.008768388
## ethnicityTurkish                           -0.003501795        -0.003501795
## ethnicityWhite.European                    -0.026574217        -0.026574217
## jundice                                    -0.012451204        -0.012451204
## austim                                     -0.014553801        -0.014553801
## contry_of_resAfghanistan                   -0.005180582        -0.005180582
## contry_of_resAmericanSamoa                 -0.002015986        -0.002015986
## contry_of_resAngola                        -0.001424501        -0.001424501
## contry_of_resArgentina                     -0.002015986        -0.002015986
## contry_of_resArmenia                       -0.002015986        -0.002015986
## contry_of_resAruba                         -0.001424501        -0.001424501
## contry_of_resAustralia                     -0.007542928        -0.007542928
## contry_of_resAustria                       -0.002855110        -0.002855110
## contry_of_resAzerbaijan                    -0.001424501        -0.001424501
## contry_of_resBahamas                       -0.002015986        -0.002015986
## contry_of_resBangladesh                    -0.002470831        -0.002470831
## contry_of_resBelgium                       -0.002470831        -0.002470831
## contry_of_resBolivia                       -0.001424501        -0.001424501
## contry_of_resBrazil                        -0.004298065        -0.004298065
## contry_of_resBurundi                       -0.001424501        -0.001424501
## contry_of_resCanada                        -0.005572921        -0.005572921
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## contry_of_resChina                         -0.001424501         1.000000000
## contry_of_resCosta.Rica                    -0.001424501        -0.001424501
## contry_of_resCyprus                        -0.001424501        -0.001424501
## contry_of_resCzech.Republic                -0.001424501        -0.001424501
## contry_of_resEcuador                       -0.001424501        -0.001424501
## contry_of_resEgypt                         -0.002470831        -0.002470831
## contry_of_resEthiopia                      -0.002015986        -0.002015986
## contry_of_resFinland                       -0.001424501        -0.001424501
## contry_of_resFrance                        -0.004758551        -0.004758551
## contry_of_resGermany                       -0.002855110        -0.002855110
## contry_of_resHong.Kong                     -0.001424501        -0.001424501
## contry_of_resIceland                       -0.002015986        -0.002015986
## contry_of_resIndia                         -0.013620052        -0.013620052
## contry_of_resIndonesia                     -0.001424501        -0.001424501
## contry_of_resIran                          -0.003785087        -0.003785087
## contry_of_resIraq                          -0.001424501        -0.001424501
```

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## contry_of_resIreland                -0.003194396        -0.003194396
## contry_of_resItaly                  -0.003194396        -0.003194396
## contry_of_resJapan                  -0.001424501        -0.001424501
## contry_of_resJordan                 -0.010102491        -0.010102491
## contry_of_resKazakhstan             -0.002470831        -0.002470831
## contry_of_resLebanon                -0.001424501        -0.001424501
## contry_of_resMalaysia               -0.003194396        -0.003194396
## contry_of_resMexico                 -0.004049338        -0.004049338
## contry_of_resNepal                  -0.001424501        -0.001424501
## contry_of_resNetherlands            -0.004533826        -0.004533826
## contry_of_resNew.Zealand            -0.013524849        -0.013524849
## contry_of_resNicaragua              -0.001424501        -0.001424501
## contry_of_resNiger                  -0.001424501        -0.001424501
## contry_of_resOman                   -0.001424501        -0.001424501
## contry_of_resPakistan               -0.002470831        -0.002470831
## contry_of_resPhilippines            -0.002855110        -0.002855110
## contry_of_resPortugal               -0.001424501        -0.001424501
## contry_of_resRomania                -0.002470831        -0.002470831
## contry_of_resRussia                 -0.003785087        -0.003785087
## contry_of_resSaudi.Arabia           -0.002855110        -0.002855110
## contry_of_resSerbia                 -0.001424501        -0.001424501
## contry_of_resSierra.Leone           -0.001424501        -0.001424501
## contry_of_resSouth.Africa           -0.002015986        -0.002015986
## contry_of_resSpain                  -0.002470831        -0.002470831
## contry_of_resSri.Lanka              -0.005380044        -0.005380044
## contry_of_resSweden                 -0.002015986        -0.002015986
## contry_of_resTonga                  -0.001424501        -0.001424501
## contry_of_resTurkey                 -0.001424501        -0.001424501
## contry_of_resUkraine                -0.002015986        -0.002015986
## contry_of_resUnited.Arab.Emirates   -0.013714898        -0.013714898
## contry_of_resUnited.Kingdom         -0.013237002        -0.013237002
## contry_of_resUnited.States          -0.016517513        -0.016517513
## contry_of_resUruguay                -0.001424501        -0.001424501
## contry_of_resViet.Nam               -0.003194396        -0.003194396
## used_app_before                     -0.004973740        -0.004973740
## relationHealth.care.professional    -0.002855110        -0.002855110
## relationOthers                      -0.015369962        -0.015369962
## relationParent                      -0.010443831        -0.010443831
## relationRelative                    -0.007687030        -0.007687030
## relationSelf                         0.022307365         0.022307365
## Class.ASD                           -0.022886574         0.062241794
##                              contry_of_resCosta.Rica contry_of_resCyprus
## gender                                   0.036113373        -0.039445261
## ethnicityAsian                          -0.017380810        -0.017380810
## ethnicityBlack                          -0.009633713        -0.009633713
## ethnicityHispanic                       -0.005180582        -0.005180582
## ethnicityLatino                          0.220560023        -0.006458566
## ethnicityMiddle.Eastern.                -0.014645519        -0.014645519
## ethnicityOthers                         -0.017637166        -0.017637166
## ethnicityPasifika                       -0.004758551        -0.004758551
## ethnicitySouth.Asian                    -0.008768388        -0.008768388
## ethnicityTurkish                        -0.003501795        -0.003501795
## ethnicityWhite.European                 -0.026574217         0.053604644
## jundice                                  0.114406718        -0.012451204
```

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## austim                                    0.097878309          -0.014553801
## contry_of_resAfghanistan                  -0.005180582          -0.005180582
## contry_of_resAmericanSamoa                -0.002015986          -0.002015986
## contry_of_resAngola                       -0.001424501          -0.001424501
## contry_of_resArgentina                    -0.002015986          -0.002015986
## contry_of_resArmenia                      -0.002015986          -0.002015986
## contry_of_resAruba                        -0.001424501          -0.001424501
## contry_of_resAustralia                    -0.007542928          -0.007542928
## contry_of_resAustria                      -0.002855110          -0.002855110
## contry_of_resAzerbaijan                   -0.001424501          -0.001424501
## contry_of_resBahamas                      -0.002015986          -0.002015986
## contry_of_resBangladesh                   -0.002470831          -0.002470831
## contry_of_resBelgium                      -0.002470831          -0.002470831
## contry_of_resBolivia                      -0.001424501          -0.001424501
## contry_of_resBrazil                       -0.004298065          -0.004298065
## contry_of_resBurundi                      -0.001424501          -0.001424501
## contry_of_resCanada                       -0.005572921          -0.005572921
## contry_of_resChile                        -0.001424501          -0.001424501
## contry_of_resChina                        -0.001424501          -0.001424501
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## contry_of_resCyprus                       -0.001424501           1.000000000
## contry_of_resCzech.Republic               -0.001424501          -0.001424501
## contry_of_resEcuador                      -0.001424501          -0.001424501
## contry_of_resEgypt                        -0.002470831          -0.002470831
## contry_of_resEthiopia                     -0.002015986          -0.002015986
## contry_of_resFinland                      -0.001424501          -0.001424501
## contry_of_resFrance                       -0.004758551          -0.004758551
## contry_of_resGermany                      -0.002855110          -0.002855110
## contry_of_resHong.Kong                    -0.001424501          -0.001424501
## contry_of_resIceland                      -0.002015986          -0.002015986
## contry_of_resIndia                        -0.013620052          -0.013620052
## contry_of_resIndonesia                    -0.001424501          -0.001424501
## contry_of_resIran                         -0.003785087          -0.003785087
## contry_of_resIraq                         -0.001424501          -0.001424501
## contry_of_resIreland                      -0.003194396          -0.003194396
## contry_of_resItaly                        -0.003194396          -0.003194396
## contry_of_resJapan                        -0.001424501          -0.001424501
## contry_of_resJordan                       -0.010102491          -0.010102491
## contry_of_resKazakhstan                   -0.002470831          -0.002470831
## contry_of_resLebanon                      -0.001424501          -0.001424501
## contry_of_resMalaysia                     -0.003194396          -0.003194396
## contry_of_resMexico                       -0.004049338          -0.004049338
## contry_of_resNepal                        -0.001424501          -0.001424501
## contry_of_resNetherlands                  -0.004533826          -0.004533826
## contry_of_resNew.Zealand                  -0.013524849          -0.013524849
## contry_of_resNicaragua                    -0.001424501          -0.001424501
## contry_of_resNiger                        -0.001424501          -0.001424501
## contry_of_resOman                         -0.001424501          -0.001424501
## contry_of_resPakistan                     -0.002470831          -0.002470831
## contry_of_resPhilippines                  -0.002855110          -0.002855110
## contry_of_resPortugal                     -0.001424501          -0.001424501
## contry_of_resRomania                      -0.002470831          -0.002470831
## contry_of_resRussia                       -0.003785087          -0.003785087
## contry_of_resSaudi.Arabia                 -0.002855110          -0.002855110
```

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## contry_of_resSerbia                       -0.001424501            -0.001424501
## contry_of_resSierra.Leone                  -0.001424501            -0.001424501
## contry_of_resSouth.Africa                  -0.002015986            -0.002015986
## contry_of_resSpain                         -0.002470831            -0.002470831
## contry_of_resSri.Lanka                     -0.005380044            -0.005380044
## contry_of_resSweden                        -0.002015986            -0.002015986
## contry_of_resTonga                         -0.001424501            -0.001424501
## contry_of_resTurkey                        -0.001424501            -0.001424501
## contry_of_resUkraine                       -0.002015986            -0.002015986
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## contry_of_resUnited.Kingdom                -0.013237002            -0.013237002
## contry_of_resUnited.States                 -0.016517513            -0.016517513
## contry_of_resUruguay                       -0.001424501            -0.001424501
## contry_of_resViet.Nam                      -0.003194396            -0.003194396
## used_app_before                            -0.004973740            -0.004973740
## relationHealth.care.professional           -0.002855110            -0.002855110
## relationOthers                             -0.015369962            -0.015369962
## relationParent                              0.136396439            -0.010443831
## relationRelative                           -0.007687030            -0.007687030
## relationSelf                               -0.063857897             0.022307365
## Class.ASD                                  -0.022886574             0.062241794
##                                 contry_of_resCzech.Republic
## gender                                       -0.039445261
## ethnicityAsian                               -0.017380810
## ethnicityBlack                               -0.009633713
## ethnicityHispanic                            -0.005180582
## ethnicityLatino                              -0.006458566
## ethnicityMiddle.Eastern.                     -0.014645519
## ethnicityOthers                              -0.017637166
## ethnicityPasifika                            -0.004758551
## ethnicitySouth.Asian                         -0.008768388
## ethnicityTurkish                             -0.003501795
## ethnicityWhite.European                       0.053604644
## jundice                                       0.114406718
## austim                                       -0.014553801
## contry_of_resAfghanistan                     -0.005180582
## contry_of_resAmericanSamoa                   -0.002015986
## contry_of_resAngola                          -0.001424501
## contry_of_resArgentina                       -0.002015986
## contry_of_resArmenia                         -0.002015986
## contry_of_resAruba                           -0.001424501
## contry_of_resAustralia                       -0.007542928
## contry_of_resAustria                         -0.002855110
## contry_of_resAzerbaijan                      -0.001424501
## contry_of_resBahamas                         -0.002015986
## contry_of_resBangladesh                      -0.002470831
## contry_of_resBelgium                         -0.002470831
## contry_of_resBolivia                         -0.001424501
## contry_of_resBrazil                          -0.004298065
## contry_of_resBurundi                         -0.001424501
## contry_of_resCanada                          -0.005572921
## contry_of_resChile                           -0.001424501
## contry_of_resChina                           -0.001424501
## contry_of_resCosta.Rica                      -0.001424501
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## contry_of_resCyprus                      -0.001424501
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## contry_of_resEthiopia                    -0.002015986
## contry_of_resFinland                     -0.001424501
## contry_of_resFrance                      -0.004758551
## contry_of_resGermany                     -0.002855110
## contry_of_resHong.Kong                   -0.001424501
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## contry_of_resIndia                       -0.013620052
## contry_of_resIndonesia                   -0.001424501
## contry_of_resIran                        -0.003785087
## contry_of_resIraq                        -0.001424501
## contry_of_resIreland                     -0.003194396
## contry_of_resItaly                       -0.003194396
## contry_of_resJapan                       -0.001424501
## contry_of_resJordan                      -0.010102491
## contry_of_resKazakhstan                  -0.002470831
## contry_of_resLebanon                     -0.001424501
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## contry_of_resMexico                      -0.004049338
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## contry_of_resNicaragua                   -0.001424501
## contry_of_resNiger                       -0.001424501
## contry_of_resOman                        -0.001424501
## contry_of_resPakistan                    -0.002470831
## contry_of_resPhilippines                 -0.002855110
## contry_of_resPortugal                    -0.001424501
## contry_of_resRomania                     -0.002470831
## contry_of_resRussia                      -0.003785087
## contry_of_resSaudi.Arabia                -0.002855110
## contry_of_resSerbia                      -0.001424501
## contry_of_resSierra.Leone                -0.001424501
## contry_of_resSouth.Africa                -0.002015986
## contry_of_resSpain                       -0.002470831
## contry_of_resSri.Lanka                   -0.005380044
## contry_of_resSweden                      -0.002015986
## contry_of_resTonga                       -0.001424501
## contry_of_resTurkey                      -0.001424501
## contry_of_resUkraine                     -0.002015986
## contry_of_resUnited.Arab.Emirates        -0.013714898
## contry_of_resUnited.Kingdom              -0.013237002
## contry_of_resUnited.States               -0.016517513
## contry_of_resUruguay                     -0.001424501
## contry_of_resViet.Nam                    -0.003194396
## used_app_before                          -0.004973740
## relationHealth.care.professional         -0.002855110
## relationOthers                           -0.015369962
## relationParent                           -0.010443831
## relationRelative                         -0.007687030
## relationSelf                              0.022307365
```

```
## Class.ASD                              -0.022886574
##                          contry_of_resEcuador contry_of_resEgypt
## gender                          0.036113373        -0.024732656
## ethnicityAsian                 -0.017380810        -0.030147421
## ethnicityBlack                 -0.009633713        -0.016709901
## ethnicityHispanic              -0.005180582        -0.008985841
## ethnicityLatino                 0.220560023        -0.011202534
## ethnicityMiddle.Eastern.       -0.014645519         0.104005014
## ethnicityOthers                -0.017637166         0.026302712
## ethnicityPasifika              -0.004758551        -0.008253818
## ethnicitySouth.Asian           -0.008768388        -0.015208975
## ethnicityTurkish               -0.003501795        -0.006073945
## ethnicityWhite.European        -0.026574217        -0.046093601
## jundice                        -0.012451204        -0.021596905
## austim                         -0.014553801         0.039761467
## contry_of_resAfghanistan       -0.005180582        -0.008985841
## contry_of_resAmericanSamoa     -0.002015986        -0.003496774
## contry_of_resAngola            -0.001424501        -0.002470831
## contry_of_resArgentina         -0.002015986        -0.003496774
## contry_of_resArmenia           -0.002015986        -0.003496774
## contry_of_resAruba             -0.001424501        -0.002470831
## contry_of_resAustralia         -0.007542928        -0.013083386
## contry_of_resAustria           -0.002855110        -0.004952255
## contry_of_resAzerbaijan        -0.001424501        -0.002470831
## contry_of_resBahamas           -0.002015986        -0.003496774
## contry_of_resBangladesh        -0.002470831        -0.004285714
## contry_of_resBelgium           -0.002470831        -0.004285714
## contry_of_resBolivia           -0.001424501        -0.002470831
## contry_of_resBrazil            -0.004298065        -0.007455094
## contry_of_resBurundi           -0.001424501        -0.002470831
## contry_of_resCanada            -0.005572921        -0.009666361
## contry_of_resChile             -0.001424501        -0.002470831
## contry_of_resChina             -0.001424501        -0.002470831
## contry_of_resCosta.Rica        -0.001424501        -0.002470831
## contry_of_resCyprus            -0.001424501        -0.002470831
## contry_of_resCzech.Republic    -0.001424501        -0.002470831
## contry_of_resEcuador            1.000000000        -0.002470831
## contry_of_resEgypt             -0.002470831         1.000000000
## contry_of_resEthiopia          -0.002015986        -0.003496774
## contry_of_resFinland           -0.001424501        -0.002470831
## contry_of_resFrance            -0.004758551        -0.008253818
## contry_of_resGermany           -0.002855110        -0.004952255
## contry_of_resHong.Kong         -0.001424501        -0.002470831
## contry_of_resIceland           -0.002015986        -0.003496774
## contry_of_resIndia             -0.013620052        -0.023624299
## contry_of_resIndonesia         -0.001424501        -0.002470831
## contry_of_resIran              -0.003785087        -0.006565322
## contry_of_resIraq              -0.001424501        -0.002470831
## contry_of_resIreland           -0.003194396        -0.005540754
## contry_of_resItaly             -0.003194396        -0.005540754
## contry_of_resJapan             -0.001424501        -0.002470831
## contry_of_resJordan            -0.010102491        -0.017523006
## contry_of_resKazakhstan        -0.002470831        -0.004285714
## contry_of_resLebanon           -0.001424501        -0.002470831
```

```
## contry_of_resMalaysia                    -0.003194396       -0.005540754
## contry_of_resMexico                       -0.004049338       -0.007023672
## contry_of_resNepal                        -0.001424501       -0.002470831
## contry_of_resNetherlands                  -0.004533826       -0.007864027
## contry_of_resNew.Zealand                  -0.013524849       -0.023459166
## contry_of_resNicaragua                    -0.001424501       -0.002470831
## contry_of_resNiger                        -0.001424501       -0.002470831
## contry_of_resOman                         -0.001424501       -0.002470831
## contry_of_resPakistan                     -0.002470831       -0.004285714
## contry_of_resPhilippines                  -0.002855110       -0.004952255
## contry_of_resPortugal                     -0.001424501       -0.002470831
## contry_of_resRomania                      -0.002470831       -0.004285714
## contry_of_resRussia                       -0.003785087       -0.006565322
## contry_of_resSaudi.Arabia                 -0.002855110       -0.004952255
## contry_of_resSerbia                       -0.001424501       -0.002470831
## contry_of_resSierra.Leone                 -0.001424501       -0.002470831
## contry_of_resSouth.Africa                 -0.002015986       -0.003496774
## contry_of_resSpain                        -0.002470831       -0.004285714
## contry_of_resSri.Lanka                    -0.005380044       -0.009331813
## contry_of_resSweden                       -0.002015986       -0.003496774
## contry_of_resTonga                        -0.001424501       -0.002470831
## contry_of_resTurkey                       -0.001424501       -0.002470831
## contry_of_resUkraine                      -0.002015986       -0.003496774
## contry_of_resUnited.Arab.Emirates         -0.013714898       -0.023788811
## contry_of_resUnited.Kingdom               -0.013237002       -0.022959890
## contry_of_resUnited.States                -0.016517513       -0.028650013
## contry_of_resUruguay                      -0.001424501       -0.002470831
## contry_of_resViet.Nam                     -0.003194396       -0.005540754
## used_app_before                           -0.004973740       -0.008627068
## relationHealth.care.professional          -0.002855110       -0.004952255
## relationOthers                            -0.015369962        0.035812673
## relationParent                            -0.010443831       -0.018115070
## relationRelative                          -0.007687030       -0.013333333
## relationSelf                               0.022307365       -0.011125908
## Class.ASD                                 -0.022886574       -0.039697298
##                                  contry_of_resEthiopia contry_of_resFinland
## gender                                     0.051108437        0.036113373
## ethnicityAsian                            -0.024597703       -0.017380810
## ethnicityBlack                             0.209263618       -0.009633713
## ethnicityHispanic                         -0.007331674       -0.005180582
## ethnicityLatino                           -0.009140304       -0.006458566
## ethnicityMiddle.Eastern.                  -0.020726659       -0.014645519
## ethnicityOthers                           -0.024960504       -0.017637166
## ethnicityPasifika                         -0.006734406       -0.004758551
## ethnicitySouth.Asian                      -0.012409215       -0.008768388
## ethnicityTurkish                          -0.004955817       -0.003501795
## ethnicityWhite.European                   -0.037608414        0.053604644
## jundice                                   -0.017621217       -0.012451204
## austim                                    -0.020596858       -0.014553801
## contry_of_resAfghanistan                  -0.007331674       -0.005180582
## contry_of_resAmericanSamoa                -0.002853067       -0.002015986
## contry_of_resAngola                       -0.002015986       -0.001424501
## contry_of_resArgentina                    -0.002853067       -0.002015986
## contry_of_resArmenia                      -0.002853067       -0.002015986
```

```
## contry_of_resAruba              -0.002015986    -0.001424501
## contry_of_resAustralia          -0.010674917    -0.007542928
## contry_of_resAustria            -0.004040614    -0.002855110
## contry_of_resAzerbaijan         -0.002015986    -0.001424501
## contry_of_resBahamas            -0.002853067    -0.002015986
## contry_of_resBangladesh         -0.003496774    -0.002470831
## contry_of_resBelgium            -0.003496774    -0.002470831
## contry_of_resBolivia            -0.002015986    -0.001424501
## contry_of_resBrazil             -0.006082716    -0.004298065
## contry_of_resBurundi            -0.002015986    -0.001424501
## contry_of_resCanada             -0.007886919    -0.005572921
## contry_of_resChile              -0.002015986    -0.001424501
## contry_of_resChina              -0.002015986    -0.001424501
## contry_of_resCosta.Rica         -0.002015986    -0.001424501
## contry_of_resCyprus             -0.002015986    -0.001424501
## contry_of_resCzech.Republic     -0.002015986    -0.001424501
## contry_of_resEcuador            -0.002015986    -0.001424501
## contry_of_resEgypt              -0.003496774    -0.002470831
## contry_of_resEthiopia            1.000000000    -0.002015986
## contry_of_resFinland            -0.002015986     1.000000000
## contry_of_resFrance             -0.006734406    -0.004758551
## contry_of_resGermany            -0.004040614    -0.002855110
## contry_of_resHong.Kong          -0.002015986    -0.001424501
## contry_of_resIceland            -0.002853067    -0.002015986
## contry_of_resIndia              -0.019275396    -0.013620052
## contry_of_resIndonesia          -0.002015986    -0.001424501
## contry_of_resIran               -0.005356738    -0.003785087
## contry_of_resIraq               -0.002015986    -0.001424501
## contry_of_resIreland            -0.004520779    -0.003194396
## contry_of_resItaly              -0.004520779    -0.003194396
## contry_of_resJapan              -0.002015986    -0.001424501
## contry_of_resJordan             -0.014297266    -0.010102491
## contry_of_resKazakhstan         -0.003496774    -0.002470831
## contry_of_resLebanon            -0.002015986    -0.001424501
## contry_of_resMalaysia           -0.004520779    -0.003194396
## contry_of_resMexico             -0.005730712    -0.004049338
## contry_of_resNepal              -0.002015986    -0.001424501
## contry_of_resNetherlands        -0.006416370    -0.004533826
## contry_of_resNew.Zealand        -0.019140662    -0.013524849
## contry_of_resNicaragua          -0.002015986    -0.001424501
## contry_of_resNiger              -0.002015986    -0.001424501
## contry_of_resOman               -0.002015986    -0.001424501
## contry_of_resPakistan           -0.003496774    -0.002470831
## contry_of_resPhilippines        -0.004040614    -0.002855110
## contry_of_resPortugal           -0.002015986    -0.001424501
## contry_of_resRomania            -0.003496774    -0.002470831
## contry_of_resRussia             -0.005356738    -0.003785087
## contry_of_resSaudi.Arabia       -0.004040614    -0.002855110
## contry_of_resSerbia             -0.002015986    -0.001424501
## contry_of_resSierra.Leone       -0.002015986    -0.001424501
## contry_of_resSouth.Africa       -0.002853067    -0.002015986
## contry_of_resSpain              -0.003496774    -0.002470831
## contry_of_resSri.Lanka          -0.007613957    -0.005380044
## contry_of_resSweden             -0.002853067    -0.002015986
```

```
## contry_of_resTonga                 -0.002015986    -0.001424501
## contry_of_resTurkey                -0.002015986    -0.001424501
## contry_of_resUkraine               -0.002853067    -0.002015986
## contry_of_resUnited.Arab.Emirates  -0.019409624    -0.013714898
## contry_of_resUnited.Kingdom        -0.018733296    -0.013237002
## contry_of_resUnited.States         -0.023375947    -0.016517513
## contry_of_resUruguay               -0.002015986    -0.001424501
## contry_of_resViet.Nam              -0.004520779    -0.003194396
## used_app_before                    -0.007038945    -0.004973740
## relationHealth.care.professional    0.351028367    -0.002855110
## relationOthers                     -0.021751907    -0.015369962
## relationParent                     -0.014780339    -0.010443831
## relationRelative                   -0.010878853     0.185312329
## relationSelf                       -0.029401612    -0.063857897
## Class.ASD                          -0.032389581     0.062241794
##                            contry_of_resFrance contry_of_resGermany
## gender                             -0.062929600    -0.003339031
## ethnicityAsian                     -0.058060645    -0.034836135
## ethnicityBlack                      0.350457989    -0.019308728
## ethnicityHispanic                  -0.017305750    -0.010383375
## ethnicityLatino                    -0.021574858    -0.012944821
## ethnicityMiddle.Eastern.            0.019047251    -0.029353826
## ethnicityOthers                    -0.058917005    -0.035349948
## ethnicityPasifika                  -0.015895954    -0.009537503
## ethnicitySouth.Asian               -0.029290827    -0.017574369
## ethnicityTurkish                   -0.011697755    -0.007018602
## ethnicityWhite.European            -0.064422365     0.107439104
## jundice                            -0.041593284    -0.024955790
## austim                              0.019670220    -0.029169998
## contry_of_resAfghanistan           -0.017305750    -0.010383375
## contry_of_resAmericanSamoa         -0.006734406    -0.004040614
## contry_of_resAngola                -0.004758551    -0.002855110
## contry_of_resArgentina             -0.006734406    -0.004040614
## contry_of_resArmenia               -0.006734406    -0.004040614
## contry_of_resAruba                 -0.004758551    -0.002855110
## contry_of_resAustralia             -0.025197174    -0.015118195
## contry_of_resAustria               -0.009537503    -0.005722461
## contry_of_resAzerbaijan            -0.004758551    -0.002855110
## contry_of_resBahamas               -0.006734406    -0.004040614
## contry_of_resBangladesh            -0.008253818    -0.004952255
## contry_of_resBelgium               -0.008253818    -0.004952255
## contry_of_resBolivia               -0.004758551    -0.002855110
## contry_of_resBrazil                -0.014357698    -0.008614557
## contry_of_resBurundi               -0.004758551    -0.002855110
## contry_of_resCanada                -0.018616357    -0.011169734
## contry_of_resChile                 -0.004758551    -0.002855110
## contry_of_resChina                 -0.004758551    -0.002855110
## contry_of_resCosta.Rica            -0.004758551    -0.002855110
## contry_of_resCyprus                -0.004758551    -0.002855110
## contry_of_resCzech.Republic        -0.004758551    -0.002855110
## contry_of_resEcuador               -0.004758551    -0.002855110
## contry_of_resEgypt                 -0.008253818    -0.004952255
## contry_of_resEthiopia              -0.006734406    -0.004040614
## contry_of_resFinland               -0.004758551    -0.002855110
```

```
## contry_of_resFrance                           1.000000000        -0.009537503
## contry_of_resGermany                         -0.009537503         1.000000000
## contry_of_resHong.Kong                       -0.004758551        -0.002855110
## contry_of_resIceland                         -0.006734406        -0.004040614
## contry_of_resIndia                           -0.045497823        -0.027298496
## contry_of_resIndonesia                       -0.004758551        -0.002855110
## contry_of_resIran                            -0.012644093        -0.007586401
## contry_of_resIraq                            -0.004758551        -0.002855110
## contry_of_resIreland                         -0.010670889        -0.006402487
## contry_of_resItaly                           -0.010670889        -0.006402487
## contry_of_resJapan                           -0.004758551        -0.002855110
## contry_of_resJordan                          -0.033747399        -0.020248293
## contry_of_resKazakhstan                      -0.008253818        -0.004952255
## contry_of_resLebanon                         -0.004758551        -0.002855110
## contry_of_resMalaysia                        -0.010670889        -0.006402487
## contry_of_resMexico                          -0.013526825        -0.008116037
## contry_of_resNepal                           -0.004758551        -0.002855110
## contry_of_resNetherlands                     -0.015145258        -0.009087089
## contry_of_resNew.Zealand                     -0.045179796        -0.027107682
## contry_of_resNicaragua                       -0.004758551        -0.002855110
## contry_of_resNiger                           -0.004758551        -0.002855110
## contry_of_resOman                            -0.004758551        -0.002855110
## contry_of_resPakistan                        -0.008253818        -0.004952255
## contry_of_resPhilippines                     -0.009537503        -0.005722461
## contry_of_resPortugal                        -0.004758551        -0.002855110
## contry_of_resRomania                         -0.008253818        -0.004952255
## contry_of_resRussia                          -0.012644093        -0.007586401
## contry_of_resSaudi.Arabia                    -0.009537503        -0.005722461
## contry_of_resSerbia                          -0.004758551        -0.002855110
## contry_of_resSierra.Leone                    -0.004758551        -0.002855110
## contry_of_resSouth.Africa                    -0.006734406        -0.004040614
## contry_of_resSpain                           -0.008253818        -0.004952255
## contry_of_resSri.Lanka                       -0.017972053        -0.010783154
## contry_of_resSweden                          -0.006734406        -0.004040614
## contry_of_resTonga                           -0.004758551        -0.002855110
## contry_of_resTurkey                          -0.004758551        -0.002855110
## contry_of_resUkraine                         -0.006734406        -0.004040614
## contry_of_resUnited.Arab.Emirates            -0.045814655        -0.027488594
## contry_of_resUnited.Kingdom                  -0.044218244        -0.026530755
## contry_of_resUnited.States                   -0.055176800        -0.033105841
## contry_of_resUruguay                         -0.004758551        -0.002855110
## contry_of_resViet.Nam                        -0.010670889        -0.006402487
## used_app_before                              -0.016614791        -0.009968803
## relationHealth.care.professional             -0.009537503        -0.005722461
## relationOthers                               -0.051343402        -0.030805818
## relationParent                               0.321854422        -0.020932438
## relationRelative                            -0.025678546        -0.015407016
## relationSelf                                 -0.134816951         0.044710368
## Class.ASD                                    0.052807133         0.039439583
##                                 contry_of_resHong.Kong contry_of_resIceland
## gender                                       -0.039445261        -0.002357681
## ethnicityAsian                               -0.017380810         0.045695732
## ethnicityBlack                               -0.009633713        -0.013633842
## ethnicityHispanic                            -0.005180582        -0.007331674
```

```
## ethnicityLatino                      -0.006458566    -0.009140304
## ethnicityMiddle.Eastern.             -0.014645519     0.058462695
## ethnicityOthers                       0.080767023    -0.024960504
## ethnicityPasifika                    -0.004758551    -0.006734406
## ethnicitySouth.Asian                 -0.008768388    -0.012409215
## ethnicityTurkish                     -0.003501795    -0.004955817
## ethnicityWhite.European              -0.026574217    -0.037608414
## jundice                              -0.012451204    -0.017621217
## austim                               -0.014553801    -0.020596858
## contry_of_resAfghanistan             -0.005180582    -0.007331674
## contry_of_resAmericanSamoa           -0.002015986    -0.002853067
## contry_of_resAngola                  -0.001424501    -0.002015986
## contry_of_resArgentina               -0.002015986    -0.002853067
## contry_of_resArmenia                 -0.002015986    -0.002853067
## contry_of_resAruba                   -0.001424501    -0.002015986
## contry_of_resAustralia               -0.007542928    -0.010674917
## contry_of_resAustria                 -0.002855110    -0.004040614
## contry_of_resAzerbaijan              -0.001424501    -0.002015986
## contry_of_resBahamas                 -0.002015986    -0.002853067
## contry_of_resBangladesh              -0.002470831    -0.003496774
## contry_of_resBelgium                 -0.002470831    -0.003496774
## contry_of_resBolivia                 -0.001424501    -0.002015986
## contry_of_resBrazil                  -0.004298065    -0.006082716
## contry_of_resBurundi                 -0.001424501    -0.002015986
## contry_of_resCanada                  -0.005572921    -0.007886919
## contry_of_resChile                   -0.001424501    -0.002015986
## contry_of_resChina                   -0.001424501    -0.002015986
## contry_of_resCosta.Rica              -0.001424501    -0.002015986
## contry_of_resCyprus                  -0.001424501    -0.002015986
## contry_of_resCzech.Republic          -0.001424501    -0.002015986
## contry_of_resEcuador                 -0.001424501    -0.002015986
## contry_of_resEgypt                   -0.002470831    -0.003496774
## contry_of_resEthiopia                -0.002015986    -0.002853067
## contry_of_resFinland                 -0.001424501    -0.002015986
## contry_of_resFrance                  -0.004758551    -0.006734406
## contry_of_resGermany                 -0.002855110    -0.004040614
## contry_of_resHong.Kong                1.000000000    -0.002015986
## contry_of_resIceland                 -0.002015986     1.000000000
## contry_of_resIndia                   -0.013620052    -0.019275396
## contry_of_resIndonesia               -0.001424501    -0.002015986
## contry_of_resIran                    -0.003785087    -0.005356738
## contry_of_resIraq                    -0.001424501    -0.002015986
## contry_of_resIreland                 -0.003194396    -0.004520779
## contry_of_resItaly                   -0.003194396    -0.004520779
## contry_of_resJapan                   -0.001424501    -0.002015986
## contry_of_resJordan                  -0.010102491    -0.014297266
## contry_of_resKazakhstan              -0.002470831    -0.003496774
## contry_of_resLebanon                 -0.001424501    -0.002015986
## contry_of_resMalaysia                -0.003194396    -0.004520779
## contry_of_resMexico                  -0.004049338    -0.005730712
## contry_of_resNepal                   -0.001424501    -0.002015986
## contry_of_resNetherlands             -0.004533826    -0.006416370
## contry_of_resNew.Zealand             -0.013524849    -0.019140662
## contry_of_resNicaragua               -0.001424501    -0.002015986
```

```
## contry_of_resNiger                      -0.001424501         -0.002015986
## contry_of_resOman                       -0.001424501         -0.002015986
## contry_of_resPakistan                   -0.002470831         -0.003496774
## contry_of_resPhilippines                -0.002855110         -0.004040614
## contry_of_resPortugal                   -0.001424501         -0.002015986
## contry_of_resRomania                    -0.002470831         -0.003496774
## contry_of_resRussia                     -0.003785087         -0.005356738
## contry_of_resSaudi.Arabia               -0.002855110         -0.004040614
## contry_of_resSerbia                     -0.001424501         -0.002015986
## contry_of_resSierra.Leone               -0.001424501         -0.002015986
## contry_of_resSouth.Africa               -0.002015986         -0.002853067
## contry_of_resSpain                      -0.002470831         -0.003496774
## contry_of_resSri.Lanka                  -0.005380044         -0.007613957
## contry_of_resSweden                     -0.002015986         -0.002853067
## contry_of_resTonga                      -0.001424501         -0.002015986
## contry_of_resTurkey                     -0.001424501         -0.002015986
## contry_of_resUkraine                    -0.002015986         -0.002853067
## contry_of_resUnited.Arab.Emirates       -0.013714898         -0.019409624
## contry_of_resUnited.Kingdom             -0.013237002         -0.018733296
## contry_of_resUnited.States              -0.016517513         -0.023375947
## contry_of_resUruguay                    -0.001424501         -0.002015986
## contry_of_resViet.Nam                   -0.003194396         -0.004520779
## used_app_before                         -0.004973740         -0.007038945
## relationHealth.care.professional        -0.002855110         -0.004040614
## relationOthers                           0.092680870         -0.021751907
## relationParent                          -0.010443831          0.089125445
## relationRelative                        -0.007687030         -0.010878853
## relationSelf                            -0.063857897         -0.029401612
## Class.ASD                               -0.022886574         -0.032389581
##                             contry_of_resIndia contry_of_resIndonesia
## gender                              0.05096376            0.036113373
## ethnicityAsian                      0.46702300            0.081958289
## ethnicityBlack                     -0.09211059           -0.009633713
## ethnicityHispanic                  -0.04953298           -0.005180582
## ethnicityLatino                    -0.06175213           -0.006458566
## ethnicityMiddle.Eastern.           -0.12681984           -0.014645519
## ethnicityOthers                    -0.12217112           -0.017637166
## ethnicityPasifika                  -0.04549782           -0.004758551
## ethnicitySouth.Asian                0.34060931           -0.008768388
## ethnicityTurkish                   -0.03348163           -0.003501795
## ethnicityWhite.European            -0.24461908           -0.026574217
## jundice                            -0.05915194           -0.012451204
## austim                             -0.11260984           -0.014553801
## contry_of_resAfghanistan           -0.04953298           -0.005180582
## contry_of_resAmericanSamoa         -0.01927540           -0.002015986
## contry_of_resAngola                -0.01362005           -0.001424501
## contry_of_resArgentina             -0.01927540           -0.002015986
## contry_of_resArmenia               -0.01927540           -0.002015986
## contry_of_resAruba                 -0.01362005           -0.001424501
## contry_of_resAustralia             -0.07212002           -0.007542928
## contry_of_resAustria               -0.02729850           -0.002855110
## contry_of_resAzerbaijan            -0.01362005           -0.001424501
## contry_of_resBahamas               -0.01927540           -0.002015986
## contry_of_resBangladesh            -0.02362430           -0.002470831
```

```
## contry_of_resBelgium                      -0.02362430        -0.002470831
## contry_of_resBolivia                      -0.01362005        -0.001424501
## contry_of_resBrazil                       -0.04109499        -0.004298065
## contry_of_resBurundi                      -0.01362005        -0.001424501
## contry_of_resCanada                       -0.05328423        -0.005572921
## contry_of_resChile                        -0.01362005        -0.001424501
## contry_of_resChina                        -0.01362005        -0.001424501
## contry_of_resCosta.Rica                   -0.01362005        -0.001424501
## contry_of_resCyprus                       -0.01362005        -0.001424501
## contry_of_resCzech.Republic               -0.01362005        -0.001424501
## contry_of_resEcuador                      -0.01362005        -0.001424501
## contry_of_resEgypt                        -0.02362430        -0.002470831
## contry_of_resEthiopia                     -0.01927540        -0.002015986
## contry_of_resFinland                      -0.01362005        -0.001424501
## contry_of_resFrance                       -0.04549782        -0.004758551
## contry_of_resGermany                      -0.02729850        -0.002855110
## contry_of_resHong.Kong                    -0.01362005        -0.001424501
## contry_of_resIceland                      -0.01927540        -0.002015986
## contry_of_resIndia                         1.00000000        -0.013620052
## contry_of_resIndonesia                    -0.01362005         1.000000000
## contry_of_resIran                         -0.03619026        -0.003785087
## contry_of_resIraq                         -0.01362005        -0.001424501
## contry_of_resIreland                      -0.03054250        -0.003194396
## contry_of_resItaly                        -0.03054250        -0.003194396
## contry_of_resJapan                        -0.01362005        -0.001424501
## contry_of_resJordan                       -0.09659270        -0.010102491
## contry_of_resKazakhstan                   -0.02362430        -0.002470831
## contry_of_resLebanon                      -0.01362005        -0.001424501
## contry_of_resMalaysia                     -0.03054250        -0.003194396
## contry_of_resMexico                       -0.03871684        -0.004049338
## contry_of_resNepal                        -0.01362005        -0.001424501
## contry_of_resNetherlands                  -0.04334916        -0.004533826
## contry_of_resNew.Zealand                  -0.12931482        -0.013524849
## contry_of_resNicaragua                    -0.01362005        -0.001424501
## contry_of_resNiger                        -0.01362005        -0.001424501
## contry_of_resOman                         -0.01362005        -0.001424501
## contry_of_resPakistan                     -0.02362430        -0.002470831
## contry_of_resPhilippines                  -0.02729850        -0.002855110
## contry_of_resPortugal                     -0.01362005        -0.001424501
## contry_of_resRomania                      -0.02362430        -0.002470831
## contry_of_resRussia                       -0.03619026        -0.003785087
## contry_of_resSaudi.Arabia                 -0.02729850        -0.002855110
## contry_of_resSerbia                       -0.01362005        -0.001424501
## contry_of_resSierra.Leone                 -0.01362005        -0.001424501
## contry_of_resSouth.Africa                 -0.01927540        -0.002015986
## contry_of_resSpain                        -0.02362430        -0.002470831
## contry_of_resSri.Lanka                    -0.05144009        -0.005380044
## contry_of_resSweden                       -0.01927540        -0.002015986
## contry_of_resTonga                        -0.01362005        -0.001424501
## contry_of_resTurkey                       -0.01362005        -0.001424501
## contry_of_resUkraine                      -0.01927540        -0.002015986
## contry_of_resUnited.Arab.Emirates         -0.13113193        -0.013714898
## contry_of_resUnited.Kingdom               -0.12656264        -0.013237002
## contry_of_resUnited.States                -0.15792851        -0.016517513
```

```
## contry_of_resUruguay                   -0.01362005          -0.001424501
## contry_of_resViet.Nam                  -0.03054250          -0.003194396
## used_app_before                        -0.04755530          -0.004973740
## relationHealth.care.professional       -0.02729850          -0.002855110
## relationOthers                         -0.13420208          -0.015369962
## relationParent                          0.00414219          -0.010443831
## relationRelative                       -0.05071609          -0.007687030
## relationSelf                            0.13191899           0.022307365
## Class.ASD                              -0.15853332          -0.022886574
##                              contry_of_resIran contry_of_resIraq
## gender                              0.009914024       0.036113373
## ethnicityAsian                     -0.046183087      -0.017380810
## ethnicityBlack                     -0.025598037      -0.009633713
## ethnicityHispanic                  -0.013765485      -0.005180582
## ethnicityLatino                    -0.017161255      -0.006458566
## ethnicityMiddle.Eastern.            0.046045460      -0.014645519
## ethnicityOthers                     0.139902038       0.080767023
## ethnicityPasifika                  -0.012644093      -0.004758551
## ethnicitySouth.Asian               -0.023298756      -0.008768388
## ethnicityTurkish                   -0.009304727      -0.003501795
## ethnicityWhite.European            -0.070611174      -0.026574217
## jundice                            -0.033084480      -0.012451204
## austim                             -0.038671355      -0.014553801
## contry_of_resAfghanistan           -0.013765485      -0.005180582
## contry_of_resAmericanSamoa         -0.005356738      -0.002015986
## contry_of_resAngola                -0.003785087      -0.001424501
## contry_of_resArgentina             -0.005356738      -0.002015986
## contry_of_resArmenia               -0.005356738      -0.002015986
## contry_of_resAruba                 -0.003785087      -0.001424501
## contry_of_resAustralia             -0.020042548      -0.007542928
## contry_of_resAustria               -0.007586401      -0.002855110
## contry_of_resAzerbaijan            -0.003785087      -0.001424501
## contry_of_resBahamas               -0.005356738      -0.002015986
## contry_of_resBangladesh            -0.006565322      -0.002470831
## contry_of_resBelgium               -0.006565322      -0.002470831
## contry_of_resBolivia               -0.003785087      -0.001424501
## contry_of_resBrazil                -0.011420521      -0.004298065
## contry_of_resBurundi               -0.003785087      -0.001424501
## contry_of_resCanada                -0.014807980      -0.005572921
## contry_of_resChile                 -0.003785087      -0.001424501
## contry_of_resChina                 -0.003785087      -0.001424501
## contry_of_resCosta.Rica            -0.003785087      -0.001424501
## contry_of_resCyprus                -0.003785087      -0.001424501
## contry_of_resCzech.Republic        -0.003785087      -0.001424501
## contry_of_resEcuador               -0.003785087      -0.001424501
## contry_of_resEgypt                 -0.006565322      -0.002470831
## contry_of_resEthiopia              -0.005356738      -0.002015986
## contry_of_resFinland               -0.003785087      -0.001424501
## contry_of_resFrance                -0.012644093      -0.004758551
## contry_of_resGermany               -0.007586401      -0.002855110
## contry_of_resHong.Kong             -0.003785087      -0.001424501
## contry_of_resIceland               -0.005356738      -0.002015986
## contry_of_resIndia                 -0.036190261      -0.013620052
## contry_of_resIndonesia             -0.003785087      -0.001424501
```

```
## contry_of_resIran                     1.000000000    -0.003785087
## contry_of_resIraq                    -0.003785087     1.000000000
## contry_of_resIreland                 -0.008487928    -0.003194396
## contry_of_resItaly                   -0.008487928    -0.003194396
## contry_of_resJapan                   -0.003785087    -0.001424501
## contry_of_resJordan                  -0.026843640    -0.010102491
## contry_of_resKazakhstan              -0.006565322    -0.002470831
## contry_of_resLebanon                 -0.003785087    -0.001424501
## contry_of_resMalaysia                -0.008487928    -0.003194396
## contry_of_resMexico                  -0.010759621    -0.004049338
## contry_of_resNepal                   -0.003785087    -0.001424501
## contry_of_resNetherlands             -0.012046969    -0.004533826
## contry_of_resNew.Zealand             -0.035937294    -0.013524849
## contry_of_resNicaragua               -0.003785087    -0.001424501
## contry_of_resNiger                   -0.003785087    -0.001424501
## contry_of_resOman                    -0.003785087    -0.001424501
## contry_of_resPakistan                -0.006565322    -0.002470831
## contry_of_resPhilippines             -0.007586401    -0.002855110
## contry_of_resPortugal                -0.003785087    -0.001424501
## contry_of_resRomania                 -0.006565322    -0.002470831
## contry_of_resRussia                  -0.010057471    -0.003785087
## contry_of_resSaudi.Arabia            -0.007586401    -0.002855110
## contry_of_resSerbia                  -0.003785087    -0.001424501
## contry_of_resSierra.Leone            -0.003785087    -0.001424501
## contry_of_resSouth.Africa            -0.005356738    -0.002015986
## contry_of_resSpain                   -0.006565322    -0.002470831
## contry_of_resSri.Lanka               -0.014295482    -0.005380044
## contry_of_resSweden                  -0.005356738    -0.002015986
## contry_of_resTonga                   -0.003785087    -0.001424501
## contry_of_resTurkey                  -0.003785087    -0.001424501
## contry_of_resUkraine                 -0.005356738    -0.002015986
## contry_of_resUnited.Arab.Emirates    -0.036442279    -0.013714898
## contry_of_resUnited.Kingdom          -0.035172448    -0.013237002
## contry_of_resUnited.States           -0.043889195    -0.016517513
## contry_of_resUruguay                 -0.003785087    -0.001424501
## contry_of_resViet.Nam                -0.008487928    -0.003194396
## used_app_before                      -0.013215877    -0.004973740
## relationHealth.care.professional     -0.007586401    -0.002855110
## relationOthers                        0.164235147     0.092680870
## relationParent                       -0.027750628    -0.010443831
## relationRelative                     -0.020425445    -0.007687030
## relationSelf                         -0.104263827    -0.063857897
## Class.ASD                            -0.060812624    -0.022886574
##                               contry_of_resIreland contry_of_resItaly
## gender                                 0.013207943        -0.054567121
## ethnicityAsian                        -0.038975873        -0.038975873
## ethnicityBlack                        -0.021603273        -0.021603273
## ethnicityHispanic                     -0.011617279        -0.011617279
## ethnicityLatino                       -0.014483114         0.087333175
## ethnicityMiddle.Eastern.              -0.032842076        -0.032842076
## ethnicityOthers                       -0.039550744        -0.039550744
## ethnicityPasifika                     -0.010670889        -0.010670889
## ethnicitySouth.Asian                  -0.019662812        -0.019662812
## ethnicityTurkish                      -0.007852655        -0.007852655
```

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## ethnicityWhite.European                   0.120206585         0.084246913
## jundice                                   -0.027921401         0.028973512
## austim                                     0.017788632         0.017788632
## contry_of_resAfghanistan                  -0.011617279        -0.011617279
## contry_of_resAmericanSamoa                -0.004520779        -0.004520779
## contry_of_resAngola                       -0.003194396        -0.003194396
## contry_of_resArgentina                    -0.004520779        -0.004520779
## contry_of_resArmenia                      -0.004520779        -0.004520779
## contry_of_resAruba                        -0.003194396        -0.003194396
## contry_of_resAustralia                    -0.016914759        -0.016914759
## contry_of_resAustria                      -0.006402487        -0.006402487
## contry_of_resAzerbaijan                   -0.003194396        -0.003194396
## contry_of_resBahamas                      -0.004520779        -0.004520779
## contry_of_resBangladesh                   -0.005540754        -0.005540754
## contry_of_resBelgium                      -0.005540754        -0.005540754
## contry_of_resBolivia                      -0.003194396        -0.003194396
## contry_of_resBrazil                       -0.009638264        -0.009638264
## contry_of_resBurundi                      -0.003194396        -0.003194396
## contry_of_resCanada                       -0.012497084        -0.012497084
## contry_of_resChile                        -0.003194396        -0.003194396
## contry_of_resChina                        -0.003194396        -0.003194396
## contry_of_resCosta.Rica                   -0.003194396        -0.003194396
## contry_of_resCyprus                       -0.003194396        -0.003194396
## contry_of_resCzech.Republic               -0.003194396        -0.003194396
## contry_of_resEcuador                      -0.003194396        -0.003194396
## contry_of_resEgypt                        -0.005540754        -0.005540754
## contry_of_resEthiopia                     -0.004520779        -0.004520779
## contry_of_resFinland                      -0.003194396        -0.003194396
## contry_of_resFrance                       -0.010670889        -0.010670889
## contry_of_resGermany                      -0.006402487        -0.006402487
## contry_of_resHong.Kong                    -0.003194396        -0.003194396
## contry_of_resIceland                      -0.004520779        -0.004520779
## contry_of_resIndia                        -0.030542502        -0.030542502
## contry_of_resIndonesia                    -0.003194396        -0.003194396
## contry_of_resIran                         -0.008487928        -0.008487928
## contry_of_resIraq                         -0.003194396        -0.003194396
## contry_of_resIreland                       1.000000000        -0.007163324
## contry_of_resItaly                        -0.007163324         1.000000000
## contry_of_resJapan                        -0.003194396        -0.003194396
## contry_of_resJordan                       -0.022654491        -0.022654491
## contry_of_resKazakhstan                   -0.005540754        -0.005540754
## contry_of_resLebanon                      -0.003194396        -0.003194396
## contry_of_resMalaysia                     -0.007163324        -0.007163324
## contry_of_resMexico                       -0.009080502        -0.009080502
## contry_of_resNepal                        -0.003194396        -0.003194396
## contry_of_resNetherlands                  -0.010166950        -0.010166950
## contry_of_resNew.Zealand                  -0.030329012        -0.030329012
## contry_of_resNicaragua                    -0.003194396        -0.003194396
## contry_of_resNiger                        -0.003194396        -0.003194396
## contry_of_resOman                         -0.003194396        -0.003194396
## contry_of_resPakistan                     -0.005540754        -0.005540754
## contry_of_resPhilippines                  -0.006402487        -0.006402487
## contry_of_resPortugal                     -0.003194396        -0.003194396
## contry_of_resRomania                      -0.005540754        -0.005540754
```

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## contry_of_resRussia                        -0.008487928        -0.008487928
## contry_of_resSaudi.Arabia                   -0.006402487        -0.006402487
## contry_of_resSerbia                         -0.003194396        -0.003194396
## contry_of_resSierra.Leone                   -0.003194396        -0.003194396
## contry_of_resSouth.Africa                   -0.004520779        -0.004520779
## contry_of_resSpain                          -0.005540754        -0.005540754
## contry_of_resSri.Lanka                      -0.012064566        -0.012064566
## contry_of_resSweden                         -0.004520779        -0.004520779
## contry_of_resTonga                          -0.003194396        -0.003194396
## contry_of_resTurkey                         -0.003194396        -0.003194396
## contry_of_resUkraine                        -0.004520779        -0.004520779
## contry_of_resUnited.Arab.Emirates           -0.030755190        -0.030755190
## contry_of_resUnited.Kingdom                 -0.029683526        -0.029683526
## contry_of_resUnited.States                  -0.037039960        -0.037039960
## contry_of_resUruguay                        -0.003194396        -0.003194396
## contry_of_resViet.Nam                       -0.007163324        -0.007163324
## used_app_before                             -0.011153441        -0.011153441
## relationHealth.care.professional            -0.006402487        -0.006402487
## relationOthers                              -0.034466615        -0.034466615
## relationParent                              -0.023419936        -0.023419936
## relationRelative                             0.069320994        -0.017237903
## relationSelf                                 0.011378973         0.050023506
## Class.ASD                                    0.025036623         0.101395608
##                                  contry_of_resJapan contry_of_resJordan
## gender                                  0.036113373        -0.006114175
## ethnicityAsian                         -0.017380810        -0.123263805
## ethnicityBlack                         -0.009633713        -0.068321795
## ethnicityHispanic                      -0.005180582        -0.036740422
## ethnicityLatino                        -0.006458566        -0.045803815
## ethnicityMiddle.Eastern.               -0.014645519        -0.019432700
## ethnicityOthers                         0.080767023         0.498553280
## ethnicityPasifika                      -0.004758551        -0.033747399
## ethnicitySouth.Asian                   -0.008768388        -0.062184958
## ethnicityTurkish                       -0.003501795        -0.024834547
## ethnicityWhite.European                -0.026574217        -0.188462974
## jundice                                -0.012451204         0.007406259
## austim                                 -0.014553801        -0.069284476
## contry_of_resAfghanistan               -0.005180582        -0.036740422
## contry_of_resAmericanSamoa             -0.002015986        -0.014297266
## contry_of_resAngola                    -0.001424501        -0.010102491
## contry_of_resArgentina                 -0.002015986        -0.014297266
## contry_of_resArmenia                   -0.002015986        -0.014297266
## contry_of_resAruba                     -0.001424501        -0.010102491
## contry_of_resAustralia                 -0.007542928        -0.053494058
## contry_of_resAustria                   -0.002855110        -0.020248293
## contry_of_resAzerbaijan                -0.001424501        -0.010102491
## contry_of_resBahamas                   -0.002015986        -0.014297266
## contry_of_resBangladesh                -0.002470831        -0.017523006
## contry_of_resBelgium                   -0.002470831        -0.017523006
## contry_of_resBolivia                   -0.001424501        -0.010102491
## contry_of_resBrazil                    -0.004298065        -0.030481654
## contry_of_resBurundi                   -0.001424501        -0.010102491
## contry_of_resCanada                    -0.005572921        -0.039522865
## contry_of_resChile                     -0.001424501        -0.010102491
```

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## contry_of_resChina                     -0.001424501     -0.010102491
## contry_of_resCosta.Rica                 -0.001424501     -0.010102491
## contry_of_resCyprus                     -0.001424501     -0.010102491
## contry_of_resCzech.Republic             -0.001424501     -0.010102491
## contry_of_resEcuador                    -0.001424501     -0.010102491
## contry_of_resEgypt                      -0.002470831     -0.017523006
## contry_of_resEthiopia                   -0.002015986     -0.014297266
## contry_of_resFinland                    -0.001424501     -0.010102491
## contry_of_resFrance                     -0.004758551     -0.033747399
## contry_of_resGermany                    -0.002855110     -0.020248293
## contry_of_resHong.Kong                  -0.001424501     -0.010102491
## contry_of_resIceland                    -0.002015986     -0.014297266
## contry_of_resIndia                      -0.013620052     -0.096592705
## contry_of_resIndonesia                  -0.001424501     -0.010102491
## contry_of_resIran                       -0.003785087     -0.026843640
## contry_of_resIraq                       -0.001424501     -0.010102491
## contry_of_resIreland                    -0.003194396     -0.022654491
## contry_of_resItaly                      -0.003194396     -0.022654491
## contry_of_resJapan                       1.000000000     -0.010102491
## contry_of_resJordan                     -0.010102491      1.000000000
## contry_of_resKazakhstan                 -0.002470831     -0.017523006
## contry_of_resLebanon                    -0.001424501     -0.010102491
## contry_of_resMalaysia                   -0.003194396     -0.022654491
## contry_of_resMexico                     -0.004049338     -0.028717696
## contry_of_resNepal                      -0.001424501     -0.010102491
## contry_of_resNetherlands                -0.004533826     -0.032153658
## contry_of_resNew.Zealand                -0.013524849     -0.095917528
## contry_of_resNicaragua                  -0.001424501     -0.010102491
## contry_of_resNiger                      -0.001424501     -0.010102491
## contry_of_resOman                       -0.001424501     -0.010102491
## contry_of_resPakistan                   -0.002470831     -0.017523006
## contry_of_resPhilippines                -0.002855110     -0.020248293
## contry_of_resPortugal                   -0.001424501     -0.010102491
## contry_of_resRomania                    -0.002470831     -0.017523006
## contry_of_resRussia                     -0.003785087     -0.026843640
## contry_of_resSaudi.Arabia               -0.002855110     -0.020248293
## contry_of_resSerbia                     -0.001424501     -0.010102491
## contry_of_resSierra.Leone               -0.001424501     -0.010102491
## contry_of_resSouth.Africa               -0.002015986     -0.014297266
## contry_of_resSpain                      -0.002470831     -0.017523006
## contry_of_resSri.Lanka                  -0.005380044     -0.038154996
## contry_of_resSweden                     -0.002015986     -0.014297266
## contry_of_resTonga                      -0.001424501     -0.010102491
## contry_of_resTurkey                     -0.001424501     -0.010102491
## contry_of_resUkraine                    -0.002015986     -0.014297266
## contry_of_resUnited.Arab.Emirates       -0.013714898     -0.097265346
## contry_of_resUnited.Kingdom             -0.013237002     -0.093876136
## contry_of_resUnited.States              -0.016517513     -0.117141350
## contry_of_resUruguay                    -0.001424501     -0.010102491
## contry_of_resViet.Nam                   -0.003194396     -0.022654491
## used_app_before                         -0.004973740     -0.035273504
## relationHealth.care.professional        -0.002855110     -0.020248293
## relationOthers                           0.092680870      0.575767632
## relationParent                          -0.010443831     -0.074067114
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## relationRelative                             -0.007687030   -0.054516020
## relationSelf                                  -0.063857897   -0.387868441
## Class.ASD                                     -0.022886574   -0.136619934
##                           contry_of_resKazakhstan contry_of_resLebanon
## gender                                          0.018953417    0.036113373
## ethnicityAsian                                 -0.030147421   -0.017380810
## ethnicityBlack                                 -0.016709901   -0.009633713
## ethnicityHispanic                              -0.008985841   -0.005180582
## ethnicityLatino                                -0.011202534   -0.006458566
## ethnicityMiddle.Eastern.                       -0.025402995   -0.014645519
## ethnicityOthers                                 0.140092292    0.080767023
## ethnicityPasifika                              -0.008253818   -0.004758551
## ethnicitySouth.Asian                           -0.015208975   -0.008768388
## ethnicityTurkish                               -0.006073945   -0.003501795
## ethnicityWhite.European                        -0.046093601   -0.026574217
## jundice                                        -0.021596905   -0.012451204
## austim                                         -0.025243908   -0.014553801
## contry_of_resAfghanistan                       -0.008985841   -0.005180582
## contry_of_resAmericanSamoa                     -0.003496774   -0.002015986
## contry_of_resAngola                            -0.002470831   -0.001424501
## contry_of_resArgentina                         -0.003496774   -0.002015986
## contry_of_resArmenia                           -0.003496774   -0.002015986
## contry_of_resAruba                             -0.002470831   -0.001424501
## contry_of_resAustralia                         -0.013083386   -0.007542928
## contry_of_resAustria                           -0.004952255   -0.002855110
## contry_of_resAzerbaijan                        -0.002470831   -0.001424501
## contry_of_resBahamas                           -0.003496774   -0.002015986
## contry_of_resBangladesh                        -0.004285714   -0.002470831
## contry_of_resBelgium                           -0.004285714   -0.002470831
## contry_of_resBolivia                           -0.002470831   -0.001424501
## contry_of_resBrazil                            -0.007455094   -0.004298065
## contry_of_resBurundi                           -0.002470831   -0.001424501
## contry_of_resCanada                            -0.009666361   -0.005572921
## contry_of_resChile                             -0.002470831   -0.001424501
## contry_of_resChina                             -0.002470831   -0.001424501
## contry_of_resCosta.Rica                        -0.002470831   -0.001424501
## contry_of_resCyprus                            -0.002470831   -0.001424501
## contry_of_resCzech.Republic                    -0.002470831   -0.001424501
## contry_of_resEcuador                           -0.002470831   -0.001424501
## contry_of_resEgypt                             -0.004285714   -0.002470831
## contry_of_resEthiopia                          -0.003496774   -0.002015986
## contry_of_resFinland                           -0.002470831   -0.001424501
## contry_of_resFrance                            -0.008253818   -0.004758551
## contry_of_resGermany                           -0.004952255   -0.002855110
## contry_of_resHong.Kong                         -0.002470831   -0.001424501
## contry_of_resIceland                           -0.003496774   -0.002015986
## contry_of_resIndia                             -0.023624299   -0.013620052
## contry_of_resIndonesia                         -0.002470831   -0.001424501
## contry_of_resIran                              -0.006565322   -0.003785087
## contry_of_resIraq                              -0.002470831   -0.001424501
## contry_of_resIreland                           -0.005540754   -0.003194396
## contry_of_resItaly                             -0.005540754   -0.003194396
## contry_of_resJapan                             -0.002470831   -0.001424501
## contry_of_resJordan                            -0.017523006   -0.010102491
```

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## contry_of_resKazakhstan                   1.000000000           -0.002470831
## contry_of_resLebanon                      -0.002470831            1.000000000
## contry_of_resMalaysia                     -0.005540754           -0.003194396
## contry_of_resMexico                       -0.007023672           -0.004049338
## contry_of_resNepal                        -0.002470831           -0.001424501
## contry_of_resNetherlands                  -0.007864027           -0.004533826
## contry_of_resNew.Zealand                  -0.023459166           -0.013524849
## contry_of_resNicaragua                    -0.002470831           -0.001424501
## contry_of_resNiger                        -0.002470831           -0.001424501
## contry_of_resOman                         -0.002470831           -0.001424501
## contry_of_resPakistan                     -0.004285714           -0.002470831
## contry_of_resPhilippines                  -0.004952255           -0.002855110
## contry_of_resPortugal                     -0.002470831           -0.001424501
## contry_of_resRomania                      -0.004285714           -0.002470831
## contry_of_resRussia                       -0.006565322           -0.003785087
## contry_of_resSaudi.Arabia                 -0.004952255           -0.002855110
## contry_of_resSerbia                       -0.002470831           -0.001424501
## contry_of_resSierra.Leone                 -0.002470831           -0.001424501
## contry_of_resSouth.Africa                 -0.003496774           -0.002015986
## contry_of_resSpain                        -0.004285714           -0.002470831
## contry_of_resSri.Lanka                    -0.009331813           -0.005380044
## contry_of_resSweden                       -0.003496774           -0.002015986
## contry_of_resTonga                        -0.002470831           -0.001424501
## contry_of_resTurkey                       -0.002470831           -0.001424501
## contry_of_resUkraine                      -0.003496774           -0.002015986
## contry_of_resUnited.Arab.Emirates         -0.023788811           -0.013714898
## contry_of_resUnited.Kingdom               -0.022959890           -0.013237002
## contry_of_resUnited.States                -0.028650013           -0.016517513
## contry_of_resUruguay                      -0.002470831           -0.001424501
## contry_of_resViet.Nam                     -0.005540754           -0.003194396
## used_app_before                            0.159840393           -0.004973740
## relationHealth.care.professional          -0.004952255           -0.002855110
## relationOthers                             0.160757137            0.092680870
## relationParent                            -0.018115070           -0.010443831
## relationRelative                          -0.013333333           -0.007687030
## relationSelf                              -0.110763017           -0.063857897
## Class.ASD                                 -0.039697298           -0.022886574
##                              contry_of_resMalaysia contry_of_resMexico
## gender                                -0.088454653          0.048960738
## ethnicityAsian                         0.139235760         -0.049407303
## ethnicityBlack                        -0.021603273          0.028579252
## ethnicityHispanic                     -0.011617279          0.084819011
## ethnicityLatino                       -0.014483114          0.465638946
## ethnicityMiddle.Eastern.              -0.032842076         -0.041631868
## ethnicityOthers                       -0.039550744         -0.050136032
## ethnicityPasifika                     -0.010670889         -0.013526825
## ethnicitySouth.Asian                  -0.019662812         -0.024925330
## ethnicityTurkish                      -0.007852655         -0.009954325
## ethnicityWhite.European               -0.023632103         -0.075540807
## jundice                                0.028973512          0.009682118
## austim                                 0.017788632         -0.001420713
## contry_of_resAfghanistan              -0.011617279         -0.014726506
## contry_of_resAmericanSamoa            -0.004520779         -0.005730712
## contry_of_resAngola                   -0.003194396         -0.004049338
```

```
## contry_of_resArgentina             -0.004520779    -0.005730712
## contry_of_resArmenia               -0.004520779    -0.005730712
## contry_of_resAruba                 -0.003194396    -0.004049338
## contry_of_resAustralia             -0.016914759    -0.021441794
## contry_of_resAustria               -0.006402487    -0.008116037
## contry_of_resAzerbaijan            -0.003194396    -0.004049338
## contry_of_resBahamas               -0.004520779    -0.005730712
## contry_of_resBangladesh            -0.005540754    -0.007023672
## contry_of_resBelgium               -0.005540754    -0.007023672
## contry_of_resBolivia               -0.003194396    -0.004049338
## contry_of_resBrazil                -0.009638264    -0.012217831
## contry_of_resBurundi               -0.003194396    -0.004049338
## contry_of_resCanada                -0.012497084    -0.015841781
## contry_of_resChile                 -0.003194396    -0.004049338
## contry_of_resChina                 -0.003194396    -0.004049338
## contry_of_resCosta.Rica            -0.003194396    -0.004049338
## contry_of_resCyprus                -0.003194396    -0.004049338
## contry_of_resCzech.Republic        -0.003194396    -0.004049338
## contry_of_resEcuador               -0.003194396    -0.004049338
## contry_of_resEgypt                 -0.005540754    -0.007023672
## contry_of_resEthiopia              -0.004520779    -0.005730712
## contry_of_resFinland               -0.003194396    -0.004049338
## contry_of_resFrance                -0.010670889    -0.013526825
## contry_of_resGermany               -0.006402487    -0.008116037
## contry_of_resHong.Kong             -0.003194396    -0.004049338
## contry_of_resIceland               -0.004520779    -0.005730712
## contry_of_resIndia                 -0.030542502    -0.038716840
## contry_of_resIndonesia             -0.003194396    -0.004049338
## contry_of_resIran                  -0.008487928    -0.010759621
## contry_of_resIraq                  -0.003194396    -0.004049338
## contry_of_resIreland               -0.007163324    -0.009080502
## contry_of_resItaly                 -0.007163324    -0.009080502
## contry_of_resJapan                 -0.003194396    -0.004049338
## contry_of_resJordan                -0.022654491    -0.028717696
## contry_of_resKazakhstan            -0.005540754    -0.007023672
## contry_of_resLebanon               -0.003194396    -0.004049338
## contry_of_resMalaysia              1.000000000     -0.009080502
## contry_of_resMexico                -0.009080502    1.000000000
## contry_of_resNepal                 -0.003194396    -0.004049338
## contry_of_resNetherlands           -0.010166950    -0.012888013
## contry_of_resNew.Zealand           -0.030329012    -0.038446212
## contry_of_resNicaragua             -0.003194396    -0.004049338
## contry_of_resNiger                 -0.003194396    -0.004049338
## contry_of_resOman                  -0.003194396    -0.004049338
## contry_of_resPakistan              -0.005540754    -0.007023672
## contry_of_resPhilippines           -0.006402487    -0.008116037
## contry_of_resPortugal              -0.003194396    -0.004049338
## contry_of_resRomania               -0.005540754    -0.007023672
## contry_of_resRussia                -0.008487928    -0.010759621
## contry_of_resSaudi.Arabia          -0.006402487    -0.008116037
## contry_of_resSerbia                -0.003194396    -0.004049338
## contry_of_resSierra.Leone          -0.003194396    -0.004049338
## contry_of_resSouth.Africa          -0.004520779    -0.005730712
## contry_of_resSpain                 -0.005540754    -0.007023672
```

```
## contry_of_resSri.Lanka                 -0.012064566        -0.015293504
## contry_of_resSweden                     -0.004520779        -0.005730712
## contry_of_resTonga                      -0.003194396        -0.004049338
## contry_of_resTurkey                     -0.003194396        -0.004049338
## contry_of_resUkraine                    -0.004520779        -0.005730712
## contry_of_resUnited.Arab.Emirates       -0.030755190        -0.038986452
## contry_of_resUnited.Kingdom             -0.029683526        -0.037627970
## contry_of_resUnited.States              -0.037039960        -0.046953266
## contry_of_resUruguay                    -0.003194396        -0.004049338
## contry_of_resViet.Nam                   -0.007163324        -0.009080502
## used_app_before                          0.119527714        -0.014138528
## relationHealth.care.professional        -0.006402487        -0.008116037
## relationOthers                          -0.034466615        -0.043691196
## relationParent                          -0.023419936         0.074665331
## relationRelative                        -0.017237903        -0.021851423
## relationSelf                             0.050023506         0.002177600
## Class.ASD                                0.101395608         0.055936269
##                                 contry_of_resNepal contry_of_resNetherlands
## gender                                   0.036113373         0.0187461147
## ethnicityAsian                          -0.017380810        -0.0553186970
## ethnicityBlack                           0.147866293        -0.0306616585
## ethnicityHispanic                       -0.005180582        -0.0164884759
## ethnicityLatino                         -0.006458566        -0.0205559725
## ethnicityMiddle.Eastern.                -0.014645519        -0.0466129610
## ethnicityOthers                         -0.017637166        -0.0248150639
## ethnicityPasifika                       -0.004758551        -0.0151452581
## ethnicitySouth.Asian                    -0.008768388        -0.0279075503
## ethnicityTurkish                        -0.003501795        -0.0111453220
## ethnicityWhite.European                 -0.026574217         0.1450910560
## jundice                                 -0.012451204         0.0007466337
## austim                                  -0.014553801         0.0968160786
## contry_of_resAfghanistan                -0.005180582        -0.0164884759
## contry_of_resAmericanSamoa              -0.002015986        -0.0064163696
## contry_of_resAngola                     -0.001424501        -0.0045338258
## contry_of_resArgentina                  -0.002015986        -0.0064163696
## contry_of_resArmenia                    -0.002015986        -0.0064163696
## contry_of_resAruba                      -0.001424501        -0.0045338258
## contry_of_resAustralia                  -0.007542928        -0.0240072225
## contry_of_resAustria                    -0.002855110        -0.0090870892
## contry_of_resAzerbaijan                 -0.001424501        -0.0045338258
## contry_of_resBahamas                    -0.002015986        -0.0064163696
## contry_of_resBangladesh                 -0.002470831        -0.0078640269
## contry_of_resBelgium                    -0.002470831        -0.0078640269
## contry_of_resBolivia                    -0.001424501        -0.0045338258
## contry_of_resBrazil                     -0.004298065        -0.0136796474
## contry_of_resBurundi                    -0.001424501        -0.0045338258
## contry_of_resCanada                     -0.005572921        -0.0177371890
## contry_of_resChile                      -0.001424501        -0.0045338258
## contry_of_resChina                      -0.001424501        -0.0045338258
## contry_of_resCosta.Rica                 -0.001424501        -0.0045338258
## contry_of_resCyprus                     -0.001424501        -0.0045338258
## contry_of_resCzech.Republic             -0.001424501        -0.0045338258
## contry_of_resEcuador                    -0.001424501        -0.0045338258
## contry_of_resEgypt                      -0.002470831        -0.0078640269
```

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## contry_of_resEthiopia                  -0.002015986        -0.0064163696
## contry_of_resFinland                   -0.001424501        -0.0045338258
## contry_of_resFrance                    -0.004758551        -0.0151452581
## contry_of_resGermany                   -0.002855110        -0.0090870892
## contry_of_resHong.Kong                 -0.001424501        -0.0045338258
## contry_of_resIceland                   -0.002015986        -0.0064163696
## contry_of_resIndia                     -0.013620052        -0.0433491613
## contry_of_resIndonesia                 -0.001424501        -0.0045338258
## contry_of_resIran                      -0.003785087        -0.0120469687
## contry_of_resIraq                      -0.001424501        -0.0045338258
## contry_of_resIreland                   -0.003194396        -0.0101669497
## contry_of_resItaly                     -0.003194396        -0.0101669497
## contry_of_resJapan                     -0.001424501        -0.0045338258
## contry_of_resJordan                    -0.010102491        -0.0321536583
## contry_of_resKazakhstan                -0.002470831        -0.0078640269
## contry_of_resLebanon                   -0.001424501        -0.0045338258
## contry_of_resMalaysia                  -0.003194396        -0.0101669497
## contry_of_resMexico                    -0.004049338        -0.0128880132
## contry_of_resNepal                      1.000000000        -0.0045338258
## contry_of_resNetherlands               -0.004533826         1.0000000000
## contry_of_resNew.Zealand               -0.013524849        -0.0430461538
## contry_of_resNicaragua                 -0.001424501        -0.0045338258
## contry_of_resNiger                     -0.001424501        -0.0045338258
## contry_of_resOman                      -0.001424501        -0.0045338258
## contry_of_resPakistan                  -0.002470831        -0.0078640269
## contry_of_resPhilippines               -0.002855110        -0.0090870892
## contry_of_resPortugal                  -0.001424501        -0.0045338258
## contry_of_resRomania                   -0.002470831        -0.0078640269
## contry_of_resRussia                    -0.003785087        -0.0120469687
## contry_of_resSaudi.Arabia              -0.002855110        -0.0090870892
## contry_of_resSerbia                    -0.001424501        -0.0045338258
## contry_of_resSierra.Leone              -0.001424501        -0.0045338258
## contry_of_resSouth.Africa              -0.002015986        -0.0064163696
## contry_of_resSpain                     -0.002470831        -0.0078640269
## contry_of_resSri.Lanka                 -0.005380044        -0.0171233128
## contry_of_resSweden                    -0.002015986        -0.0064163696
## contry_of_resTonga                     -0.001424501        -0.0045338258
## contry_of_resTurkey                    -0.001424501        -0.0045338258
## contry_of_resUkraine                   -0.002015986        -0.0064163696
## contry_of_resUnited.Arab.Emirates      -0.013714898        -0.0436510313
## contry_of_resUnited.Kingdom            -0.013237002        -0.0421300116
## contry_of_resUnited.States             -0.016517513        -0.0525710436
## contry_of_resUruguay                   -0.001424501        -0.0045338258
## contry_of_resViet.Nam                  -0.003194396        -0.0101669497
## used_app_before                        -0.004973740        -0.0158301482
## relationHealth.care.professional       -0.002855110         0.1506185033
## relationOthers                         -0.015369962        -0.0489186797
## relationParent                         -0.010443831        -0.0332400596
## relationRelative                       -0.007687030         0.0983877142
## relationSelf                            0.022307365        -0.0112739647
## Class.ASD                               0.062241794         0.0355346336
##                                    contry_of_resNew.Zealand
## gender                                      0.055921506
## ethnicityAsian                              0.141508964
```

```
## ethnicityBlack                        -0.035390186
## ethnicityHispanic                     -0.049186747
## ethnicityLatino                       -0.061320490
## ethnicityMiddle.Eastern.              -0.046079554
## ethnicityOthers                       -0.050668453
## ethnicityPasifika                      0.171375181
## ethnicitySouth.Asian                   0.099641005
## ethnicityTurkish                      -0.033247593
## ethnicityWhite.European               -0.071509659
## jundice                               -0.057994989
## austim                                -0.098149731
## contry_of_resAfghanistan              -0.049186747
## contry_of_resAmericanSamoa            -0.019140662
## contry_of_resAngola                   -0.013524849
## contry_of_resArgentina                -0.019140662
## contry_of_resArmenia                  -0.019140662
## contry_of_resAruba                    -0.013524849
## contry_of_resAustralia                -0.071615908
## contry_of_resAustria                  -0.027107682
## contry_of_resAzerbaijan               -0.013524849
## contry_of_resBahamas                  -0.019140662
## contry_of_resBangladesh               -0.023459166
## contry_of_resBelgium                  -0.023459166
## contry_of_resBolivia                  -0.013524849
## contry_of_resBrazil                   -0.040807735
## contry_of_resBurundi                  -0.013524849
## contry_of_resCanada                   -0.052911781
## contry_of_resChile                    -0.013524849
## contry_of_resChina                    -0.013524849
## contry_of_resCosta.Rica               -0.013524849
## contry_of_resCyprus                   -0.013524849
## contry_of_resCzech.Republic           -0.013524849
## contry_of_resEcuador                  -0.013524849
## contry_of_resEgypt                    -0.023459166
## contry_of_resEthiopia                 -0.019140662
## contry_of_resFinland                  -0.013524849
## contry_of_resFrance                   -0.045179796
## contry_of_resGermany                  -0.027107682
## contry_of_resHong.Kong                -0.013524849
## contry_of_resIceland                  -0.019140662
## contry_of_resIndia                    -0.129314816
## contry_of_resIndonesia                -0.013524849
## contry_of_resIran                     -0.035937294
## contry_of_resIraq                     -0.013524849
## contry_of_resIreland                  -0.030329012
## contry_of_resItaly                    -0.030329012
## contry_of_resJapan                    -0.013524849
## contry_of_resJordan                   -0.095917528
## contry_of_resKazakhstan               -0.023459166
## contry_of_resLebanon                  -0.013524849
## contry_of_resMalaysia                 -0.030329012
## contry_of_resMexico                   -0.038446212
## contry_of_resNepal                    -0.013524849
## contry_of_resNetherlands              -0.043046154
```

```
## contry_of_resNew.Zealand                    1.000000000
## contry_of_resNicaragua                      -0.013524849
## contry_of_resNiger                          -0.013524849
## contry_of_resOman                           -0.013524849
## contry_of_resPakistan                       -0.023459166
## contry_of_resPhilippines                    -0.027107682
## contry_of_resPortugal                       -0.013524849
## contry_of_resRomania                        -0.023459166
## contry_of_resRussia                         -0.035937294
## contry_of_resSaudi.Arabia                   -0.027107682
## contry_of_resSerbia                         -0.013524849
## contry_of_resSierra.Leone                   -0.013524849
## contry_of_resSouth.Africa                   -0.019140662
## contry_of_resSpain                          -0.023459166
## contry_of_resSri.Lanka                      -0.051080528
## contry_of_resSweden                         -0.019140662
## contry_of_resTonga                          -0.013524849
## contry_of_resTurkey                         -0.013524849
## contry_of_resUkraine                        -0.019140662
## contry_of_resUnited.Arab.Emirates           -0.130215324
## contry_of_resUnited.Kingdom                 -0.125677973
## contry_of_resUnited.States                  -0.156824599
## contry_of_resUruguay                        -0.013524849
## contry_of_resViet.Nam                       -0.030329012
## used_app_before                             -0.047222891
## relationHealth.care.professional            -0.027107682
## relationOthers                              -0.081811579
## relationParent                               0.005404131
## relationRelative                             0.018637004
## relationSelf                                 0.058403917
## Class.ASD                                   -0.065749071
##                              contry_of_resNicaragua contry_of_resNiger
## gender                                 0.036113373         0.036113373
## ethnicityAsian                        -0.017380810        -0.017380810
## ethnicityBlack                        -0.009633713         0.147866293
## ethnicityHispanic                      0.274969367        -0.005180582
## ethnicityLatino                       -0.006458566        -0.006458566
## ethnicityMiddle.Eastern.              -0.014645519        -0.014645519
## ethnicityOthers                       -0.017637166        -0.017637166
## ethnicityPasifika                     -0.004758551        -0.004758551
## ethnicitySouth.Asian                  -0.008768388        -0.008768388
## ethnicityTurkish                      -0.003501795        -0.003501795
## ethnicityWhite.European               -0.026574217        -0.026574217
## jundice                                0.114406718        -0.012451204
## austim                                -0.014553801        -0.014553801
## contry_of_resAfghanistan              -0.005180582        -0.005180582
## contry_of_resAmericanSamoa            -0.002015986        -0.002015986
## contry_of_resAngola                   -0.001424501        -0.001424501
## contry_of_resArgentina                -0.002015986        -0.002015986
## contry_of_resArmenia                  -0.002015986        -0.002015986
## contry_of_resAruba                    -0.001424501        -0.001424501
## contry_of_resAustralia                -0.007542928        -0.007542928
## contry_of_resAustria                  -0.002855110        -0.002855110
## contry_of_resAzerbaijan               -0.001424501        -0.001424501
```

```
## contry_of_resBahamas                  -0.002015986    -0.002015986
## contry_of_resBangladesh               -0.002470831    -0.002470831
## contry_of_resBelgium                  -0.002470831    -0.002470831
## contry_of_resBolivia                  -0.001424501    -0.001424501
## contry_of_resBrazil                   -0.004298065    -0.004298065
## contry_of_resBurundi                  -0.001424501    -0.001424501
## contry_of_resCanada                   -0.005572921    -0.005572921
## contry_of_resChile                    -0.001424501    -0.001424501
## contry_of_resChina                    -0.001424501    -0.001424501
## contry_of_resCosta.Rica               -0.001424501    -0.001424501
## contry_of_resCyprus                   -0.001424501    -0.001424501
## contry_of_resCzech.Republic           -0.001424501    -0.001424501
## contry_of_resEcuador                  -0.001424501    -0.001424501
## contry_of_resEgypt                    -0.002470831    -0.002470831
## contry_of_resEthiopia                 -0.002015986    -0.002015986
## contry_of_resFinland                  -0.001424501    -0.001424501
## contry_of_resFrance                   -0.004758551    -0.004758551
## contry_of_resGermany                  -0.002855110    -0.002855110
## contry_of_resHong.Kong                -0.001424501    -0.001424501
## contry_of_resIceland                  -0.002015986    -0.002015986
## contry_of_resIndia                    -0.013620052    -0.013620052
## contry_of_resIndonesia                -0.001424501    -0.001424501
## contry_of_resIran                     -0.003785087    -0.003785087
## contry_of_resIraq                     -0.001424501    -0.001424501
## contry_of_resIreland                  -0.003194396    -0.003194396
## contry_of_resItaly                    -0.003194396    -0.003194396
## contry_of_resJapan                    -0.001424501    -0.001424501
## contry_of_resJordan                   -0.010102491    -0.010102491
## contry_of_resKazakhstan               -0.002470831    -0.002470831
## contry_of_resLebanon                  -0.001424501    -0.001424501
## contry_of_resMalaysia                 -0.003194396    -0.003194396
## contry_of_resMexico                   -0.004049338    -0.004049338
## contry_of_resNepal                    -0.001424501    -0.001424501
## contry_of_resNetherlands              -0.004533826    -0.004533826
## contry_of_resNew.Zealand              -0.013524849    -0.013524849
## contry_of_resNicaragua                 1.000000000    -0.001424501
## contry_of_resNiger                    -0.001424501     1.000000000
## contry_of_resOman                     -0.001424501    -0.001424501
## contry_of_resPakistan                 -0.002470831    -0.002470831
## contry_of_resPhilippines              -0.002855110    -0.002855110
## contry_of_resPortugal                 -0.001424501    -0.001424501
## contry_of_resRomania                  -0.002470831    -0.002470831
## contry_of_resRussia                   -0.003785087    -0.003785087
## contry_of_resSaudi.Arabia             -0.002855110    -0.002855110
## contry_of_resSerbia                   -0.001424501    -0.001424501
## contry_of_resSierra.Leone             -0.001424501    -0.001424501
## contry_of_resSouth.Africa             -0.002015986    -0.002015986
## contry_of_resSpain                    -0.002470831    -0.002470831
## contry_of_resSri.Lanka                -0.005380044    -0.005380044
## contry_of_resSweden                   -0.002015986    -0.002015986
## contry_of_resTonga                    -0.001424501    -0.001424501
## contry_of_resTurkey                   -0.001424501    -0.001424501
## contry_of_resUkraine                  -0.002015986    -0.002015986
## contry_of_resUnited.Arab.Emirates     -0.013714898    -0.013714898
```

```
## contry_of_resUnited.Kingdom              -0.013237002       -0.013237002
## contry_of_resUnited.States              -0.016517513       -0.016517513
## contry_of_resUruguay                    -0.001424501       -0.001424501
## contry_of_resViet.Nam                   -0.003194396       -0.003194396
## used_app_before                         -0.004973740       -0.004973740
## relationHealth.care.professional        -0.002855110       -0.002855110
## relationOthers                          -0.015369962       -0.015369962
## relationParent                          -0.010443831       -0.010443831
## relationRelative                        -0.007687030       -0.007687030
## relationSelf                             0.022307365        0.022307365
## Class.ASD                               -0.022886574       -0.022886574
##                              contry_of_resOman contry_of_resPakistan
## gender                            0.036113373           0.018953417
## ethnicityAsian                   -0.017380810           0.027287910
## ethnicityBlack                   -0.009633713          -0.016709901
## ethnicityHispanic                -0.005180582          -0.008985841
## ethnicityLatino                  -0.006458566          -0.011202534
## ethnicityMiddle.Eastern.         -0.014645519          -0.025402995
## ethnicityOthers                  -0.017637166           0.026302712
## ethnicityPasifika                 0.299356125          -0.008253818
## ethnicitySouth.Asian             -0.008768388           0.083790185
## ethnicityTurkish                 -0.003501795          -0.006073945
## ethnicityWhite.European          -0.026574217          -0.046093601
## jundice                          -0.012451204          -0.021596905
## austim                           -0.014553801          -0.025243908
## contry_of_resAfghanistan         -0.005180582          -0.008985841
## contry_of_resAmericanSamoa       -0.002015986          -0.003496774
## contry_of_resAngola              -0.001424501          -0.002470831
## contry_of_resArgentina           -0.002015986          -0.003496774
## contry_of_resArmenia             -0.002015986          -0.003496774
## contry_of_resAruba               -0.001424501          -0.002470831
## contry_of_resAustralia           -0.007542928          -0.013083386
## contry_of_resAustria             -0.002855110          -0.004952255
## contry_of_resAzerbaijan          -0.001424501          -0.002470831
## contry_of_resBahamas             -0.002015986          -0.003496774
## contry_of_resBangladesh          -0.002470831          -0.004285714
## contry_of_resBelgium             -0.002470831          -0.004285714
## contry_of_resBolivia             -0.001424501          -0.002470831
## contry_of_resBrazil              -0.004298065          -0.007455094
## contry_of_resBurundi             -0.001424501          -0.002470831
## contry_of_resCanada              -0.005572921          -0.009666361
## contry_of_resChile               -0.001424501          -0.002470831
## contry_of_resChina               -0.001424501          -0.002470831
## contry_of_resCosta.Rica          -0.001424501          -0.002470831
## contry_of_resCyprus              -0.001424501          -0.002470831
## contry_of_resCzech.Republic      -0.001424501          -0.002470831
## contry_of_resEcuador             -0.001424501          -0.002470831
## contry_of_resEgypt               -0.002470831          -0.004285714
## contry_of_resEthiopia            -0.002015986          -0.003496774
## contry_of_resFinland             -0.001424501          -0.002470831
## contry_of_resFrance              -0.004758551          -0.008253818
## contry_of_resGermany             -0.002855110          -0.004952255
## contry_of_resHong.Kong           -0.001424501          -0.002470831
## contry_of_resIceland             -0.002015986          -0.003496774
```

```
## contry_of_resIndia                   -0.013620052        -0.023624299
## contry_of_resIndonesia               -0.001424501        -0.002470831
## contry_of_resIran                    -0.003785087        -0.006565322
## contry_of_resIraq                    -0.001424501        -0.002470831
## contry_of_resIreland                 -0.003194396        -0.005540754
## contry_of_resItaly                   -0.003194396        -0.005540754
## contry_of_resJapan                   -0.001424501        -0.002470831
## contry_of_resJordan                  -0.010102491        -0.017523006
## contry_of_resKazakhstan              -0.002470831        -0.004285714
## contry_of_resLebanon                 -0.001424501        -0.002470831
## contry_of_resMalaysia                -0.003194396        -0.005540754
## contry_of_resMexico                  -0.004049338        -0.007023672
## contry_of_resNepal                   -0.001424501        -0.002470831
## contry_of_resNetherlands             -0.004533826        -0.007864027
## contry_of_resNew.Zealand             -0.013524849        -0.023459166
## contry_of_resNicaragua               -0.001424501        -0.002470831
## contry_of_resNiger                   -0.001424501        -0.002470831
## contry_of_resOman                     1.000000000        -0.002470831
## contry_of_resPakistan                -0.002470831         1.000000000
## contry_of_resPhilippines             -0.002855110        -0.004952255
## contry_of_resPortugal                -0.001424501        -0.002470831
## contry_of_resRomania                 -0.002470831        -0.004285714
## contry_of_resRussia                  -0.003785087        -0.006565322
## contry_of_resSaudi.Arabia            -0.002855110        -0.004952255
## contry_of_resSerbia                  -0.001424501        -0.002470831
## contry_of_resSierra.Leone            -0.001424501        -0.002470831
## contry_of_resSouth.Africa            -0.002015986        -0.003496774
## contry_of_resSpain                   -0.002470831        -0.004285714
## contry_of_resSri.Lanka               -0.005380044        -0.009331813
## contry_of_resSweden                  -0.002015986        -0.003496774
## contry_of_resTonga                   -0.001424501        -0.002470831
## contry_of_resTurkey                  -0.001424501        -0.002470831
## contry_of_resUkraine                 -0.002015986        -0.003496774
## contry_of_resUnited.Arab.Emirates    -0.013714898        -0.023788811
## contry_of_resUnited.Kingdom          -0.013237002        -0.022959890
## contry_of_resUnited.States           -0.016517513        -0.028650013
## contry_of_resUruguay                 -0.001424501        -0.002470831
## contry_of_resViet.Nam                -0.003194396        -0.005540754
## used_app_before                      -0.004973740        -0.008627068
## relationHealth.care.professional     -0.002855110        -0.004952255
## relationOthers                       -0.015369962         0.035812673
## relationParent                       -0.010443831        -0.018115070
## relationRelative                     -0.007687030        -0.013333333
## relationSelf                          0.022307365        -0.011125908
## Class.ASD                            -0.022886574         0.009521751
##                               contry_of_resPhilippines
## gender                                    -0.041199333
## ethnicityAsian                             0.114491932
## ethnicityBlack                            -0.019308728
## ethnicityHispanic                         -0.010383375
## ethnicityLatino                           -0.012944821
## ethnicityMiddle.Eastern.                  -0.029353826
## ethnicityOthers                            0.013957618
## ethnicityPasifika                         -0.009537503
```

```
## ethnicitySouth.Asian                      -0.017574369
## ethnicityTurkish                           -0.007018602
## ethnicityWhite.European                    -0.053262364
## jundice                                     -0.024955790
## austim                                      -0.029169998
## contry_of_resAfghanistan                   -0.010383375
## contry_of_resAmericanSamoa                 -0.004040614
## contry_of_resAngola                        -0.002855110
## contry_of_resArgentina                     -0.004040614
## contry_of_resArmenia                       -0.004040614
## contry_of_resAruba                         -0.002855110
## contry_of_resAustralia                     -0.015118195
## contry_of_resAustria                       -0.005722461
## contry_of_resAzerbaijan                    -0.002855110
## contry_of_resBahamas                       -0.004040614
## contry_of_resBangladesh                    -0.004952255
## contry_of_resBelgium                       -0.004952255
## contry_of_resBolivia                       -0.002855110
## contry_of_resBrazil                        -0.008614557
## contry_of_resBurundi                       -0.002855110
## contry_of_resCanada                        -0.011169734
## contry_of_resChile                         -0.002855110
## contry_of_resChina                         -0.002855110
## contry_of_resCosta.Rica                    -0.002855110
## contry_of_resCyprus                        -0.002855110
## contry_of_resCzech.Republic                -0.002855110
## contry_of_resEcuador                       -0.002855110
## contry_of_resEgypt                         -0.004952255
## contry_of_resEthiopia                      -0.004040614
## contry_of_resFinland                       -0.002855110
## contry_of_resFrance                        -0.009537503
## contry_of_resGermany                       -0.005722461
## contry_of_resHong.Kong                     -0.002855110
## contry_of_resIceland                       -0.004040614
## contry_of_resIndia                         -0.027298496
## contry_of_resIndonesia                     -0.002855110
## contry_of_resIran                          -0.007586401
## contry_of_resIraq                          -0.002855110
## contry_of_resIreland                       -0.006402487
## contry_of_resItaly                         -0.006402487
## contry_of_resJapan                         -0.002855110
## contry_of_resJordan                        -0.020248293
## contry_of_resKazakhstan                    -0.004952255
## contry_of_resLebanon                       -0.002855110
## contry_of_resMalaysia                      -0.006402487
## contry_of_resMexico                        -0.008116037
## contry_of_resNepal                         -0.002855110
## contry_of_resNetherlands                   -0.009087089
## contry_of_resNew.Zealand                   -0.027107682
## contry_of_resNicaragua                     -0.002855110
## contry_of_resNiger                         -0.002855110
## contry_of_resOman                          -0.002855110
## contry_of_resPakistan                      -0.004952255
## contry_of_resPhilippines                    1.000000000
```

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## contry_of_resPortugal                              -0.002855110
## contry_of_resRomania                               -0.004952255
## contry_of_resRussia                                -0.007586401
## contry_of_resSaudi.Arabia                          -0.005722461
## contry_of_resSerbia                                -0.002855110
## contry_of_resSierra.Leone                          -0.002855110
## contry_of_resSouth.Africa                          -0.004040614
## contry_of_resSpain                                 -0.004952255
## contry_of_resSri.Lanka                             -0.010783154
## contry_of_resSweden                                -0.004040614
## contry_of_resTonga                                 -0.002855110
## contry_of_resTurkey                                -0.002855110
## contry_of_resUkraine                               -0.004040614
## contry_of_resUnited.Arab.Emirates                  -0.027488594
## contry_of_resUnited.Kingdom                        -0.026530755
## contry_of_resUnited.States                         -0.033105841
## contry_of_resUruguay                               -0.002855110
## contry_of_resViet.Nam                              -0.006402487
## used_app_before                                    -0.009968803
## relationHealth.care.professional                   -0.005722461
## relationOthers                                     -0.030805818
## relationParent                                      0.052645082
## relationRelative                                   -0.015407016
## relationSelf                                        0.001535384
## Class.ASD                                          -0.045871269
##                                 contry_of_resPortugal contry_of_resRomania
## gender                                   0.036113373          -0.068418729
## ethnicityAsian                          -0.017380810          -0.030147421
## ethnicityBlack                          -0.009633713          -0.016709901
## ethnicityHispanic                       -0.005180582          -0.008985841
## ethnicityLatino                         -0.006458566          -0.011202534
## ethnicityMiddle.Eastern.                -0.014645519          -0.025402995
## ethnicityOthers                         -0.017637166          -0.030592078
## ethnicityPasifika                       -0.004758551          -0.008253818
## ethnicitySouth.Asian                    -0.008768388          -0.015208975
## ethnicityTurkish                        -0.003501795          -0.006073945
## ethnicityWhite.European                  0.053604644           0.092978509
## jundice                                 -0.012451204          -0.021596905
## austim                                  -0.014553801           0.039761467
## contry_of_resAfghanistan                -0.005180582          -0.008985841
## contry_of_resAmericanSamoa              -0.002015986          -0.003496774
## contry_of_resAngola                     -0.001424501          -0.002470831
## contry_of_resArgentina                  -0.002015986          -0.003496774
## contry_of_resArmenia                    -0.002015986          -0.003496774
## contry_of_resAruba                      -0.001424501          -0.002470831
## contry_of_resAustralia                  -0.007542928          -0.013083386
## contry_of_resAustria                    -0.002855110          -0.004952255
## contry_of_resAzerbaijan                 -0.001424501          -0.002470831
## contry_of_resBahamas                    -0.002015986          -0.003496774
## contry_of_resBangladesh                 -0.002470831          -0.004285714
## contry_of_resBelgium                    -0.002470831          -0.004285714
## contry_of_resBolivia                    -0.001424501          -0.002470831
## contry_of_resBrazil                     -0.004298065          -0.007455094
## contry_of_resBurundi                    -0.001424501          -0.002470831
```

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## contry_of_resCanada                    -0.005572921    -0.009666361
## contry_of_resChile                     -0.001424501    -0.002470831
## contry_of_resChina                     -0.001424501    -0.002470831
## contry_of_resCosta.Rica                -0.001424501    -0.002470831
## contry_of_resCyprus                    -0.001424501    -0.002470831
## contry_of_resCzech.Republic            -0.001424501    -0.002470831
## contry_of_resEcuador                   -0.001424501    -0.002470831
## contry_of_resEgypt                     -0.002470831    -0.004285714
## contry_of_resEthiopia                  -0.002015986    -0.003496774
## contry_of_resFinland                   -0.001424501    -0.002470831
## contry_of_resFrance                    -0.004758551    -0.008253818
## contry_of_resGermany                   -0.002855110    -0.004952255
## contry_of_resHong.Kong                 -0.001424501    -0.002470831
## contry_of_resIceland                   -0.002015986    -0.003496774
## contry_of_resIndia                     -0.013620052    -0.023624299
## contry_of_resIndonesia                 -0.001424501    -0.002470831
## contry_of_resIran                      -0.003785087    -0.006565322
## contry_of_resIraq                      -0.001424501    -0.002470831
## contry_of_resIreland                   -0.003194396    -0.005540754
## contry_of_resItaly                     -0.003194396    -0.005540754
## contry_of_resJapan                     -0.001424501    -0.002470831
## contry_of_resJordan                    -0.010102491    -0.017523006
## contry_of_resKazakhstan                -0.002470831    -0.004285714
## contry_of_resLebanon                   -0.001424501    -0.002470831
## contry_of_resMalaysia                  -0.003194396    -0.005540754
## contry_of_resMexico                    -0.004049338    -0.007023672
## contry_of_resNepal                     -0.001424501    -0.002470831
## contry_of_resNetherlands               -0.004533826    -0.007864027
## contry_of_resNew.Zealand               -0.013524849    -0.023459166
## contry_of_resNicaragua                 -0.001424501    -0.002470831
## contry_of_resNiger                     -0.001424501    -0.002470831
## contry_of_resOman                      -0.001424501    -0.002470831
## contry_of_resPakistan                  -0.002470831    -0.004285714
## contry_of_resPhilippines               -0.002855110    -0.004952255
## contry_of_resPortugal                   1.000000000    -0.002470831
## contry_of_resRomania                   -0.002470831     1.000000000
## contry_of_resRussia                    -0.003785087    -0.006565322
## contry_of_resSaudi.Arabia              -0.002855110    -0.004952255
## contry_of_resSerbia                    -0.001424501    -0.002470831
## contry_of_resSierra.Leone              -0.001424501    -0.002470831
## contry_of_resSouth.Africa              -0.002015986    -0.003496774
## contry_of_resSpain                     -0.002470831    -0.004285714
## contry_of_resSri.Lanka                 -0.005380044    -0.009331813
## contry_of_resSweden                    -0.002015986    -0.003496774
## contry_of_resTonga                     -0.001424501    -0.002470831
## contry_of_resTurkey                    -0.001424501    -0.002470831
## contry_of_resUkraine                   -0.002015986    -0.003496774
## contry_of_resUnited.Arab.Emirates      -0.013714898    -0.023788811
## contry_of_resUnited.Kingdom            -0.013237002    -0.022959890
## contry_of_resUnited.States             -0.016517513    -0.028650013
## contry_of_resUruguay                   -0.001424501    -0.002470831
## contry_of_resViet.Nam                  -0.003194396    -0.005540754
## used_app_before                        -0.004973740    -0.008627068
## relationHealth.care.professional       -0.002855110    -0.004952255
```

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## relationOthers                      -0.015369962        -0.026659558
## relationParent                      -0.010443831        -0.018115070
## relationRelative                    -0.007687030        -0.013333333
## relationSelf                         0.022307365         0.038692647
## Class.ASD                           -0.022886574         0.009521751
##                            contry_of_resRussia contry_of_resSaudi.Arabia
## gender                              -0.018767288         0.034521271
## ethnicityAsian                      -0.046183087        -0.034836135
## ethnicityBlack                      -0.025598037        -0.019308728
## ethnicityHispanic                   -0.013765485        -0.010383375
## ethnicityLatino                     -0.017161255        -0.012944821
## ethnicityMiddle.Eastern.            -0.038915060         0.082796933
## ethnicityOthers                      0.177255297         0.063265184
## ethnicityPasifika                   -0.012644093        -0.009537503
## ethnicitySouth.Asian                -0.023298756        -0.017574369
## ethnicityTurkish                    -0.009304727        -0.007018602
## ethnicityWhite.European             -0.040176070        -0.053262364
## jundice                             -0.033084480        -0.024955790
## austim                               0.004006765        -0.029169998
## contry_of_resAfghanistan            -0.013765485        -0.010383375
## contry_of_resAmericanSamoa          -0.005356738        -0.004040614
## contry_of_resAngola                 -0.003785087        -0.002855110
## contry_of_resArgentina              -0.005356738        -0.004040614
## contry_of_resArmenia                -0.005356738        -0.004040614
## contry_of_resAruba                  -0.003785087        -0.002855110
## contry_of_resAustralia              -0.020042548        -0.015118195
## contry_of_resAustria                -0.007586401        -0.005722461
## contry_of_resAzerbaijan             -0.003785087        -0.002855110
## contry_of_resBahamas                -0.005356738        -0.004040614
## contry_of_resBangladesh             -0.006565322        -0.004952255
## contry_of_resBelgium                -0.006565322        -0.004952255
## contry_of_resBolivia                -0.003785087        -0.002855110
## contry_of_resBrazil                 -0.011420521        -0.008614557
## contry_of_resBurundi                -0.003785087        -0.002855110
## contry_of_resCanada                 -0.014807980        -0.011169734
## contry_of_resChile                  -0.003785087        -0.002855110
## contry_of_resChina                  -0.003785087        -0.002855110
## contry_of_resCosta.Rica             -0.003785087        -0.002855110
## contry_of_resCyprus                 -0.003785087        -0.002855110
## contry_of_resCzech.Republic         -0.003785087        -0.002855110
## contry_of_resEcuador                -0.003785087        -0.002855110
## contry_of_resEgypt                  -0.006565322        -0.004952255
## contry_of_resEthiopia               -0.005356738        -0.004040614
## contry_of_resFinland                -0.003785087        -0.002855110
## contry_of_resFrance                 -0.012644093        -0.009537503
## contry_of_resGermany                -0.007586401        -0.005722461
## contry_of_resHong.Kong              -0.003785087        -0.002855110
## contry_of_resIceland                -0.005356738        -0.004040614
## contry_of_resIndia                  -0.036190261        -0.027298496
## contry_of_resIndonesia              -0.003785087        -0.002855110
## contry_of_resIran                   -0.010057471        -0.007586401
## contry_of_resIraq                   -0.003785087        -0.002855110
## contry_of_resIreland                -0.008487928        -0.006402487
## contry_of_resItaly                  -0.008487928        -0.006402487
```

```
## contry_of_resJapan                     -0.003785087       -0.002855110
## contry_of_resJordan                    -0.026843640       -0.020248293
## contry_of_resKazakhstan                -0.006565322       -0.004952255
## contry_of_resLebanon                   -0.003785087       -0.002855110
## contry_of_resMalaysia                  -0.008487928       -0.006402487
## contry_of_resMexico                    -0.010759621       -0.008116037
## contry_of_resNepal                     -0.003785087       -0.002855110
## contry_of_resNetherlands               -0.012046969       -0.009087089
## contry_of_resNew.Zealand               -0.035937294       -0.027107682
## contry_of_resNicaragua                 -0.003785087       -0.002855110
## contry_of_resNiger                     -0.003785087       -0.002855110
## contry_of_resOman                      -0.003785087       -0.002855110
## contry_of_resPakistan                  -0.006565322       -0.004952255
## contry_of_resPhilippines               -0.007586401       -0.005722461
## contry_of_resPortugal                  -0.003785087       -0.002855110
## contry_of_resRomania                   -0.006565322       -0.004952255
## contry_of_resRussia                     1.000000000       -0.007586401
## contry_of_resSaudi.Arabia              -0.007586401        1.000000000
## contry_of_resSerbia                    -0.003785087       -0.002855110
## contry_of_resSierra.Leone              -0.003785087       -0.002855110
## contry_of_resSouth.Africa              -0.005356738       -0.004040614
## contry_of_resSpain                     -0.006565322       -0.004952255
## contry_of_resSri.Lanka                 -0.014295482       -0.010783154
## contry_of_resSweden                    -0.005356738       -0.004040614
## contry_of_resTonga                     -0.003785087       -0.002855110
## contry_of_resTurkey                    -0.003785087       -0.002855110
## contry_of_resUkraine                   -0.005356738       -0.004040614
## contry_of_resUnited.Arab.Emirates      -0.036442279       -0.027488594
## contry_of_resUnited.Kingdom            -0.035172448       -0.026530755
## contry_of_resUnited.States             -0.043889195       -0.033105841
## contry_of_resUruguay                   -0.003785087       -0.002855110
## contry_of_resViet.Nam                  -0.008487928       -0.006402487
## used_app_before                        -0.013215877       -0.009968803
## relationHealth.care.professional       -0.007586401       -0.005722461
## relationOthers                          0.164235147        0.077476633
## relationParent                        -0.027750628       -0.020932438
## relationRelative                      -0.020425445       -0.015407016
## relationSelf                          -0.104263827       -0.041639601
## Class.ASD                               0.036129042       -0.003215843
##                                contry_of_resSerbia contry_of_resSierra.Leone
## gender                                 -0.039445261        0.036113373
## ethnicityAsian                         -0.017380810        0.081958289
## ethnicityBlack                         -0.009633713       -0.009633713
## ethnicityHispanic                      -0.005180582       -0.005180582
## ethnicityLatino                        -0.006458566       -0.006458566
## ethnicityMiddle.Eastern.               -0.014645519       -0.014645519
## ethnicityOthers                        -0.017637166       -0.017637166
## ethnicityPasifika                      -0.004758551       -0.004758551
## ethnicitySouth.Asian                   -0.008768388       -0.008768388
## ethnicityTurkish                       -0.003501795       -0.003501795
## ethnicityWhite.European                 0.053604644       -0.026574217
## jundice                                -0.012451204        0.114406718
## austim                                 -0.014553801       -0.014553801
## contry_of_resAfghanistan               -0.005180582       -0.005180582
```

```
## contry_of_resAmericanSamoa          -0.002015986          -0.002015986
## contry_of_resAngola                 -0.001424501          -0.001424501
## contry_of_resArgentina              -0.002015986          -0.002015986
## contry_of_resArmenia                -0.002015986          -0.002015986
## contry_of_resAruba                  -0.001424501          -0.001424501
## contry_of_resAustralia              -0.007542928          -0.007542928
## contry_of_resAustria                -0.002855110          -0.002855110
## contry_of_resAzerbaijan             -0.001424501          -0.001424501
## contry_of_resBahamas                -0.002015986          -0.002015986
## contry_of_resBangladesh             -0.002470831          -0.002470831
## contry_of_resBelgium                -0.002470831          -0.002470831
## contry_of_resBolivia                -0.001424501          -0.001424501
## contry_of_resBrazil                 -0.004298065          -0.004298065
## contry_of_resBurundi                -0.001424501          -0.001424501
## contry_of_resCanada                 -0.005572921          -0.005572921
## contry_of_resChile                  -0.001424501          -0.001424501
## contry_of_resChina                  -0.001424501          -0.001424501
## contry_of_resCosta.Rica             -0.001424501          -0.001424501
## contry_of_resCyprus                 -0.001424501          -0.001424501
## contry_of_resCzech.Republic         -0.001424501          -0.001424501
## contry_of_resEcuador                -0.001424501          -0.001424501
## contry_of_resEgypt                  -0.002470831          -0.002470831
## contry_of_resEthiopia               -0.002015986          -0.002015986
## contry_of_resFinland                -0.001424501          -0.001424501
## contry_of_resFrance                 -0.004758551          -0.004758551
## contry_of_resGermany                -0.002855110          -0.002855110
## contry_of_resHong.Kong              -0.001424501          -0.001424501
## contry_of_resIceland                -0.002015986          -0.002015986
## contry_of_resIndia                  -0.013620052          -0.013620052
## contry_of_resIndonesia              -0.001424501          -0.001424501
## contry_of_resIran                   -0.003785087          -0.003785087
## contry_of_resIraq                   -0.001424501          -0.001424501
## contry_of_resIreland                -0.003194396          -0.003194396
## contry_of_resItaly                  -0.003194396          -0.003194396
## contry_of_resJapan                  -0.001424501          -0.001424501
## contry_of_resJordan                 -0.010102491          -0.010102491
## contry_of_resKazakhstan             -0.002470831          -0.002470831
## contry_of_resLebanon                -0.001424501          -0.001424501
## contry_of_resMalaysia               -0.003194396          -0.003194396
## contry_of_resMexico                 -0.004049338          -0.004049338
## contry_of_resNepal                  -0.001424501          -0.001424501
## contry_of_resNetherlands            -0.004533826          -0.004533826
## contry_of_resNew.Zealand            -0.013524849          -0.013524849
## contry_of_resNicaragua              -0.001424501          -0.001424501
## contry_of_resNiger                  -0.001424501          -0.001424501
## contry_of_resOman                   -0.001424501          -0.001424501
## contry_of_resPakistan               -0.002470831          -0.002470831
## contry_of_resPhilippines            -0.002855110          -0.002855110
## contry_of_resPortugal               -0.001424501          -0.001424501
## contry_of_resRomania                -0.002470831          -0.002470831
## contry_of_resRussia                 -0.003785087          -0.003785087
## contry_of_resSaudi.Arabia           -0.002855110          -0.002855110
## contry_of_resSerbia                  1.000000000          -0.001424501
## contry_of_resSierra.Leone           -0.001424501           1.000000000
```

```
## contry_of_resSouth.Africa                 -0.002015986         -0.002015986
## contry_of_resSpain                         -0.002470831         -0.002470831
## contry_of_resSri.Lanka                     -0.005380044         -0.005380044
## contry_of_resSweden                        -0.002015986         -0.002015986
## contry_of_resTonga                         -0.001424501         -0.001424501
## contry_of_resTurkey                        -0.001424501         -0.001424501
## contry_of_resUkraine                       -0.002015986         -0.002015986
## contry_of_resUnited.Arab.Emirates          -0.013714898         -0.013714898
## contry_of_resUnited.Kingdom                -0.013237002         -0.013237002
## contry_of_resUnited.States                 -0.016517513         -0.016517513
## contry_of_resUruguay                       -0.001424501         -0.001424501
## contry_of_resViet.Nam                      -0.003194396         -0.003194396
## used_app_before                            -0.004973740         -0.004973740
## relationHealth.care.professional           -0.002855110         -0.002855110
## relationOthers                             -0.015369962         -0.015369962
## relationParent                             -0.010443831         -0.010443831
## relationRelative                           -0.007687030         -0.007687030
## relationSelf                                0.022307365          0.022307365
## Class.ASD                                  -0.022886574          0.062241794
##                              contry_of_resSouth.Africa contry_of_resSpain
## gender                                     -0.055823798         -0.024732656
## ethnicityAsian                             -0.024597703         -0.030147421
## ethnicityBlack                             -0.013633842          0.165415063
## ethnicityHispanic                          -0.007331674         -0.008985841
## ethnicityLatino                            -0.009140304          0.120053818
## ethnicityMiddle.Eastern.                   -0.020726659         -0.025402995
## ethnicityOthers                            -0.024960504         -0.030592078
## ethnicityPasifika                          -0.006734406         -0.008253818
## ethnicitySouth.Asian                       -0.012409215         -0.015208975
## ethnicityTurkish                           -0.004955817         -0.006073945
## ethnicityWhite.European                     0.075862466         -0.046093601
## jundice                                     0.072144839          0.051749106
## austim                                     -0.020596858          0.039761467
## contry_of_resAfghanistan                   -0.007331674         -0.008985841
## contry_of_resAmericanSamoa                 -0.002853067         -0.003496774
## contry_of_resAngola                        -0.002015986         -0.002470831
## contry_of_resArgentina                     -0.002853067         -0.003496774
## contry_of_resArmenia                       -0.002853067         -0.003496774
## contry_of_resAruba                         -0.002015986         -0.002470831
## contry_of_resAustralia                     -0.010674917         -0.013083386
## contry_of_resAustria                       -0.004040614         -0.004952255
## contry_of_resAzerbaijan                    -0.002015986         -0.002470831
## contry_of_resBahamas                       -0.002853067         -0.003496774
## contry_of_resBangladesh                    -0.003496774         -0.004285714
## contry_of_resBelgium                       -0.003496774         -0.004285714
## contry_of_resBolivia                       -0.002015986         -0.002470831
## contry_of_resBrazil                        -0.006082716         -0.007455094
## contry_of_resBurundi                       -0.002015986         -0.002470831
## contry_of_resCanada                        -0.007886919         -0.009666361
## contry_of_resChile                         -0.002015986         -0.002470831
## contry_of_resChina                         -0.002015986         -0.002470831
## contry_of_resCosta.Rica                    -0.002015986         -0.002470831
## contry_of_resCyprus                        -0.002015986         -0.002470831
## contry_of_resCzech.Republic                -0.002015986         -0.002470831
```

```
## contry_of_resEcuador                          -0.002015986      -0.002470831
## contry_of_resEgypt                            -0.003496774      -0.004285714
## contry_of_resEthiopia                         -0.002853067      -0.003496774
## contry_of_resFinland                          -0.002015986      -0.002470831
## contry_of_resFrance                           -0.006734406      -0.008253818
## contry_of_resGermany                          -0.004040614      -0.004952255
## contry_of_resHong.Kong                        -0.002015986      -0.002470831
## contry_of_resIceland                          -0.002853067      -0.003496774
## contry_of_resIndia                            -0.019275396      -0.023624299
## contry_of_resIndonesia                        -0.002015986      -0.002470831
## contry_of_resIran                             -0.005356738      -0.006565322
## contry_of_resIraq                             -0.002015986      -0.002470831
## contry_of_resIreland                          -0.004520779      -0.005540754
## contry_of_resItaly                            -0.004520779      -0.005540754
## contry_of_resJapan                            -0.002015986      -0.002470831
## contry_of_resJordan                           -0.014297266      -0.017523006
## contry_of_resKazakhstan                       -0.003496774      -0.004285714
## contry_of_resLebanon                          -0.002015986      -0.002470831
## contry_of_resMalaysia                         -0.004520779      -0.005540754
## contry_of_resMexico                           -0.005730712      -0.007023672
## contry_of_resNepal                            -0.002015986      -0.002470831
## contry_of_resNetherlands                      -0.006416370      -0.007864027
## contry_of_resNew.Zealand                      -0.019140662      -0.023459166
## contry_of_resNicaragua                        -0.002015986      -0.002470831
## contry_of_resNiger                            -0.002015986      -0.002470831
## contry_of_resOman                             -0.002015986      -0.002470831
## contry_of_resPakistan                         -0.003496774      -0.004285714
## contry_of_resPhilippines                      -0.004040614      -0.004952255
## contry_of_resPortugal                         -0.002015986      -0.002470831
## contry_of_resRomania                          -0.003496774      -0.004285714
## contry_of_resRussia                           -0.005356738      -0.006565322
## contry_of_resSaudi.Arabia                     -0.004040614      -0.004952255
## contry_of_resSerbia                           -0.002015986      -0.002470831
## contry_of_resSierra.Leone                     -0.002015986      -0.002470831
## contry_of_resSouth.Africa                      1.000000000      -0.003496774
## contry_of_resSpain                            -0.003496774       1.000000000
## contry_of_resSri.Lanka                        -0.007613957      -0.009331813
## contry_of_resSweden                           -0.002853067      -0.003496774
## contry_of_resTonga                            -0.002015986      -0.002470831
## contry_of_resTurkey                           -0.002015986      -0.002470831
## contry_of_resUkraine                          -0.002853067      -0.003496774
## contry_of_resUnited.Arab.Emirates             -0.019409624      -0.023788811
## contry_of_resUnited.Kingdom                   -0.018733296      -0.022959890
## contry_of_resUnited.States                    -0.023375947      -0.028650013
## contry_of_resUruguay                          -0.002015986      -0.002470831
## contry_of_resViet.Nam                         -0.004520779      -0.005540754
## used_app_before                               -0.007038945      -0.008627068
## relationHealth.care.professional              -0.004040614      -0.004952255
## relationOthers                                -0.021751907      -0.026659558
## relationParent                                -0.014780339       0.066784225
## relationRelative                              -0.010878853      -0.013333333
## relationSelf                                   0.031569872      -0.011125908
## Class.ASD                                      0.088085951       0.058740799
##                                 contry_of_resSri.Lanka contry_of_resSweden
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## gender                            0.0140915891   -0.055823798
## ethnicityAsian                     0.2827405495   -0.024597703
## ethnicityBlack                    -0.0363845214   -0.013633842
## ethnicityHispanic                 -0.0195659770   -0.007331674
## ethnicityLatino                   -0.0243926539   -0.009140304
## ethnicityMiddle.Eastern.          -0.0553130639   -0.020726659
## ethnicityOthers                   -0.0666118926   -0.024960504
## ethnicityPasifika                 -0.0179720535   -0.006734406
## ethnicitySouth.Asian               0.0130757100   -0.012409215
## ethnicityTurkish                  -0.0132255470   -0.004955817
## ethnicityWhite.European           -0.1003652656    0.075862466
## jundice                           -0.0470255976   -0.017621217
## austim                            -0.0549666655    0.138519528
## contry_of_resAfghanistan          -0.0195659770   -0.007331674
## contry_of_resAmericanSamoa        -0.0076139566   -0.002853067
## contry_of_resAngola               -0.0053800443   -0.002015986
## contry_of_resArgentina            -0.0076139566   -0.002853067
## contry_of_resArmenia              -0.0076139566   -0.002853067
## contry_of_resAruba                -0.0053800443   -0.002015986
## contry_of_resAustralia            -0.0284880643   -0.010674917
## contry_of_resAustria              -0.0107831542   -0.004040614
## contry_of_resAzerbaijan           -0.0053800443   -0.002015986
## contry_of_resBahamas              -0.0076139566   -0.002853067
## contry_of_resBangladesh           -0.0093318127   -0.003496774
## contry_of_resBelgium              -0.0093318127   -0.003496774
## contry_of_resBolivia              -0.0053800443   -0.002015986
## contry_of_resBrazil               -0.0162328930   -0.006082716
## contry_of_resBurundi              -0.0053800443   -0.002015986
## contry_of_resCanada               -0.0210477568   -0.007886919
## contry_of_resChile                -0.0053800443   -0.002015986
## contry_of_resChina                -0.0053800443   -0.002015986
## contry_of_resCosta.Rica           -0.0053800443   -0.002015986
## contry_of_resCyprus               -0.0053800443   -0.002015986
## contry_of_resCzech.Republic       -0.0053800443   -0.002015986
## contry_of_resEcuador              -0.0053800443   -0.002015986
## contry_of_resEgypt                -0.0093318127   -0.003496774
## contry_of_resEthiopia             -0.0076139566   -0.002853067
## contry_of_resFinland              -0.0053800443   -0.002015986
## contry_of_resFrance               -0.0179720535   -0.006734406
## contry_of_resGermany              -0.0107831542   -0.004040614
## contry_of_resHong.Kong            -0.0053800443   -0.002015986
## contry_of_resIceland              -0.0076139566   -0.002853067
## contry_of_resIndia                -0.0514400905   -0.019275396
## contry_of_resIndonesia            -0.0053800443   -0.002015986
## contry_of_resIran                 -0.0142954821   -0.005356738
## contry_of_resIraq                 -0.0053800443   -0.002015986
## contry_of_resIreland              -0.0120645658   -0.004520779
## contry_of_resItaly                -0.0120645658   -0.004520779
## contry_of_resJapan                -0.0053800443   -0.002015986
## contry_of_resJordan               -0.0381549963   -0.014297266
## contry_of_resKazakhstan           -0.0093318127   -0.003496774
## contry_of_resLebanon              -0.0053800443   -0.002015986
## contry_of_resMalaysia             -0.0120645658   -0.004520779
## contry_of_resMexico               -0.0152935039   -0.005730712
```

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## contry_of_resNepal                     -0.0053800443        -0.002015986
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## contry_of_resNicaragua                 -0.0053800443        -0.002015986
## contry_of_resNiger                     -0.0053800443        -0.002015986
## contry_of_resOman                      -0.0053800443        -0.002015986
## contry_of_resPakistan                  -0.0093318127        -0.003496774
## contry_of_resPhilippines               -0.0107831542        -0.004040614
## contry_of_resPortugal                  -0.0053800443        -0.002015986
## contry_of_resRomania                   -0.0093318127        -0.003496774
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## contry_of_resSaudi.Arabia              -0.0107831542        -0.004040614
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## contry_of_resSierra.Leone              -0.0053800443        -0.002015986
## contry_of_resSouth.Africa              -0.0076139566        -0.002853067
## contry_of_resSpain                     -0.0093318127        -0.003496774
## contry_of_resSri.Lanka                  1.0000000000        -0.007613957
## contry_of_resSweden                    -0.0076139566         1.000000000
## contry_of_resTonga                     -0.0053800443        -0.002015986
## contry_of_resTurkey                    -0.0053800443        -0.002015986
## contry_of_resUkraine                   -0.0076139566        -0.002853067
## contry_of_resUnited.Arab.Emirates      -0.0517983031        -0.019409624
## contry_of_resUnited.Kingdom            -0.0499933918        -0.018733296
## contry_of_resUnited.States             -0.0623831963        -0.023375947
## contry_of_resUruguay                   -0.0053800443        -0.002015986
## contry_of_resViet.Nam                  -0.0120645658        -0.004520779
## used_app_before                        -0.0187847754        -0.007038945
## relationHealth.care.professional       -0.0107831542        -0.004040614
## relationOthers                         -0.0580491348        -0.021751907
## relationParent                          0.0001690464        -0.014780339
## relationRelative                       -0.0290323062        -0.010878853
## relationSelf                            0.0610053869         0.031569872
## Class.ASD                              -0.0864378089         0.088085951
##                                  contry_of_resTonga contry_of_resTurkey
## gender                                 -0.039445261        -0.039445261
## ethnicityAsian                         -0.017380810        -0.017380810
## ethnicityBlack                         -0.009633713        -0.009633713
## ethnicityHispanic                      -0.005180582        -0.005180582
## ethnicityLatino                        -0.006458566        -0.006458566
## ethnicityMiddle.Eastern.               -0.014645519        -0.014645519
## ethnicityOthers                        -0.017637166        -0.017637166
## ethnicityPasifika                       0.299356125        -0.004758551
## ethnicitySouth.Asian                   -0.008768388        -0.008768388
## ethnicityTurkish                       -0.003501795         0.406791817
## ethnicityWhite.European                -0.026574217        -0.026574217
## jundice                                -0.012451204        -0.012451204
## austim                                 -0.014553801        -0.014553801
## contry_of_resAfghanistan               -0.005180582        -0.005180582
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## contry_of_resArgentina                 -0.002015986        -0.002015986
## contry_of_resArmenia                   -0.002015986        -0.002015986
## contry_of_resAruba                     -0.001424501        -0.001424501
## contry_of_resAustralia                 -0.007542928        -0.007542928
```

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## contry_of_resAustria                -0.002855110            -0.002855110
## contry_of_resAzerbaijan             -0.001424501            -0.001424501
## contry_of_resBahamas                -0.002015986            -0.002015986
## contry_of_resBangladesh             -0.002470831            -0.002470831
## contry_of_resBelgium                -0.002470831            -0.002470831
## contry_of_resBolivia                -0.001424501            -0.001424501
## contry_of_resBrazil                 -0.004298065            -0.004298065
## contry_of_resBurundi                -0.001424501            -0.001424501
## contry_of_resCanada                 -0.005572921            -0.005572921
## contry_of_resChile                  -0.001424501            -0.001424501
## contry_of_resChina                  -0.001424501            -0.001424501
## contry_of_resCosta.Rica             -0.001424501            -0.001424501
## contry_of_resCyprus                 -0.001424501            -0.001424501
## contry_of_resCzech.Republic         -0.001424501            -0.001424501
## contry_of_resEcuador                -0.001424501            -0.001424501
## contry_of_resEgypt                  -0.002470831            -0.002470831
## contry_of_resEthiopia               -0.002015986            -0.002015986
## contry_of_resFinland                -0.001424501            -0.001424501
## contry_of_resFrance                 -0.004758551            -0.004758551
## contry_of_resGermany                -0.002855110            -0.002855110
## contry_of_resHong.Kong              -0.001424501            -0.001424501
## contry_of_resIceland                -0.002015986            -0.002015986
## contry_of_resIndia                  -0.013620052            -0.013620052
## contry_of_resIndonesia              -0.001424501            -0.001424501
## contry_of_resIran                   -0.003785087            -0.003785087
## contry_of_resIraq                   -0.001424501            -0.001424501
## contry_of_resIreland                -0.003194396            -0.003194396
## contry_of_resItaly                  -0.003194396            -0.003194396
## contry_of_resJapan                  -0.001424501            -0.001424501
## contry_of_resJordan                 -0.010102491            -0.010102491
## contry_of_resKazakhstan             -0.002470831            -0.002470831
## contry_of_resLebanon                -0.001424501            -0.001424501
## contry_of_resMalaysia               -0.003194396            -0.003194396
## contry_of_resMexico                 -0.004049338            -0.004049338
## contry_of_resNepal                  -0.001424501            -0.001424501
## contry_of_resNetherlands            -0.004533826            -0.004533826
## contry_of_resNew.Zealand            -0.013524849            -0.013524849
## contry_of_resNicaragua              -0.001424501            -0.001424501
## contry_of_resNiger                  -0.001424501            -0.001424501
## contry_of_resOman                   -0.001424501            -0.001424501
## contry_of_resPakistan               -0.002470831            -0.002470831
## contry_of_resPhilippines            -0.002855110            -0.002855110
## contry_of_resPortugal               -0.001424501            -0.001424501
## contry_of_resRomania                -0.002470831            -0.002470831
## contry_of_resRussia                 -0.003785087            -0.003785087
## contry_of_resSaudi.Arabia           -0.002855110            -0.002855110
## contry_of_resSerbia                 -0.001424501            -0.001424501
## contry_of_resSierra.Leone           -0.001424501            -0.001424501
## contry_of_resSouth.Africa           -0.002015986            -0.002015986
## contry_of_resSpain                  -0.002470831            -0.002470831
## contry_of_resSri.Lanka              -0.005380044            -0.005380044
## contry_of_resSweden                 -0.002015986            -0.002015986
## contry_of_resTonga                   1.000000000            -0.001424501
## contry_of_resTurkey                 -0.001424501             1.000000000
```

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## contry_of_resUnited.States                -0.016517513          -0.016517513
## contry_of_resUruguay                      -0.001424501          -0.001424501
## contry_of_resViet.Nam                     -0.003194396          -0.003194396
## used_app_before                           -0.004973740          -0.004973740
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## relationParent                            -0.010443831          -0.010443831
## relationRelative                          -0.007687030          -0.007687030
## relationSelf                               0.022307365           0.022307365
## Class.ASD                                 -0.022886574          -0.022886574
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## ethnicityBlack                            -0.013633842
## ethnicityHispanic                         -0.007331674
## ethnicityLatino                           -0.009140304
## ethnicityMiddle.Eastern.                  -0.020726659
## ethnicityOthers                            0.044671379
## ethnicityPasifika                         -0.006734406
## ethnicitySouth.Asian                      -0.012409215
## ethnicityTurkish                          -0.004955817
## ethnicityWhite.European                    0.019127026
## jundice                                   -0.017621217
## austim                                    -0.020596858
## contry_of_resAfghanistan                  -0.007331674
## contry_of_resAmericanSamoa                -0.002853067
## contry_of_resAngola                       -0.002015986
## contry_of_resArgentina                    -0.002853067
## contry_of_resArmenia                      -0.002853067
## contry_of_resAruba                        -0.002015986
## contry_of_resAustralia                    -0.010674917
## contry_of_resAustria                      -0.004040614
## contry_of_resAzerbaijan                   -0.002015986
## contry_of_resBahamas                      -0.002853067
## contry_of_resBangladesh                   -0.003496774
## contry_of_resBelgium                      -0.003496774
## contry_of_resBolivia                      -0.002015986
## contry_of_resBrazil                       -0.006082716
## contry_of_resBurundi                      -0.002015986
## contry_of_resCanada                       -0.007886919
## contry_of_resChile                        -0.002015986
## contry_of_resChina                        -0.002015986
## contry_of_resCosta.Rica                   -0.002015986
## contry_of_resCyprus                       -0.002015986
## contry_of_resCzech.Republic               -0.002015986
## contry_of_resEcuador                      -0.002015986
## contry_of_resEgypt                        -0.003496774
## contry_of_resEthiopia                     -0.002853067
## contry_of_resFinland                      -0.002015986
## contry_of_resFrance                       -0.006734406
## contry_of_resGermany                      -0.004040614
```

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## contry_of_resHong.Kong                       -0.002015986
## contry_of_resIceland                          -0.002853067
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## contry_of_resIndonesia                        -0.002015986
## contry_of_resIran                             -0.005356738
## contry_of_resIraq                             -0.002015986
## contry_of_resIreland                          -0.004520779
## contry_of_resItaly                            -0.004520779
## contry_of_resJapan                            -0.002015986
## contry_of_resJordan                           -0.014297266
## contry_of_resKazakhstan                       -0.003496774
## contry_of_resLebanon                          -0.002015986
## contry_of_resMalaysia                         -0.004520779
## contry_of_resMexico                           -0.005730712
## contry_of_resNepal                            -0.002015986
## contry_of_resNetherlands                      -0.006416370
## contry_of_resNew.Zealand                      -0.019140662
## contry_of_resNicaragua                        -0.002015986
## contry_of_resNiger                            -0.002015986
## contry_of_resOman                             -0.002015986
## contry_of_resPakistan                         -0.003496774
## contry_of_resPhilippines                      -0.004040614
## contry_of_resPortugal                         -0.002015986
## contry_of_resRomania                          -0.003496774
## contry_of_resRussia                           -0.005356738
## contry_of_resSaudi.Arabia                     -0.004040614
## contry_of_resSerbia                           -0.002015986
## contry_of_resSierra.Leone                     -0.002015986
## contry_of_resSouth.Africa                     -0.002853067
## contry_of_resSpain                            -0.003496774
## contry_of_resSri.Lanka                        -0.007613957
## contry_of_resSweden                           -0.002853067
## contry_of_resTonga                            -0.002015986
## contry_of_resTurkey                           -0.002015986
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## contry_of_resUnited.States                    -0.023375947
## contry_of_resUruguay                          -0.002015986
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## relationHealth.care.professional              -0.004040614
## relationOthers                                 0.054706045
## relationParent                                -0.014780339
## relationRelative                              -0.010878853
## relationSelf                                  -0.029401612
## Class.ASD                                     -0.032389581
##                               contry_of_resUnited.Arab.Emirates
## gender                                         -0.0249110338
## ethnicityAsian                                 -0.1440125851
## ethnicityBlack                                 -0.0002893568
## ethnicityHispanic                              -0.0498779111
## ethnicityLatino                                -0.0621821554
## ethnicityMiddle.Eastern.                        0.5554033431
```

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## ethnicityOthers                              0.0381624554
## ethnicityPasifika                            -0.0101076678
## ethnicitySouth.Asian                         -0.0643165236
## ethnicityTurkish                              0.0626327463
## ethnicityWhite.European                      -0.2558527903
## jundice                                      -0.0156151294
## austim                                       -0.1005189885
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## contry_of_resAmericanSamoa                   -0.0194096237
## contry_of_resAngola                          -0.0137148976
## contry_of_resArgentina                       -0.0194096237
## contry_of_resArmenia                         -0.0194096237
## contry_of_resAruba                           -0.0137148976
## contry_of_resAustralia                       -0.0726222433
## contry_of_resAustria                         -0.0274885944
## contry_of_resAzerbaijan                      -0.0137148976
## contry_of_resBahamas                         -0.0194096237
## contry_of_resBangladesh                      -0.0237888109
## contry_of_resBelgium                         -0.0237888109
## contry_of_resBolivia                         -0.0137148976
## contry_of_resBrazil                          -0.0413811586
## contry_of_resBurundi                         -0.0137148976
## contry_of_resCanada                          -0.0536552888
## contry_of_resChile                           -0.0137148976
## contry_of_resChina                           -0.0137148976
## contry_of_resCosta.Rica                      -0.0137148976
## contry_of_resCyprus                          -0.0137148976
## contry_of_resCzech.Republic                  -0.0137148976
## contry_of_resEcuador                         -0.0137148976
## contry_of_resEgypt                           -0.0237888109
## contry_of_resEthiopia                        -0.0194096237
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## contry_of_resFrance                          -0.0458146551
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## contry_of_resIran                            -0.0364422788
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## contry_of_resIreland                         -0.0307551902
## contry_of_resItaly                           -0.0307551902
## contry_of_resJapan                           -0.0137148976
## contry_of_resJordan                          -0.0972653459
## contry_of_resKazakhstan                      -0.0237888109
## contry_of_resLebanon                         -0.0137148976
## contry_of_resMalaysia                        -0.0307551902
## contry_of_resMexico                          -0.0389864523
## contry_of_resNepal                           -0.0137148976
## contry_of_resNetherlands                     -0.0436510313
## contry_of_resNew.Zealand                     -0.1302153241
## contry_of_resNicaragua                       -0.0137148976
## contry_of_resNiger                           -0.0137148976
## contry_of_resOman                            -0.0137148976
```

```
## contry_of_resPakistan                              -0.0237888109
## contry_of_resPhilippines                           -0.0274885944
## contry_of_resPortugal                              -0.0137148976
## contry_of_resRomania                               -0.0237888109
## contry_of_resRussia                                -0.0364422788
## contry_of_resSaudi.Arabia                          -0.0274885944
## contry_of_resSerbia                                -0.0137148976
## contry_of_resSierra.Leone                          -0.0137148976
## contry_of_resSouth.Africa                          -0.0194096237
## contry_of_resSpain                                 -0.0237888109
## contry_of_resSri.Lanka                             -0.0517983031
## contry_of_resSweden                                -0.0194096237
## contry_of_resTonga                                 -0.0137148976
## contry_of_resTurkey                                -0.0137148976
## contry_of_resUkraine                               -0.0194096237
## contry_of_resUnited.Arab.Emirates                   1.0000000000
## contry_of_resUnited.Kingdom                        -0.1274439789
## contry_of_resUnited.States                         -0.1590282728
## contry_of_resUruguay                               -0.0137148976
## contry_of_resViet.Nam                              -0.0307551902
## used_app_before                                     0.0205366725
## relationHealth.care.professional                   -0.0274885944
## relationOthers                                      0.0550051787
## relationParent                                     -0.0660698426
## relationRelative                                    0.0846146728
## relationSelf                                       -0.0381506943
## Class.ASD                                          -0.1903631812
##                                 contry_of_resUnited.Kingdom
## gender                                      -0.001802933
## ethnicityAsian                              -0.137532485
## ethnicityBlack                              -0.013491549
## ethnicityHispanic                           -0.048139916
## ethnicityLatino                             -0.032618770
## ethnicityMiddle.Eastern.                    -0.109080806
## ethnicityOthers                             -0.128264860
## ethnicityPasifika                           -0.044218244
## ethnicitySouth.Asian                        -0.081479157
## ethnicityTurkish                            -0.032539991
## ethnicityWhite.European                      0.382002465
## jundice                                      0.144555808
## austim                                       0.095422222
## contry_of_resAfghanistan                    -0.048139916
## contry_of_resAmericanSamoa                  -0.018733296
## contry_of_resAngola                         -0.013237002
## contry_of_resArgentina                      -0.018733296
## contry_of_resArmenia                        -0.018733296
## contry_of_resAruba                          -0.013237002
## contry_of_resAustralia                      -0.070091722
## contry_of_resAustria                        -0.026530755
## contry_of_resAzerbaijan                     -0.013237002
## contry_of_resBahamas                        -0.018733296
## contry_of_resBangladesh                     -0.022959890
## contry_of_resBelgium                        -0.022959890
## contry_of_resBolivia                        -0.013237002
```

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## contry_of_resBrazil                        -0.039939233
## contry_of_resBurundi                       -0.013237002
## contry_of_resCanada                        -0.051785671
## contry_of_resChile                         -0.013237002
## contry_of_resChina                         -0.013237002
## contry_of_resCosta.Rica                    -0.013237002
## contry_of_resCyprus                        -0.013237002
## contry_of_resCzech.Republic                -0.013237002
## contry_of_resEcuador                       -0.013237002
## contry_of_resEgypt                         -0.022959890
## contry_of_resEthiopia                      -0.018733296
## contry_of_resFinland                       -0.013237002
## contry_of_resFrance                        -0.044218244
## contry_of_resGermany                       -0.026530755
## contry_of_resHong.Kong                     -0.013237002
## contry_of_resIceland                       -0.018733296
## contry_of_resIndia                         -0.126562636
## contry_of_resIndonesia                     -0.013237002
## contry_of_resIran                          -0.035172448
## contry_of_resIraq                          -0.013237002
## contry_of_resIreland                       -0.029683526
## contry_of_resItaly                         -0.029683526
## contry_of_resJapan                         -0.013237002
## contry_of_resJordan                        -0.093876136
## contry_of_resKazakhstan                    -0.022959890
## contry_of_resLebanon                       -0.013237002
## contry_of_resMalaysia                      -0.029683526
## contry_of_resMexico                        -0.037627970
## contry_of_resNepal                         -0.013237002
## contry_of_resNetherlands                   -0.042130012
## contry_of_resNew.Zealand                   -0.125677973
## contry_of_resNicaragua                     -0.013237002
## contry_of_resNiger                         -0.013237002
## contry_of_resOman                          -0.013237002
## contry_of_resPakistan                      -0.022959890
## contry_of_resPhilippines                   -0.026530755
## contry_of_resPortugal                      -0.013237002
## contry_of_resRomania                       -0.022959890
## contry_of_resRussia                        -0.035172448
## contry_of_resSaudi.Arabia                  -0.026530755
## contry_of_resSerbia                        -0.013237002
## contry_of_resSierra.Leone                  -0.013237002
## contry_of_resSouth.Africa                  -0.018733296
## contry_of_resSpain                         -0.022959890
## contry_of_resSri.Lanka                     -0.049993392
## contry_of_resSweden                        -0.018733296
## contry_of_resTonga                         -0.013237002
## contry_of_resTurkey                        -0.013237002
## contry_of_resUkraine                       -0.018733296
## contry_of_resUnited.Arab.Emirates          -0.127443979
## contry_of_resUnited.Kingdom                 1.000000000
## contry_of_resUnited.States                 -0.153486934
## contry_of_resUruguay                       -0.013237002
## contry_of_resViet.Nam                      -0.029683526
```

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## used_app_before                            -0.046217856
## relationHealth.care.professional           -0.026530755
## relationOthers                             -0.116744264
## relationParent                              0.009276277
## relationRelative                           -0.001557164
## relationSelf                                0.092905561
## Class.ASD                                   0.085255309
##                                 contry_of_resUnited.States
## gender                                     -0.007687142
## ethnicityAsian                             -0.160761581
## ethnicityBlack                              0.049910095
## ethnicityHispanic                           0.256147605
## ethnicityLatino                            -0.051593862
## ethnicityMiddle.Eastern.                   -0.112401424
## ethnicityOthers                            -0.113629992
## ethnicityPasifika                          -0.023970613
## ethnicitySouth.Asian                       -0.084101874
## ethnicityTurkish                            0.001497210
## ethnicityWhite.European                     0.267782927
## jundice                                     0.011832226
## austim                                      0.096595884
## contry_of_resAfghanistan                   -0.060070375
## contry_of_resAmericanSamoa                 -0.023375947
## contry_of_resAngola                        -0.016517513
## contry_of_resArgentina                     -0.023375947
## contry_of_resArmenia                       -0.023375947
## contry_of_resAruba                         -0.016517513
## contry_of_resAustralia                     -0.087462472
## contry_of_resAustria                       -0.033105841
## contry_of_resAzerbaijan                    -0.016517513
## contry_of_resBahamas                       -0.023375947
## contry_of_resBangladesh                    -0.028650013
## contry_of_resBelgium                       -0.028650013
## contry_of_resBolivia                       -0.016517513
## contry_of_resBrazil                        -0.049837326
## contry_of_resBurundi                       -0.016517513
## contry_of_resCanada                        -0.064619654
## contry_of_resChile                         -0.016517513
## contry_of_resChina                         -0.016517513
## contry_of_resCosta.Rica                    -0.016517513
## contry_of_resCyprus                        -0.016517513
## contry_of_resCzech.Republic                -0.016517513
## contry_of_resEcuador                       -0.016517513
## contry_of_resEgypt                         -0.028650013
## contry_of_resEthiopia                      -0.023375947
## contry_of_resFinland                       -0.016517513
## contry_of_resFrance                        -0.055176800
## contry_of_resGermany                       -0.033105841
## contry_of_resHong.Kong                     -0.016517513
## contry_of_resIceland                       -0.023375947
## contry_of_resIndia                         -0.157928508
## contry_of_resIndonesia                     -0.016517513
## contry_of_resIran                          -0.043889195
## contry_of_resIraq                          -0.016517513
```

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## contry_of_resIreland                           -0.037039960
## contry_of_resItaly                             -0.037039960
## contry_of_resJapan                             -0.016517513
## contry_of_resJordan                            -0.117141350
## contry_of_resKazakhstan                        -0.028650013
## contry_of_resLebanon                           -0.016517513
## contry_of_resMalaysia                          -0.037039960
## contry_of_resMexico                            -0.046953266
## contry_of_resNepal                             -0.016517513
## contry_of_resNetherlands                       -0.052571044
## contry_of_resNew.Zealand                       -0.156824599
## contry_of_resNicaragua                         -0.016517513
## contry_of_resNiger                             -0.016517513
## contry_of_resOman                              -0.016517513
## contry_of_resPakistan                          -0.028650013
## contry_of_resPhilippines                       -0.033105841
## contry_of_resPortugal                          -0.016517513
## contry_of_resRomania                           -0.028650013
## contry_of_resRussia                            -0.043889195
## contry_of_resSaudi.Arabia                      -0.033105841
## contry_of_resSerbia                            -0.016517513
## contry_of_resSierra.Leone                      -0.016517513
## contry_of_resSouth.Africa                      -0.023375947
## contry_of_resSpain                             -0.028650013
## contry_of_resSri.Lanka                         -0.062383196
## contry_of_resSweden                            -0.023375947
## contry_of_resTonga                             -0.016517513
## contry_of_resTurkey                            -0.016517513
## contry_of_resUkraine                           -0.023375947
## contry_of_resUnited.Arab.Emirates              -0.159028273
## contry_of_resUnited.Kingdom                    -0.153486934
## contry_of_resUnited.States                      1.000000000
## contry_of_resUruguay                           -0.016517513
## contry_of_resViet.Nam                          -0.037039960
## used_app_before                                 0.032025808
## relationHealth.care.professional               -0.033105841
## relationOthers                                 -0.144956897
## relationParent                                 -0.030692778
## relationRelative                                0.029692344
## relationSelf                                    0.126035033
## Class.ASD                                       0.197594140
##                                 contry_of_resUruguay contry_of_resViet.Nam
## gender                                   0.036113373          -0.020679589
## ethnicityAsian                          -0.017380810           0.139235760
## ethnicityBlack                          -0.009633713          -0.021603273
## ethnicityHispanic                       -0.005180582          -0.011617279
## ethnicityLatino                         -0.006458566          -0.014483114
## ethnicityMiddle.Eastern.                -0.014645519          -0.032842076
## ethnicityOthers                         -0.017637166           0.004582864
## ethnicityPasifika                       -0.004758551          -0.010670889
## ethnicitySouth.Asian                    -0.008768388          -0.019662812
## ethnicityTurkish                        -0.003501795          -0.007852655
## ethnicityWhite.European                  0.053604644          -0.059591775
## jundice                                  0.114406718          -0.027921401
```

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## austim                             0.097878309    -0.032636402
## contry_of_resAfghanistan          -0.005180582    -0.011617279
## contry_of_resAmericanSamoa        -0.002015986    -0.004520779
## contry_of_resAngola               -0.001424501    -0.003194396
## contry_of_resArgentina            -0.002015986    -0.004520779
## contry_of_resArmenia              -0.002015986    -0.004520779
## contry_of_resAruba                -0.001424501    -0.003194396
## contry_of_resAustralia            -0.007542928    -0.016914759
## contry_of_resAustria              -0.002855110    -0.006402487
## contry_of_resAzerbaijan           -0.001424501    -0.003194396
## contry_of_resBahamas              -0.002015986    -0.004520779
## contry_of_resBangladesh           -0.002470831    -0.005540754
## contry_of_resBelgium              -0.002470831    -0.005540754
## contry_of_resBolivia              -0.001424501    -0.003194396
## contry_of_resBrazil               -0.004298065    -0.009638264
## contry_of_resBurundi              -0.001424501    -0.003194396
## contry_of_resCanada               -0.005572921    -0.012497084
## contry_of_resChile                -0.001424501    -0.003194396
## contry_of_resChina                -0.001424501    -0.003194396
## contry_of_resCosta.Rica           -0.001424501    -0.003194396
## contry_of_resCyprus               -0.001424501    -0.003194396
## contry_of_resCzech.Republic       -0.001424501    -0.003194396
## contry_of_resEcuador              -0.001424501    -0.003194396
## contry_of_resEgypt                -0.002470831    -0.005540754
## contry_of_resEthiopia             -0.002015986    -0.004520779
## contry_of_resFinland              -0.001424501    -0.003194396
## contry_of_resFrance               -0.004758551    -0.010670889
## contry_of_resGermany              -0.002855110    -0.006402487
## contry_of_resHong.Kong            -0.001424501    -0.003194396
## contry_of_resIceland              -0.002015986    -0.004520779
## contry_of_resIndia                -0.013620052    -0.030542502
## contry_of_resIndonesia            -0.001424501    -0.003194396
## contry_of_resIran                 -0.003785087    -0.008487928
## contry_of_resIraq                 -0.001424501    -0.003194396
## contry_of_resIreland              -0.003194396    -0.007163324
## contry_of_resItaly                -0.003194396    -0.007163324
## contry_of_resJapan                -0.001424501    -0.003194396
## contry_of_resJordan               -0.010102491    -0.022654491
## contry_of_resKazakhstan           -0.002470831    -0.005540754
## contry_of_resLebanon              -0.001424501    -0.003194396
## contry_of_resMalaysia             -0.003194396    -0.007163324
## contry_of_resMexico               -0.004049338    -0.009080502
## contry_of_resNepal                -0.001424501    -0.003194396
## contry_of_resNetherlands          -0.004533826    -0.010166950
## contry_of_resNew.Zealand          -0.013524849    -0.030329012
## contry_of_resNicaragua            -0.001424501    -0.003194396
## contry_of_resNiger                -0.001424501    -0.003194396
## contry_of_resOman                 -0.001424501    -0.003194396
## contry_of_resPakistan             -0.002470831    -0.005540754
## contry_of_resPhilippines          -0.002855110    -0.006402487
## contry_of_resPortugal             -0.001424501    -0.003194396
## contry_of_resRomania              -0.002470831    -0.005540754
## contry_of_resRussia               -0.003785087    -0.008487928
## contry_of_resSaudi.Arabia         -0.002855110    -0.006402487
```

```
## contry_of_resSerbia                         -0.001424501        -0.003194396
## contry_of_resSierra.Leone                    -0.001424501        -0.003194396
## contry_of_resSouth.Africa                    -0.002015986        -0.004520779
## contry_of_resSpain                           -0.002470831        -0.005540754
## contry_of_resSri.Lanka                       -0.005380044        -0.012064566
## contry_of_resSweden                          -0.002015986        -0.004520779
## contry_of_resTonga                           -0.001424501        -0.003194396
## contry_of_resTurkey                          -0.001424501        -0.003194396
## contry_of_resUkraine                         -0.002015986        -0.004520779
## contry_of_resUnited.Arab.Emirates            -0.013714898        -0.030755190
## contry_of_resUnited.Kingdom                  -0.013237002        -0.029683526
## contry_of_resUnited.States                   -0.016517513        -0.037039960
## contry_of_resUruguay                          1.000000000        -0.003194396
## contry_of_resViet.Nam                        -0.003194396         1.000000000
## used_app_before                              -0.004973740        -0.011153441
## relationHealth.care.professional             -0.002855110        -0.006402487
## relationOthers                               -0.015369962        -0.034466615
## relationParent                               -0.010443831        -0.023419936
## relationRelative                             -0.007687030        -0.017237903
## relationSelf                                  0.022307365         0.050023506
## Class.ASD                                     0.062241794        -0.013142869
##                                  used_app_before
## gender                                -0.027801578
## ethnicityAsian                        -0.031782152
## ethnicityBlack                         0.012190058
## ethnicityHispanic                      0.063425143
## ethnicityLatino                        0.043503680
## ethnicityMiddle.Eastern.               0.046550237
## ethnicityOthers                        0.024314845
## ethnicityPasifika                     -0.016614791
## ethnicitySouth.Asian                  -0.030615400
## ethnicityTurkish                      -0.012226744
## ethnicityWhite.European               -0.046127324
## jundice                                0.030347926
## austim                                 0.014611796
## contry_of_resAfghanistan              -0.018088341
## contry_of_resAmericanSamoa            -0.007038945
## contry_of_resAngola                   -0.004973740
## contry_of_resArgentina                -0.007038945
## contry_of_resArmenia                   0.199143493
## contry_of_resAruba                    -0.004973740
## contry_of_resAustralia                -0.026336626
## contry_of_resAustria                  -0.009968803
## contry_of_resAzerbaijan               -0.004973740
## contry_of_resBahamas                  -0.007038945
## contry_of_resBangladesh               -0.008627068
## contry_of_resBelgium                  -0.008627068
## contry_of_resBolivia                  -0.004973740
## contry_of_resBrazil                    0.180361590
## contry_of_resBurundi                  -0.004973740
## contry_of_resCanada                    0.056536926
## contry_of_resChile                    -0.004973740
## contry_of_resChina                    -0.004973740
## contry_of_resCosta.Rica               -0.004973740
```

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## contry_of_resCyprus                       -0.004973740
## contry_of_resCzech.Republic               -0.004973740
## contry_of_resEcuador                      -0.004973740
## contry_of_resEgypt                        -0.008627068
## contry_of_resEthiopia                     -0.007038945
## contry_of_resFinland                      -0.004973740
## contry_of_resFrance                       -0.016614791
## contry_of_resGermany                      -0.009968803
## contry_of_resHong.Kong                    -0.004973740
## contry_of_resIceland                      -0.007038945
## contry_of_resIndia                        -0.047555299
## contry_of_resIndonesia                    -0.004973740
## contry_of_resIran                         -0.013215877
## contry_of_resIraq                         -0.004973740
## contry_of_resIreland                      -0.011153441
## contry_of_resItaly                        -0.011153441
## contry_of_resJapan                        -0.004973740
## contry_of_resJordan                       -0.035273504
## contry_of_resKazakhstan                    0.159840393
## contry_of_resLebanon                      -0.004973740
## contry_of_resMalaysia                      0.119527714
## contry_of_resMexico                       -0.014138528
## contry_of_resNepal                        -0.004973740
## contry_of_resNetherlands                  -0.015830148
## contry_of_resNew.Zealand                  -0.047222891
## contry_of_resNicaragua                    -0.004973740
## contry_of_resNiger                        -0.004973740
## contry_of_resOman                         -0.004973740
## contry_of_resPakistan                     -0.008627068
## contry_of_resPhilippines                  -0.009968803
## contry_of_resPortugal                     -0.004973740
## contry_of_resRomania                      -0.008627068
## contry_of_resRussia                       -0.013215877
## contry_of_resSaudi.Arabia                 -0.009968803
## contry_of_resSerbia                       -0.004973740
## contry_of_resSierra.Leone                 -0.004973740
## contry_of_resSouth.Africa                 -0.007038945
## contry_of_resSpain                        -0.008627068
## contry_of_resSri.Lanka                    -0.018784775
## contry_of_resSweden                       -0.007038945
## contry_of_resTonga                        -0.004973740
## contry_of_resTurkey                       -0.004973740
## contry_of_resUkraine                       0.199143493
## contry_of_resUnited.Arab.Emirates          0.020536673
## contry_of_resUnited.Kingdom               -0.046217856
## contry_of_resUnited.States                 0.032025808
## contry_of_resUruguay                      -0.004973740
## contry_of_resViet.Nam                     -0.011153441
## used_app_before                            1.000000000
## relationHealth.care.professional          -0.009968803
## relationOthers                             0.009212530
## relationParent                             0.006259880
## relationRelative                           0.029316054
## relationSelf                              -0.022396257
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## Class.ASD                              0.043936387
##                           relationHealth.care.professional
## gender                                  0.034521271
## ethnicityAsian                          0.014939887
## ethnicityBlack                          0.059610085
## ethnicityHispanic                      -0.010383375
## ethnicityLatino                        -0.012944821
## ethnicityMiddle.Eastern.               -0.029353826
## ethnicityOthers                         0.013957618
## ethnicityPasifika                      -0.009537503
## ethnicitySouth.Asian                   -0.017574369
## ethnicityTurkish                       -0.007018602
## ethnicityWhite.European                -0.013086997
## jundice                                 0.038609139
## austim                                  0.027166564
## contry_of_resAfghanistan                0.129991868
## contry_of_resAmericanSamoa             -0.004040614
## contry_of_resAngola                    -0.002855110
## contry_of_resArgentina                 -0.004040614
## contry_of_resArmenia                   -0.004040614
## contry_of_resAruba                     -0.002855110
## contry_of_resAustralia                 -0.015118195
## contry_of_resAustria                   -0.005722461
## contry_of_resAzerbaijan                -0.002855110
## contry_of_resBahamas                    0.351028367
## contry_of_resBangladesh                -0.004952255
## contry_of_resBelgium                   -0.004952255
## contry_of_resBolivia                   -0.002855110
## contry_of_resBrazil                    -0.008614557
## contry_of_resBurundi                   -0.002855110
## contry_of_resCanada                    -0.011169734
## contry_of_resChile                     -0.002855110
## contry_of_resChina                     -0.002855110
## contry_of_resCosta.Rica                -0.002855110
## contry_of_resCyprus                    -0.002855110
## contry_of_resCzech.Republic            -0.002855110
## contry_of_resEcuador                   -0.002855110
## contry_of_resEgypt                     -0.004952255
## contry_of_resEthiopia                   0.351028367
## contry_of_resFinland                   -0.002855110
## contry_of_resFrance                    -0.009537503
## contry_of_resGermany                   -0.005722461
## contry_of_resHong.Kong                 -0.002855110
## contry_of_resIceland                   -0.004040614
## contry_of_resIndia                     -0.027298496
## contry_of_resIndonesia                 -0.002855110
## contry_of_resIran                      -0.007586401
## contry_of_resIraq                      -0.002855110
## contry_of_resIreland                   -0.006402487
## contry_of_resItaly                     -0.006402487
## contry_of_resJapan                     -0.002855110
## contry_of_resJordan                    -0.020248293
## contry_of_resKazakhstan                -0.004952255
## contry_of_resLebanon                   -0.002855110
```

```
## contry_of_resMalaysia                                      -0.006402487
## contry_of_resMexico                                        -0.008116037
## contry_of_resNepal                                         -0.002855110
## contry_of_resNetherlands                                    0.150618503
## contry_of_resNew.Zealand                                   -0.027107682
## contry_of_resNicaragua                                     -0.002855110
## contry_of_resNiger                                         -0.002855110
## contry_of_resOman                                          -0.002855110
## contry_of_resPakistan                                      -0.004952255
## contry_of_resPhilippines                                   -0.005722461
## contry_of_resPortugal                                      -0.002855110
## contry_of_resRomania                                       -0.004952255
## contry_of_resRussia                                        -0.007586401
## contry_of_resSaudi.Arabia                                  -0.005722461
## contry_of_resSerbia                                        -0.002855110
## contry_of_resSierra.Leone                                  -0.002855110
## contry_of_resSouth.Africa                                  -0.004040614
## contry_of_resSpain                                         -0.004952255
## contry_of_resSri.Lanka                                     -0.010783154
## contry_of_resSweden                                        -0.004040614
## contry_of_resTonga                                         -0.002855110
## contry_of_resTurkey                                        -0.002855110
## contry_of_resUkraine                                       -0.004040614
## contry_of_resUnited.Arab.Emirates                          -0.027488594
## contry_of_resUnited.Kingdom                                -0.026530755
## contry_of_resUnited.States                                 -0.033105841
## contry_of_resUruguay                                       -0.002855110
## contry_of_resViet.Nam                                      -0.006402487
## used_app_before                                            -0.009968803
## relationHealth.care.professional                            1.000000000
## relationOthers                                             -0.030805818
## relationParent                                             -0.020932438
## relationRelative                                           -0.015407016
## relationSelf                                               -0.127989569
## Class.ASD                                                  -0.003215843
##                                  relationOthers relationParent
## gender                             -0.009822501  -0.0122139866
## ethnicityAsian                     -0.176815547  -0.0254650033
## ethnicityBlack                     -0.103945000   0.1372197700
## ethnicityHispanic                  -0.055896997   0.0030969775
## ethnicityLatino                    -0.069686073   0.0525127308
## ethnicityMiddle.Eastern.           -0.158020944   0.1387700508
## ethnicityOthers                     0.818365368  -0.1148789705
## ethnicityPasifika                  -0.051343402  -0.0348876492
## ethnicitySouth.Asian               -0.094608396  -0.0391787763
## ethnicityTurkish                    0.006486144  -0.0256736519
## ethnicityWhite.European            -0.260774971  -0.0419931285
## jundice                             0.002531136   0.0947266676
## austim                             -0.072113622   0.1076167959
## contry_of_resAfghanistan            0.034785131   0.0852545326
## contry_of_resAmericanSamoa         -0.021751907  -0.0147803392
## contry_of_resAngola                -0.015369962   0.1363964391
## contry_of_resArgentina              0.131163998  -0.0147803392
## contry_of_resArmenia               -0.021751907  -0.0147803392
```

```
## contry_of_resAruba                -0.015369962  -0.0104438315
## contry_of_resAustralia            -0.081386033   0.0022939883
## contry_of_resAustria               0.023335407  -0.0209324383
## contry_of_resAzerbaijan            0.092680870  -0.0104438315
## contry_of_resBahamas               0.054706045  -0.0147803392
## contry_of_resBangladesh           -0.026659558  -0.0181150701
## contry_of_resBelgium              -0.026659558  -0.0181150701
## contry_of_resBolivia              -0.015369962  -0.0104438315
## contry_of_resBrazil               -0.010150947   0.0177165004
## contry_of_resBurundi              -0.015369962   0.1363964391
## contry_of_resCanada               -0.060130215  -0.0025604507
## contry_of_resChile                -0.015369962  -0.0104438315
## contry_of_resChina                -0.015369962  -0.0104438315
## contry_of_resCosta.Rica           -0.015369962   0.1363964391
## contry_of_resCyprus               -0.015369962  -0.0104438315
## contry_of_resCzech.Republic       -0.015369962  -0.0104438315
## contry_of_resEcuador              -0.015369962  -0.0104438315
## contry_of_resEgypt                 0.035812673  -0.0181150701
## contry_of_resEthiopia             -0.021751907  -0.0147803392
## contry_of_resFinland              -0.015369962  -0.0104438315
## contry_of_resFrance               -0.051343402   0.3218544220
## contry_of_resGermany              -0.030805818  -0.0209324383
## contry_of_resHong.Kong             0.092680870  -0.0104438315
## contry_of_resIceland              -0.021751907   0.0891254453
## contry_of_resIndia                -0.134202084   0.0041421897
## contry_of_resIndonesia            -0.015369962  -0.0104438315
## contry_of_resIran                  0.164235147  -0.0277506277
## contry_of_resIraq                  0.092680870  -0.0104438315
## contry_of_resIreland              -0.034466615  -0.0234199359
## contry_of_resItaly                -0.034466615  -0.0234199359
## contry_of_resJapan                 0.092680870  -0.0104438315
## contry_of_resJordan                0.575767632  -0.0740671137
## contry_of_resKazakhstan            0.160757137  -0.0181150701
## contry_of_resLebanon               0.092680870  -0.0104438315
## contry_of_resMalaysia             -0.034466615  -0.0234199359
## contry_of_resMexico               -0.043691196   0.0746653306
## contry_of_resNepal                -0.015369962  -0.0104438315
## contry_of_resNetherlands          -0.048918680  -0.0332400596
## contry_of_resNew.Zealand          -0.081811579   0.0054041312
## contry_of_resNicaragua            -0.015369962  -0.0104438315
## contry_of_resNiger                -0.015369962  -0.0104438315
## contry_of_resOman                 -0.015369962  -0.0104438315
## contry_of_resPakistan              0.035812673  -0.0181150701
## contry_of_resPhilippines          -0.030805818   0.0526450823
## contry_of_resPortugal             -0.015369962  -0.0104438315
## contry_of_resRomania              -0.026659558  -0.0181150701
## contry_of_resRussia                0.164235147  -0.0277506277
## contry_of_resSaudi.Arabia          0.077476633  -0.0209324383
## contry_of_resSerbia               -0.015369962  -0.0104438315
## contry_of_resSierra.Leone         -0.015369962  -0.0104438315
## contry_of_resSouth.Africa         -0.021751907  -0.0147803392
## contry_of_resSpain                -0.026659558   0.0667842251
## contry_of_resSri.Lanka            -0.058049135   0.0001690464
## contry_of_resSweden               -0.021751907  -0.0147803392
```

```
## contry_of_resTonga                   -0.015369962 -0.0104438315
## contry_of_resTurkey                  -0.015369962 -0.0104438315
## contry_of_resUkraine                  0.054706045 -0.0147803392
## contry_of_resUnited.Arab.Emirates     0.055005179 -0.0660698426
## contry_of_resUnited.Kingdom          -0.116744264  0.0092762767
## contry_of_resUnited.States           -0.144956897 -0.0306927780
## contry_of_resUruguay                 -0.015369962 -0.0104438315
## contry_of_resViet.Nam                -0.034466615 -0.0234199359
## used_app_before                       0.009212530  0.0062598797
## relationHealth.care.professional     -0.030805818 -0.0209324383
## relationOthers                        1.000000000 -0.1126859461
## relationParent                       -0.112685946  1.0000000000
## relationRelative                     -0.082940848 -0.0563579959
## relationSelf                         -0.689008392 -0.4681786222
## Class.ASD                            -0.155088502 -0.0180046175
##                                    relationRelative relationSelf   Class.ASD
## gender                                  0.092944243 -0.032423111 -0.081361471
## ethnicityAsian                         -0.074646866  0.186705450 -0.144133867
## ethnicityBlack                          0.039076124 -0.025310689  0.086216788
## ethnicityHispanic                       0.026035899  0.032917016  0.035840741
## ethnicityLatino                         0.008899791  0.023006494  0.089216576
## ethnicityMiddle.Eastern.                0.093512473  0.007875874 -0.159194491
## ethnicityOthers                        -0.095175353 -0.545101302 -0.132794031
## ethnicityPasifika                       0.091542348  0.022184126 -0.050600707
## ethnicitySouth.Asian                   -0.047316811  0.122578104 -0.097209558
## ethnicityTurkish                       -0.018896717  0.019534533 -0.021383205
## ethnicityWhite.European                 0.042027165  0.216080784  0.315969388
## jundice                                 0.055052981 -0.088812133  0.101901979
## austim                                  0.051474147 -0.033287786  0.177147712
## contry_of_resAfghanistan               -0.027955950 -0.087607266 -0.035603610
## contry_of_resAmericanSamoa             -0.010878853  0.031569872  0.027848185
## contry_of_resAngola                    -0.007687030 -0.063857897 -0.022886574
## contry_of_resArgentina                 -0.010878853 -0.090373095  0.027848185
## contry_of_resArmenia                    0.125689608 -0.029401612 -0.032389581
## contry_of_resAruba                     -0.007687030  0.022307365 -0.022886574
## contry_of_resAustralia                 -0.002853578  0.067425330  0.079153044
## contry_of_resAustria                   -0.015407016  0.001535384  0.082095008
## contry_of_resAzerbaijan                -0.007687030 -0.063857897 -0.022886574
## contry_of_resBahamas                   -0.010878853 -0.090373095  0.027848185
## contry_of_resBangladesh                -0.013333333  0.038692647  0.009521751
## contry_of_resBelgium                   -0.013333333  0.038692647  0.009521751
## contry_of_resBolivia                    0.185312329 -0.063857897 -0.022886574
## contry_of_resBrazil                    -0.023193626  0.009533062  0.073641704
## contry_of_resBurundi                   -0.007687030 -0.063857897 -0.022886574
## contry_of_resCanada                    -0.030073124  0.064797663  0.132488949
## contry_of_resChile                     -0.007687030  0.022307365 -0.022886574
## contry_of_resChina                     -0.007687030  0.022307365  0.062241794
## contry_of_resCosta.Rica                -0.007687030 -0.063857897 -0.022886574
## contry_of_resCyprus                    -0.007687030  0.022307365  0.062241794
## contry_of_resCzech.Republic            -0.007687030  0.022307365 -0.022886574
## contry_of_resEcuador                   -0.007687030  0.022307365 -0.022886574
## contry_of_resEgypt                     -0.013333333 -0.011125908 -0.039697298
## contry_of_resEthiopia                  -0.010878853 -0.029401612 -0.032389581
## contry_of_resFinland                    0.185312329 -0.063857897  0.062241794
```

```
## contry_of_resFrance                    -0.025678546 -0.134816951  0.052807133
## contry_of_resGermany                   -0.015407016  0.044710368  0.039439583
## contry_of_resHong.Kong                 -0.007687030 -0.063857897 -0.022886574
## contry_of_resIceland                   -0.010878853 -0.029401612 -0.032389581
## contry_of_resIndia                     -0.050716087  0.131918994 -0.158533315
## contry_of_resIndonesia                 -0.007687030  0.022307365 -0.022886574
## contry_of_resIran                      -0.020425445 -0.104263827 -0.060812624
## contry_of_resIraq                      -0.007687030 -0.063857897 -0.022886574
## contry_of_resIreland                    0.069320994  0.011378973  0.025036623
## contry_of_resItaly                     -0.017237903  0.050023506  0.101395608
## contry_of_resJapan                     -0.007687030 -0.063857897 -0.022886574
## contry_of_resJordan                    -0.054516020 -0.387868441 -0.136619934
## contry_of_resKazakhstan                -0.013333333 -0.110763017 -0.039697298
## contry_of_resLebanon                   -0.007687030 -0.063857897 -0.022886574
## contry_of_resMalaysia                  -0.017237903  0.050023506  0.101395608
## contry_of_resMexico                    -0.021851423  0.002177600  0.055936269
## contry_of_resNepal                     -0.007687030  0.022307365  0.062241794
## contry_of_resNetherlands                0.098387714 -0.011273965  0.035534634
## contry_of_resNew.Zealand                0.018637004  0.058403917 -0.065749071
## contry_of_resNicaragua                 -0.007687030  0.022307365 -0.022886574
## contry_of_resNiger                     -0.007687030  0.022307365 -0.022886574
## contry_of_resOman                      -0.007687030  0.022307365 -0.022886574
## contry_of_resPakistan                  -0.013333333 -0.011125908  0.009521751
## contry_of_resPhilippines               -0.015407016  0.001535384 -0.045871269
## contry_of_resPortugal                  -0.007687030  0.022307365 -0.022886574
## contry_of_resRomania                   -0.013333333  0.038692647  0.009521751
## contry_of_resRussia                    -0.020425445 -0.104263827  0.036129042
## contry_of_resSaudi.Arabia              -0.015407016 -0.041639601 -0.003215843
## contry_of_resSerbia                    -0.007687030  0.022307365 -0.022886574
## contry_of_resSierra.Leone              -0.007687030  0.022307365  0.062241794
## contry_of_resSouth.Africa              -0.010878853  0.031569872  0.088085951
## contry_of_resSpain                     -0.013333333 -0.011125908  0.058740799
## contry_of_resSri.Lanka                 -0.029032306  0.061005387 -0.086437809
## contry_of_resSweden                    -0.010878853  0.031569872  0.088085951
## contry_of_resTonga                     -0.007687030  0.022307365 -0.022886574
## contry_of_resTurkey                    -0.007687030  0.022307365 -0.022886574
## contry_of_resUkraine                   -0.010878853 -0.029401612 -0.032389581
## contry_of_resUnited.Arab.Emirates       0.084614673 -0.038150694 -0.190363181
## contry_of_resUnited.Kingdom            -0.001557164  0.092905561  0.085255309
## contry_of_resUnited.States              0.029692344  0.126035033  0.197594140
## contry_of_resUruguay                   -0.007687030  0.022307365  0.062241794
## contry_of_resViet.Nam                  -0.017237903  0.050023506 -0.013142869
## used_app_before                         0.029316054 -0.022396257  0.043936387
## relationHealth.care.professional       -0.015407016 -0.127989569 -0.003215843
## relationOthers                         -0.082940848 -0.689008392 -0.155088502
## relationParent                         -0.056357996 -0.468178622 -0.018004618
## relationRelative                        1.000000000 -0.344596052  0.024154441
## relationSelf                           -0.344596052  1.000000000  0.124008921
## Class.ASD                               0.024154441  0.124008921  1.000000000
```

```r
# relation Others and ethnicity are highly correlated. We will drop the relationothers because of other
catgl_autism_data <- catgl_autism_data[,-83]
catgl_autism_data
```

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```
##    gender ethnicityAsian ethnicityBlack ethnicityHispanic ethnicityLatino
## 1       0              0              0                 0               0
## 2       1              0              0                 0               1
## 3       1              0              0                 0               1
## 4       0              0              0                 0               0
## 5       0              0              0                 0               0
## 6       1              0              0                 0               0
## 7       0              0              1                 0               0
## 8       1              0              0                 0               0
## 9       1              0              0                 0               0
## 10      1              1              0                 0               0
## 11      1              0              0                 0               0
## 12      0              0              0                 0               0
## 13      0              0              0                 0               0
## 14      1              0              0                 0               0
## 15      0              0              0                 0               0
## 16      1              0              0                 0               0
## 17      1              0              0                 0               0
## 18      1              0              0                 0               0
## 19      0              0              0                 0               0
## 20      1              0              0                 0               0
## 21      1              0              0                 0               0
## 22      0              0              1                 0               0
## 23      1              0              0                 0               0
## 24      1              0              0                 0               0
## 25      1              0              0                 0               0
## 26      0              0              0                 0               0
## 27      1              0              0                 0               0
## 28      1              0              0                 0               0
## 29      1              0              1                 0               0
## 30      1              0              0                 0               0
## 31      1              0              0                 0               0
## 32      0              0              0                 0               0
## 33      0              0              0                 0               0
## 34      0              0              0                 0               0
## 35      0              0              0                 0               0
## 36      1              0              0                 0               0
## 37      1              0              0                 0               0
## 38      0              0              0                 0               0
## 39      0              0              0                 0               0
## 40      0              0              0                 0               0
## 41      0              0              0                 0               1
## 42      0              1              0                 0               0
## 43      0              0              0                 0               0
## 44      0              0              0                 0               0
## 45      0              0              0                 0               0
## 46      0              0              0                 0               0
## 47      0              0              0                 0               0
## 48      1              0              0                 0               0
## 49      1              0              0                 0               0
## 50      0              1              0                 0               0
## 51      0              0              0                 0               1
## 52      0              0              1                 0               0
## 54      1              0              0                 0               1
```

```
## 55      1           0           0           0           0
## 56      0           1           0           0           0
## 57      0           0           0           0           0
## 58      0           0           0           0           0
## 59      0           0           0           0           0
## 60      0           0           0           0           0
## 61      0           0           0           0           0
## 62      0           0           0           0           0
## 63      1           0           0           0           0
## 64      1           0           0           0           0
## 65      0           0           0           0           0
## 66      1           0           0           0           0
## 67      1           0           0           0           0
## 68      1           0           0           1           0
## 69      1           0           0           0           0
## 70      1           0           1           0           0
## 71      0           0           0           0           0
## 72      1           1           0           0           0
## 73      1           0           0           0           0
## 74      1           0           0           0           0
## 75      0           0           0           0           0
## 76      1           0           0           1           0
## 77      1           0           0           0           0
## 78      0           0           1           0           0
## 79      1           0           0           0           0
## 80      0           0           0           0           0
## 81      1           0           0           0           0
## 82      1           0           0           0           0
## 83      0           0           0           0           0
## 84      0           0           0           0           0
## 85      0           0           0           0           0
## 86      0           0           0           0           0
## 87      0           0           0           0           0
## 88      1           0           0           0           0
## 89      0           0           0           0           0
## 90      0           0           0           0           0
## 91      0           0           0           0           0
## 92      0           0           0           0           0
## 93      0           0           0           0           0
## 94      0           0           0           0           1
## 95      0           0           0           0           0
## 96      0           0           0           0           0
## 97      0           0           0           0           0
## 98      1           0           0           0           0
## 99      0           0           0           0           0
## 100     1           0           0           0           0
## 101     0           0           0           0           0
## 102     0           1           0           0           0
## 103     1           1           0           0           0
## 104     1           1           0           0           0
## 105     1           0           0           0           0
## 106     1           1           0           0           0
## 107     1           0           0           0           0
## 108     0           0           0           0           0
```

```
## 109      0           1           0           0           0
## 110      0           1           0           0           0
## 111      0           0           0           0           0
## 112      1           0           0           0           0
## 113      1           1           0           0           0
## 114      1           1           0           0           0
## 115      0           0           0           0           0
## 116      0           0           0           0           0
## 117      0           0           0           0           0
## 118      1           0           0           0           0
## 119      0           0           0           0           0
## 120      1           0           0           0           0
## 121      1           0           0           0           0
## 122      0           0           0           0           0
## 123      0           0           1           0           0
## 124      1           1           0           0           0
## 125      0           0           0           0           0
## 126      0           0           0           0           0
## 127      0           0           0           0           0
## 128      1           0           0           0           0
## 129      0           0           0           0           0
## 130      0           0           0           0           0
## 131      0           0           0           0           0
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## 161      1           1           0           0           0
## 162      0           0           0           0           0
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## 214   0          0          0          0          0
## 215   1          0          0          0          0
## 216   0          0          1          0          0
```

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## 221	1	0	0	0	0
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## 224	1	0	0	0	0
## 225	0	0	0	0	0
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## 233	1	0	0	0	0
## 234	1	0	0	0	0
## 235	1	0	1	0	0
## 236	1	0	0	0	0
## 237	1	1	0	0	0
## 238	1	0	0	0	0
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## 260	1	1	0	0	0
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## 269	0	0	0	0	0
## 270	0	1	0	0	0

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## 285	0	0	0	0	0
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## 288	1	0	0	0	0
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## 308	0	0	0	0	0
## 309	0	0	0	0	0
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## 313	1	0	0	1	0
## 314	1	0	0	1	0
## 315	0	0	0	0	0
## 316	1	0	0	0	0
## 317	0	0	0	0	0
## 318	1	0	0	0	0
## 319	1	0	0	0	0
## 320	1	0	0	0	0
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## 322	0	0	0	0	0
## 323	1	0	0	0	0
## 324	0	0	0	0	0

```
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## 377   0          0          0          0          0
## 378   1          0          0          0          0
```

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## 431   0          0          1          0          0
## 432   1          0          0          0          0
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## 485     1            0            0            0            0
## 486     1            0            0            0            0
```

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## 540    1              0              0              0              0
```

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## 589    0              0              0              0              0
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## 591    0              1              0              0              0
## 592    1              0              0              0              0
## 593    1              0              0              0              0
## 594    1              0              0              0              0
```

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## 647   0           0           0           0           0
## 648   1           0           0           0           0
```

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```

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441

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445

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450

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## 545                    0              1              1
## 546                    0              1              1
## 547                    0              1              0
## 548                    0              1              0
## 549                    0              1              0
## 550                    0              1              1
## 551                    0              1              0
## 552                    0              1              0
## 553                    0              1              0
## 554                    0              1              1
## 555                    1              0              1
## 556                    0              1              0
## 557                    0              0              0
## 558                    0              1              0
## 559                    0              1              1
## 560                    0              1              0
## 561                    0              1              1
## 562                    0              1              1
## 563                    0              0              0
## 564                    0              0              0
## 565                    0              0              0
## 566                    0              1              0
## 567                    0              1              0
## 568                    0              1              0
## 569                    0              1              1
## 570                    0              1              0
## 571                    0              1              0
## 572                    0              0              0
## 573                    0              0              0
## 574                    0              1              1
## 575                    0              1              0
## 576                    0              1              0
## 577                    0              1              1
## 578                    0              1              1
## 579                    0              1              1
## 580                    0              1              0
## 581                    0              1              0
## 582                    0              0              0
## 583                    1              0              0
## 584                    1              0              1
## 585                    0              1              1
## 586                    0              1              0
## 587                    0              1              1
## 588                    0              1              1
## 589                    0              0              1
## 590                    0              1              0
## 591                    0              1              0
## 592                    0              1              0
## 593                    0              1              1
## 594                    0              0              0
```

```
## 595                   0                   1                   0
## 596                   0                   1                   0
## 597                   0                   1                   0
## 598                   0                   1                   0
## 599                   0                   1                   0
## 600                   0                   0                   0
## 601                   0                   1                   0
## 602                   0                   1                   0
## 603                   0                   1                   0
## 604                   0                   1                   0
## 605                   0                   1                   0
## 606                   0                   1                   0
## 607                   0                   1                   0
## 608                   0                   1                   0
## 609                   0                   1                   0
## 610                   0                   1                   0
## 611                   0                   1                   0
## 612                   0                   1                   0
## 613                   0                   1                   0
## 614                   0                   1                   0
## 615                   0                   1                   0
## 616                   0                   1                   0
## 617                   0                   1                   0
## 618                   0                   1                   0
## 619                   0                   1                   0
## 620                   0                   1                   0
## 621                   0                   1                   0
## 622                   0                   1                   1
## 623                   0                   1                   0
## 624                   0                   1                   1
## 625                   0                   1                   0
## 626                   0                   1                   0
## 627                   0                   1                   0
## 628                   0                   1                   0
## 629                   0                   1                   0
## 630                   0                   1                   0
## 631                   0                   1                   0
## 632                   0                   1                   0
## 633                   0                   0                   0
## 634                   0                   1                   0
## 635                   0                   1                   1
## 636                   0                   1                   0
## 637                   0                   0                   0
## 638                   0                   1                   1
## 639                   0                   1                   0
## 640                   0                   0                   1
## 641                   0                   1                   0
## 642                   0                   1                   1
## 643                   0                   0                   0
## 644                   0                   0                   0
## 645                   0                   0                   0
## 646                   0                   0                   1
## 647                   0                   1                   0
## 648                   0                   0                   0
```

```
## 649             0             1             0
## 650             0             1             0
## 651             0             1             0
## 652             0             0             0
## 653             0             0             0
## 654             0             1             1
## 655             0             1             1
## 656             0             1             0
## 657             0             1             0
## 658             0             1             0
## 659             0             0             0
## 660             0             0             1
## 661             0             1             1
## 662             0             1             1
## 663             0             1             0
## 664             0             1             0
## 665             0             1             0
## 666             0             1             1
## 667             0             0             0
## 668             0             0             0
## 669             0             1             0
## 670             0             1             1
## 671             0             1             1
## 672             0             1             1
## 673             0             1             1
## 674             0             1             1
## 675             0             1             0
## 676             0             1             0
## 677             0             0             0
## 678             0             0             0
## 679             0             1             1
## 680             0             1             1
## 681             0             0             1
## 682             0             1             1
## 683             0             1             0
## 684             0             1             0
## 685             1             0             0
## 686             0             1             1
## 687             0             1             0
## 688             0             1             1
## 689             0             1             1
## 690             0             1             1
## 691             0             1             0
## 692             0             1             0
## 693             0             1             1
## 694             0             1             0
## 695             0             1             1
## 696             0             0             0
## 697             0             1             1
## 698             0             1             0
## 699             0             1             1
## 700             0             1             1
## 701             0             0             0
## 702             0             0             1
```

```
## 703                  0          1        0
## 704                  0          1        1
```

Since the other columns are binary, the min max scaling function won't have an impact on them when we implement min max scaling. We will use min max normalization to bring the age and result columns to the same scale.

```r
min_max_scaler <- function(x) {
  (x - min(x)) / (max(x) - min(x))
}
# using min_max_scaler function
scaled_numerical_aut_data <- as.data.frame(lapply(numerical_aut_data, min_max_scaler))
scaled_numerical_aut_data
```

```
##      A1_Score A2_Score A3_Score A4_Score A5_Score A6_Score A7_Score A8_Score
## 1           1        1        1        1        0        0        1        1
## 2           1        1        0        1        0        0        0        1
## 3           1        1        0        1        1        0        1        1
## 4           1        1        0        1        0        0        1        1
## 5           1        0        0        0        0        0        0        1
## 6           1        1        1        1        1        0        1        1
## 7           0        1        0        0        0        0        0        1
## 8           1        1        1        1        0        0        0        0
## 9           1        1        0        0        1        0        0        1
## 10          1        1        1        1        0        1        1        1
## 11          1        1        1        1        1        1        1        1
## 12          0        1        0        1        1        1        1        0
## 13          0        1        1        1        1        1        0        0
## 14          1        0        0        0        0        0        1        1
## 15          1        0        0        0        0        0        1        1
## 16          1        1        0        1        1        0        0        1
## 17          1        0        0        0        0        0        1        1
## 18          0        0        0        0        0        0        0        1
## 19          0        0        1        0        1        1        0        0
## 20          0        0        0        0        0        0        1        1
## 21          0        1        1        1        0        0        0        0
## 22          0        0        0        0        0        0        0        0
## 23          0        0        0        1        0        0        1        1
## 24          0        0        0        0        0        0        0        1
## 25          1        1        1        1        0        0        0        1
## 26          0        1        1        0        0        0        0        1
## 27          0        0        0        0        0        0        0        1
## 28          0        0        0        0        0        0        0        1
## 29          0        0        0        0        0        0        0        1
## 30          0        1        1        0        0        0        0        0
## 31          0        0        0        0        0        0        0        0
## 32          1        0        0        1        1        1        1        1
## 33          1        1        0        0        0        0        1        0
## 34          1        1        1        1        1        1        1        1
```

```
## 35      1      1      1      1      1      1      1      1
## 36      0      0      1      0      0      0      0      0
## 37      0      1      1      0      1      0      0      1
## 38      1      0      1      1      1      1      0      0
## 39      1      0      0      1      1      1      1      0
## 40      1      0      1      1      0      1      1      1
## 41      1      0      1      1      1      0      1      1
## 42      0      0      0      0      1      1      0      0
## 43      0      0      1      1      0      0      0      0
## 44      0      1      1      1      0      0      0      0
## 45      1      1      1      1      1      1      0      1
## 46      1      0      1      1      1      1      0      1
## 47      1      1      1      1      0      1      0      0
## 48      0      0      1      1      1      0      1      0
## 49      0      1      1      0      0      1      0      0
## 50      1      1      0      0      0      1      1      1
## 51      1      0      0      1      0      0      0      1
## 52      1      1      1      1      1      1      1      1
## 53      1      0      1      1      1      1      1      1
## 54      1      1      1      1      1      1      1      1
## 55      1      1      1      1      1      1      0      1
## 56      1      0      1      1      1      1      0      1
## 57      1      1      1      1      1      1      0      1
## 58      1      0      0      0      1      0      0      1
## 59      1      1      1      1      0      0      0      1
## 60      1      0      1      1      1      1      1      1
## 61      1      0      1      1      0      1      1      1
## 62      0      0      0      0      0      0      0      0
## 63      1      0      0      1      1      0      0      1
## 64      1      1      1      1      1      1      1      1
## 65      1      0      1      0      0      0      0      1
## 66      0      1      0      0      0      0      0      1
## 67      1      0      1      0      1      1      1      1
## 68      1      0      0      0      1      0      1      0
## 69      0      0      0      0      1      0      0      0
## 70      1      1      0      0      0      0      1      1
## 71      0      0      1      1      0      0      0      1
## 72      1      0      1      1      0      0      1      1
## 73      1      1      1      0      0      0      0      1
## 74      0      0      1      1      1      0      0      1
## 75      1      1      0      1      1      1      1      1
## 76      1      0      0      0      0      0      1      1
## 77      1      1      0      1      1      1      1      1
## 78      1      0      0      1      1      0      0      0
## 79      1      1      0      0      0      0      0      0
## 80      0      0      1      1      0      0      1      1
## 81      1      0      0      0      0      0      1      0
## 82      1      1      1      1      1      1      1      1
## 83      0      0      1      0      1      0      0      1
## 84      1      1      0      0      0      0      0      0
## 85      1      0      0      0      0      0      0      1
## 86      1      0      0      1      1      1      1      1
## 87      1      0      0      0      0      0      0      0
## 88      1      0      0      0      0      0      0      1
```

```
## 89       1          1          1          1          1          1          0          1
## 90       1          0          1          1          0          0          0          0
## 91       0          1          0          0          1          0          1          0
## 92       0          0          0          1          1          1          0          1
## 93       1          1          1          0          1          1          1          0
## 94       1          1          1          1          1          0          0          1
## 95       1          1          0          0          0          0          0          1
## 96       1          0          0          0          1          0          1          1
## 97       1          0          0          1          1          0          1          0
## 98       1          1          0          0          0          0          0          1
## 99       0          0          0          0          0          0          0          0
## 100      0          1          1          0          0          0          0          1
## 101      1          0          0          0          0          0          0          1
## 102      1          0          0          0          0          0          0          0
## 103      1          1          0          0          1          0          1          1
## 104      0          0          0          0          1          1          0          1
## 105      0          0          0          0          0          0          0          0
## 106      0          0          1          0          1          1          1          1
## 107      1          1          0          1          1          0          1          1
## 108      1          0          0          1          1          1          1          0
## 109      1          0          0          0          0          1          1          0
## 110      1          0          1          1          1          1          1          1
## 111      0          0          1          1          0          1          0          1
## 112      1          0          0          0          1          0          0          0
## 113      0          1          0          0          0          0          0          1
## 114      1          1          0          1          1          1          1          1
## 115      1          0          1          1          1          1          0          1
## 116      1          1          1          1          1          1          0          1
## 117      1          1          1          0          1          0          1          1
## 118      1          1          1          1          1          1          0          1
## 119      1          1          1          1          1          1          0          0
## 120      1          1          1          1          1          1          0          1
## 121      1          0          1          1          1          1          1          1
## 122      1          0          0          0          0          0          0          0
## 123      1          0          0          1          1          1          1          1
## 124      1          0          1          1          1          1          1          1
## 125      1          1          0          0          1          1          1          1
## 126      0          0          0          0          0          0          0          0
## 127      1          0          0          1          1          1          0          1
## 128      1          0          1          1          0          0          1          0
## 129      1          0          0          0          1          0          0          0
## 130      1          1          0          0          0          0          0          1
## 131      1          0          0          0          0          0          0          1
## 132      1          1          0          0          0          0          0          1
## 133      1          0          1          1          0          0          0          1
## 134      0          1          0          0          1          1          0          1
## 135      1          0          1          1          0          0          0          1
## 136      0          1          1          0          0          1          0          0
## 137      0          0          0          0          1          0          0          0
## 138      1          0          0          0          0          0          1          0
## 139      0          1          0          0          0          0          0          0
## 140      0          0          1          1          0          0          0          1
## 141      1          0          0          0          0          0          0          1
## 142      1          0          1          0          0          0          0          1
```

```
## 143    1    0    0    1    1    0    0    1
## 144    0    0    0    0    0    0    0    1
## 145    1    0    0    1    1    1    1    1
## 146    1    0    1    1    1    1    1    1
## 147    1    1    1    1    1    1    1    1
## 148    1    1    0    0    1    1    1    1
## 149    1    1    1    1    1    0    1    1
## 150    0    0    0    0    1    0    0    1
## 151    0    1    1    1    1    0    1    1
## 152    1    1    0    0    1    0    0    0
## 153    0    0    1    0    1    0    1    0
## 154    1    0    0    0    1    0    1    0
## 155    0    0    0    0    0    0    1    1
## 156    1    0    0    0    0    1    0    1
## 157    0    1    0    0    1    0    0    1
## 158    1    0    0    1    0    0    0    0
## 159    1    0    0    0    0    0    1    1
## 160    0    0    0    0    0    0    0    0
## 161    0    1    0    0    0    0    0    1
## 162    0    0    0    0    0    0    0    1
## 163    1    1    0    0    0    0    0    1
## 164    1    0    1    0    1    0    1    1
## 165    1    0    0    0    1    0    1    1
## 166    0    0    1    0    0    0    0    1
## 167    1    0    0    0    1    0    1    1
## 168    0    0    1    1    1    0    0    1
## 169    1    1    1    1    1    0    0    1
## 170    1    0    1    1    0    0    1    1
## 171    1    1    0    1    0    0    1    0
## 172    0    0    1    1    1    0    0    0
## 173    1    0    0    0    0    0    0    1
## 174    1    0    0    1    0    0    0    1
## 175    1    1    0    0    0    0    1    1
## 176    1    1    1    1    1    1    0    1
## 177    0    0    1    1    1    0    0    1
## 178    1    0    1    0    1    0    0    1
## 179    1    0    1    0    1    0    1    0
## 180    1    0    0    0    1    0    1    0
## 181    1    1    1    1    1    0    0    0
## 182    0    1    0    1    1    1    0    1
## 183    0    0    1    1    1    0    0    0
## 184    0    0    1    1    1    0    1    0
## 185    1    0    1    1    1    1    1    0
## 186    1    0    0    0    0    0    1    1
## 187    1    0    0    0    0    0    1    1
## 188    1    1    0    1    1    1    0    1
## 189    1    1    1    0    1    0    1    0
## 190    1    1    1    1    1    1    0    1
## 191    1    1    0    1    0    0    0    1
## 192    1    0    0    0    0    0    0    1
## 193    1    0    0    0    0    0    0    1
## 194    0    1    0    1    0    0    0    1
## 195    1    0    1    1    1    1    1    1
## 196    1    1    1    1    1    1    1    1
```

## 197	1	0	1	1	1	1	1	1
## 198	1	1	1	0	1	1	0	1
## 199	1	1	1	1	0	0	0	0
## 200	1	1	1	1	1	0	1	1
## 201	1	1	0	1	1	0	0	0
## 202	1	1	0	1	1	0	0	1
## 203	1	1	1	1	1	1	1	0
## 204	1	0	1	1	0	0	0	0
## 205	1	1	1	1	1	1	1	1
## 206	1	1	1	1	1	1	1	1
## 207	1	1	1	0	1	0	0	1
## 208	1	1	1	1	0	0	1	1
## 209	1	0	0	1	1	1	1	1
## 210	1	0	1	1	1	1	1	1
## 211	0	0	0	1	0	1	0	1
## 212	1	1	0	0	0	1	1	1
## 213	1	0	1	1	0	0	0	0
## 214	1	1	1	1	0	0	0	0
## 215	1	1	0	0	1	1	1	1
## 216	1	0	0	0	0	0	1	1
## 217	1	1	0	0	0	0	0	1
## 218	1	1	0	1	1	0	1	1
## 219	1	0	0	1	0	0	0	0
## 220	1	1	0	0	0	0	0	1
## 221	0	0	1	0	0	0	0	0
## 222	1	1	1	1	1	0	0	1
## 223	1	0	1	1	0	1	1	1
## 224	1	1	1	1	1	1	1	0
## 225	0	1	0	1	0	0	0	1
## 226	1	1	1	1	1	1	1	0
## 227	0	1	0	0	0	0	0	0
## 228	0	0	0	1	1	0	1	1
## 229	1	1	1	1	1	1	1	1
## 230	1	0	0	0	0	0	1	1
## 231	1	0	0	1	0	0	0	0
## 232	1	1	0	0	1	0	0	0
## 233	0	1	0	0	0	0	0	1
## 234	0	1	1	0	0	0	0	0
## 235	1	0	0	0	0	0	0	1
## 236	1	0	0	0	1	1	1	1
## 237	1	0	0	0	0	0	0	0
## 238	0	1	0	0	0	0	0	1
## 239	1	0	0	0	0	0	0	1
## 240	1	0	0	1	1	0	1	1
## 241	1	0	0	0	1	0	1	1
## 242	1	0	0	0	1	0	0	1
## 243	0	0	1	0	1	1	0	0
## 244	1	0	1	0	1	0	1	1
## 245	1	0	0	0	0	0	1	1
## 246	1	0	0	1	1	0	1	1
## 247	0	0	1	1	0	1	0	1
## 248	0	0	0	0	0	0	0	1
## 249	1	0	0	1	1	1	1	1
## 250	1	0	0	0	0	0	1	1

```
## 251       1          0          0          1          0          0          1          1
## 252       0          0          0          1          0          0          0          1
## 253       0          0          0          1          0          0          1          0
## 254       1          0          1          0          0          0          1          0
## 255       1          1          0          0          1          0          0          1
## 256       1          0          0          0          0          1          0          1
## 257       0          1          1          0          1          0          0          1
## 258       1          0          0          0          1          1          0          1
## 259       1          0          0          0          0          0          1          1
## 260       0          0          0          0          0          0          1          1
## 261       1          0          1          0          1          0          0          1
## 262       1          0          0          0          0          0          1          1
## 263       0          0          0          0          0          0          0          0
## 264       1          0          0          0          1          0          0          1
## 265       1          1          1          0          1          0          1          1
## 266       1          0          0          1          0          0          0          0
## 267       1          0          0          0          0          0          0          1
## 268       1          0          1          1          1          0          0          1
## 269       1          0          0          1          1          0          1          1
## 270       1          0          1          1          1          1          0          0
## 271       1          1          1          1          0          0          0          1
## 272       1          1          1          1          1          1          1          1
## 273       1          1          0          0          0          0          0          0
## 274       1          1          1          0          0          0          0          1
## 275       0          1          1          1          0          0          0          0
## 276       1          0          0          0          1          0          0          0
## 277       1          1          0          0          0          0          0          0
## 278       1          0          1          1          1          1          1          1
## 279       0          1          1          0          1          0          0          0
## 280       1          0          0          0          0          0          0          0
## 281       1          1          1          1          1          0          0          1
## 282       0          1          1          0          1          1          1          0
## 283       1          1          1          1          1          1          1          1
## 284       0          1          0          0          0          0          1          0
## 285       0          0          0          1          1          1          1          0
## 286       0          0          0          0          0          0          0          0
## 287       1          0          0          1          1          0          0          1
## 288       0          0          0          0          0          0          0          0
## 289       1          1          1          0          1          1          1          0
## 290       1          1          1          0          1          1          1          0
## 291       1          1          0          1          1          0          0          1
## 292       0          1          1          1          0          0          0          1
## 293       1          0          0          0          1          0          1          0
## 294       0          0          0          0          0          0          0          0
## 295       1          0          1          1          1          1          0          0
## 296       1          1          1          1          1          1          0          0
## 297       1          1          1          1          0          1          0          1
## 298       1          0          0          1          0          0          1          1
## 299       1          1          1          1          1          1          1          0
## 300       1          0          0          1          0          0          0          1
## 301       1          1          1          1          1          1          1          1
## 302       0          0          1          1          1          1          1          1
## 303       0          0          0          0          0          0          0          1
## 304       1          1          1          1          1          0          0          0
```

```
## 305      1        1        0        1        0        0        0        0
## 306      1        0        0        1        1        0        1        1
## 307      1        0        0        1        1        1        1        1
## 308      1        1        1        1        1        1        0        0
## 309      1        1        1        1        1        1        0        1
## 310      1        0        1        0        0        0        0        0
## 311      0        0        1        1        1        0        0        1
## 312      1        0        1        0        1        1        1        1
## 313      1        0        1        1        1        1        0        1
## 314      1        0        0        1        1        0        0        1
## 315      1        1        0        0        0        0        0        1
## 316      0        1        0        0        0        0        1        1
## 317      0        0        0        1        1        0        0        1
## 318      1        1        1        0        1        0        0        1
## 319      0        0        0        0        0        0        0        0
## 320      1        1        0        0        0        0        0        0
## 321      0        1        1        0        0        0        0        1
## 322      1        1        1        0        1        1        1        1
## 323      1        1        0        1        1        0        0        0
## 324      1        0        0        0        0        0        0        0
## 325      1        1        1        0        1        0        0        1
## 326      1        1        1        0        1        0        0        1
## 327      0        0        0        0        1        0        0        1
## 328      1        1        1        0        0        0        0        1
## 329      0        1        0        0        0        0        1        1
## 330      1        1        1        0        0        0        0        1
## 331      1        1        1        1        1        1        1        1
## 332      1        0        0        1        1        1        1        0
## 333      1        0        0        0        0        1        1        0
## 334      1        1        0        1        0        0        1        1
## 335      1        1        1        1        0        0        1        1
## 336      1        0        0        1        1        1        0        0
## 337      1        1        0        0        0        0        0        0
## 338      1        0        1        0        0        0        1        1
## 339      1        0        0        0        0        0        1        0
## 340      1        0        1        1        0        0        1        1
## 341      1        1        1        1        1        0        0        1
## 342      1        0        1        1        0        0        0        0
## 343      1        0        0        1        0        0        0        0
## 344      0        1        0        1        0        1        0        1
## 345      1        0        0        0        0        0        0        0
## 346      1        0        0        0        1        0        1        1
## 347      0        0        0        0        0        0        0        1
## 348      1        0        1        1        0        1        1        1
## 349      1        1        1        0        0        0        0        1
## 350      1        1        1        0        1        0        1        1
## 351      1        1        0        0        0        0        1        1
## 352      0        1        0        0        0        0        0        1
## 353      1        0        1        0        0        0        1        0
## 354      0        0        0        1        0        0        0        1
## 355      0        0        0        0        1        0        0        1
## 356      1        0        0        1        0        0        0        1
## 357      1        0        0        0        0        0        0        1
## 358      1        0        0        1        0        0        1        0
```

```
## 359     0         0         1         0         0         0         0         0
## 360     1         0         1         0         1         0         0         1
## 361     0         0         0         0         0         1         0         1
## 362     0         0         0         0         1         0         0         1
## 363     0         1         0         1         0         0         0         0
## 364     0         1         1         0         0         0         0         1
## 365     1         0         0         0         0         1         0         1
## 366     1         0         1         0         1         0         0         1
## 367     0         0         1         1         0         0         1         0
## 368     1         0         1         0         1         0         0         1
## 369     0         0         0         0         0         0         0         1
## 370     1         0         1         0         0         0         0         0
## 371     1         0         0         1         1         0         0         1
## 372     0         1         0         0         0         0         0         0
## 373     1         0         0         0         0         0         0         1
## 374     1         0         0         1         1         0         1         0
## 375     1         0         0         0         0         1         0         0
## 376     1         0         0         0         0         0         0         1
## 377     1         0         0         0         0         1         1         1
## 378     1         0         0         0         0         0         0         1
## 379     0         1         0         0         1         1         0         0
## 380     0         0         0         1         0         0         1         0
## 381     1         0         0         0         0         0         0         1
## 382     1         1         1         1         1         0         1         0
## 383     1         0         0         0         0         0         1         1
## 384     1         1         0         0         0         0         0         1
## 385     1         0         1         0         0         0         0         0
## 386     1         0         0         1         0         0         0         0
## 387     1         0         1         1         1         0         1         1
## 388     1         1         0         0         1         0         0         1
## 389     0         1         0         0         0         0         0         1
## 390     1         0         0         0         1         0         0         1
## 391     1         0         1         1         1         0         0         0
## 392     0         1         0         0         0         1         0         1
## 393     1         1         0         0         0         0         0         1
## 394     1         0         0         0         1         1         0         1
## 395     0         1         1         1         0         1         0         1
## 396     1         1         1         0         1         0         0         0
## 397     0         1         0         0         0         0         0         1
## 398     0         1         1         0         0         0         0         1
## 399     1         0         0         0         0         0         0         0
## 400     1         0         0         1         0         0         1         1
## 401     1         0         0         0         0         0         0         1
## 402     1         0         0         1         0         0         1         0
## 403     1         0         0         1         0         0         1         0
## 404     0         1         0         1         1         0         0         0
## 405     1         0         0         0         0         0         1         1
## 406     0         1         0         0         1         0         1         1
## 407     1         0         1         1         1         1         1         1
## 408     1         0         0         1         1         0         0         1
## 409     1         1         0         0         0         0         0         0
## 410     1         1         0         1         0         0         0         0
## 411     0         1         0         1         0         0         0         1
## 412     0         0         1         1         1         0         0         1
```

```
## 413      0        0        1        1        1        0        0        0
## 414      1        0        1        1        1        0        1        1
## 415      1        0        1        0        0        0        0        0
## 416      1        0        0        0        0        0        1        1
## 417      1        1        0        1        0        0        1        1
## 418      1        0        0        0        0        0        1        0
## 419      1        0        0        0        1        0        1        0
## 420      1        0        1        0        1        0        1        1
## 421      0        0        0        0        0        0        1        0
## 422      1        0        1        0        0        1        0        1
## 423      0        1        0        1        0        0        0        0
## 424      1        1        1        1        0        0        1        0
## 425      1        0        0        0        0        0        1        1
## 426      1        0        1        1        1        1        0        1
## 427      1        0        0        1        0        0        1        1
## 428      0        0        0        0        1        0        1        0
## 429      1        0        1        0        1        0        1        1
## 430      1        1        1        1        1        1        1        0
## 431      1        1        1        1        1        1        1        1
## 432      1        0        0        1        1        0        0        0
## 433      1        1        1        1        1        1        0        1
## 434      1        0        0        0        0        1        0        0
## 435      0        0        1        1        0        0        0        0
## 436      1        1        1        1        0        0        0        0
## 437      1        1        0        0        1        1        0        1
## 438      1        1        0        0        0        0        0        1
## 439      0        1        0        0        0        0        0        1
## 440      1        0        1        1        1        0        1        0
## 441      1        0        1        0        0        0        0        0
## 442      0        1        1        1        1        0        1        0
## 443      1        1        1        1        1        0        0        1
## 444      0        1        1        1        1        1        0        1
## 445      1        0        0        0        0        0        0        1
## 446      1        0        0        1        1        0        1        1
## 447      1        0        0        0        0        0        0        1
## 448      1        1        1        1        1        1        1        0
## 449      1        1        1        0        0        0        0        1
## 450      1        1        0        0        0        0        0        1
## 451      0        0        1        1        0        0        0        1
## 452      1        1        1        1        1        0        0        1
## 453      0        0        1        1        1        0        0        0
## 454      1        1        0        0        0        0        1        0
## 455      1        0        0        0        0        0        0        1
## 456      1        1        0        1        1        0        0        0
## 457      0        0        0        0        0        0        1        0
## 458      0        1        1        1        1        1        0        1
## 459      1        1        1        1        1        0        0        1
## 460      0        0        0        1        0        0        0        0
## 461      0        0        0        0        0        0        0        1
## 462      0        1        1        1        1        1        0        0
## 463      0        0        0        1        0        0        1        0
## 464      1        1        0        1        1        1        1        1
## 465      1        0        0        0        0        1        0        0
## 466      0        0        1        1        0        1        1        1
```

```
## 467       1           0           1           1           0           1           0           0
## 468       1           1           1           1           1           1           1           1
## 469       0           0           0           0           0           0           0           1
## 470       0           0           0           0           0           1           0           1
## 471       1           1           1           1           1           0           1           1
## 472       1           0           1           1           1           0           0           0
## 473       1           0           0           0           0           0           0           1
## 474       1           0           0           1           1           0           1           0
## 475       1           0           0           0           0           1           0           1
## 476       0           0           0           0           0           0           0           0
## 477       1           0           0           0           0           0           0           1
## 478       1           0           0           0           1           0           0           1
## 479       0           0           0           0           0           0           0           1
## 480       1           0           0           0           1           0           1           1
## 481       0           0           0           0           0           0           0           1
## 482       0           0           0           0           0           0           1           0
## 483       1           1           1           1           0           0           1           1
## 484       1           0           1           1           0           0           1           1
## 485       0           1           0           0           0           0           0           1
## 486       1           1           1           1           1           1           1           0
## 487       1           1           0           1           1           1           0           0
## 488       0           1           1           0           0           0           1           0
## 489       1           1           1           1           0           0           0           1
## 490       1           1           1           1           0           0           1           1
## 491       0           0           0           0           0           0           0           0
## 492       1           0           0           0           1           0           1           1
## 493       1           1           1           1           1           1           1           1
## 494       1           1           1           1           0           0           1           0
## 495       1           0           1           1           0           0           0           0
## 496       0           0           0           1           0           0           0           1
## 497       0           1           1           1           1           1           1           0
## 498       1           1           1           1           1           0           1           1
## 499       1           1           0           0           0           0           0           1
## 500       0           1           1           1           1           0           0           0
## 501       1           1           0           1           1           1           0           1
## 502       0           1           0           0           1           0           1           1
## 503       1           0           1           1           1           0           0           1
## 504       1           0           1           1           1           0           1           1
## 505       1           0           1           0           1           0           1           1
## 506       1           0           1           0           0           0           1           0
## 507       0           1           1           0           1           0           0           1
## 508       1           1           1           1           1           1           1           1
## 509       0           1           0           0           0           0           0           0
## 510       0           1           1           1           1           1           1           1
## 511       1           1           1           1           1           1           1           0
## 512       1           1           1           0           0           0           0           0
## 513       1           0           1           1           0           0           0           0
## 514       1           1           1           1           1           0           1           1
## 515       1           1           1           1           1           1           0           1
## 516       1           1           0           1           0           0           1           0
## 517       1           0           1           1           1           0           1           0
## 518       0           1           0           0           0           0           0           0
## 519       0           0           1           1           0           0           0           0
## 520       1           1           1           1           1           0           0           1
```

```
## 521      1      1      1      1      1      0      0      1
## 522      1      1      1      1      1      0      1      0
## 523      1      1      0      1      1      1      0      0
## 524      1      1      1      1      0      1      0      1
## 525      1      0      0      0      0      0      1      1
## 526      0      0      0      1      0      0      1      1
## 527      0      0      0      0      1      0      0      1
## 528      1      1      1      1      1      1      1      1
## 529      0      1      0      0      0      0      0      1
## 530      1      0      0      0      1      0      0      0
## 531      1      1      0      0      0      0      1      1
## 532      0      1      1      1      0      0      0      0
## 533      0      1      1      1      1      1      1      1
## 534      0      0      0      1      1      0      1      0
## 535      0      1      0      0      1      0      0      0
## 536      0      1      0      0      1      0      0      0
## 537      0      1      0      0      1      1      0      0
## 538      1      0      1      0      0      1      0      1
## 539      0      1      1      1      1      1      0      0
## 540      1      1      1      1      1      1      0      1
## 541      0      1      0      0      0      0      0      0
## 542      0      1      1      1      1      1      1      1
## 543      0      1      1      1      1      1      1      1
## 544      1      0      1      1      1      1      1      1
## 545      1      0      1      1      1      1      1      0
## 546      1      0      1      1      0      0      0      0
## 547      0      1      1      1      0      0      0      1
## 548      1      1      1      1      0      0      1      0
## 549      1      1      1      1      1      1      1      1
## 550      1      1      0      0      0      0      0      0
## 551      1      0      0      0      1      0      0      0
## 552      0      0      1      0      0      0      0      0
## 553      1      1      1      0      1      0      1      0
## 554      1      1      1      1      1      1      0      1
## 555      1      0      0      1      1      0      0      1
## 556      1      1      0      0      0      0      0      1
## 557      1      1      0      1      1      0      0      0
## 558      1      1      1      1      1      1      1      1
## 559      0      1      1      1      1      1      0      0
## 560      1      1      1      1      1      1      1      0
## 561      1      0      0      1      1      1      1      1
## 562      0      1      0      1      0      1      1      0
## 563      1      0      0      0      0      0      1      1
## 564      0      1      0      0      1      1      0      0
## 565      0      1      0      0      0      0      0      1
## 566      0      1      0      1      0      1      0      0
## 567      1      1      0      0      0      0      1      1
## 568      1      1      1      1      1      1      0      1
## 569      1      0      1      1      0      0      0      0
## 570      1      1      0      1      0      0      0      0
## 571      1      0      0      0      0      0      0      1
## 572      1      0      0      1      0      0      0      1
## 573      1      1      1      1      1      1      1      1
## 574      1      0      0      0      1      0      1      1
```

```
## 575     1          0          0          0          1          0          1          1
## 576     1          1          0          0          1          1          1          1
## 577     1          1          1          1          1          0          1          1
## 578     1          1          1          1          1          0          0          1
## 579     1          1          0          0          0          0          0          1
## 580     0          0          1          1          0          0          0          0
## 581     1          1          0          0          1          0          0          0
## 582     1          1          0          0          1          1          0          1
## 583     1          1          0          1          1          1          0          1
## 584     1          1          1          1          1          0          0          1
## 585     1          0          1          1          0          0          1          0
## 586     1          1          1          1          1          1          1          1
## 587     1          1          1          1          1          1          0          1
## 588     1          0          1          1          1          1          1          1
## 589     1          1          1          0          0          0          0          0
## 590     0          1          1          1          0          0          0          1
## 591     0          1          1          1          1          0          1          0
## 592     1          1          1          1          1          1          1          1
## 593     1          0          0          0          0          0          0          0
## 594     1          0          0          0          1          0          0          0
## 595     1          1          0          0          0          0          0          1
## 596     1          1          0          0          0          0          0          1
## 597     1          0          0          0          1          0          1          1
## 598     1          0          0          0          0          0          0          1
## 599     1          0          1          1          0          0          0          1
## 600     1          0          0          0          0          0          0          1
## 601     1          0          1          0          0          0          0          1
## 602     1          0          1          0          0          0          0          0
## 603     1          0          0          0          0          0          0          1
## 604     1          0          0          0          0          0          1          0
## 605     1          0          0          0          1          1          0          1
## 606     1          0          0          0          0          0          1          1
## 607     0          0          0          0          0          0          0          1
## 608     1          0          0          0          0          0          0          0
## 609     1          0          0          1          0          0          1          1
## 610     0          0          1          0          1          1          0          1
## 611     1          0          0          0          1          0          1          1
## 612     1          1          1          1          0          0          0          0
## 613     1          0          0          0          0          0          0          0
## 614     1          1          0          1          0          0          0          1
## 615     1          0          1          1          0          1          0          1
## 616     1          0          0          0          1          0          1          0
## 617     0          0          0          1          1          0          0          1
## 618     0          1          0          0          0          0          0          0
## 619     1          0          0          1          0          0          0          1
## 620     0          1          0          0          1          0          1          1
## 621     1          0          1          1          1          0          1          1
## 622     1          0          0          0          1          0          1          1
## 623     1          0          0          1          1          0          1          1
## 624     1          0          0          0          0          0          0          1
## 625     1          0          1          0          1          0          1          1
## 626     1          0          1          0          0          0          0          1
## 627     1          0          0          0          0          0          1          1
## 628     1          0          0          0          1          0          1          1
```

```
## 629      1         0         0         0         1         0         1         1
## 630      1         1         0         1         1         0         1         1
## 631      0         0         0         0         0         0         1         0
## 632      0         0         1         0         0         0         0         1
## 633      1         1         0         0         1         0         0         1
## 634      1         0         1         0         1         0         1         1
## 635      0         1         1         0         0         0         1         0
## 636      0         0         0         0         0         0         0         0
## 637      1         1         1         1         1         1         1         1
## 638      1         1         0         1         1         0         0         1
## 639      1         0         0         0         1         1         1         1
## 640      1         1         1         0         0         0         0         1
## 641      1         0         1         1         1         0         1         1
## 642      0         0         0         0         1         0         0         1
## 643      1         0         0         0         0         0         0         0
## 644      1         0         1         1         1         0         0         1
## 645      1         0         1         1         0         0         1         1
## 646      1         1         1         1         0         0         0         0
## 647      1         0         1         0         0         1         0         1
## 648      1         0         1         1         1         0         0         0
## 649      0         1         1         1         0         0         0         0
## 650      1         1         0         0         0         0         0         0
## 651      1         0         0         0         0         0         1         0
## 652      0         0         0         0         0         0         0         0
## 653      1         1         1         1         1         1         1         1
## 654      1         1         1         1         1         0         1         1
## 655      1         0         0         1         1         0         1         0
## 656      1         0         0         0         1         0         1         0
## 657      1         1         0         0         1         0         1         0
## 658      0         0         1         1         0         0         1         0
## 659      1         1         1         1         1         1         0         0
## 660      1         1         1         0         1         1         0         1
## 661      1         1         1         1         1         1         0         1
## 662      1         0         0         1         1         1         0         0
## 663      1         0         0         0         0         0         1         1
## 664      0         0         0         0         0         0         1         1
## 665      1         1         1         1         1         1         1         0
## 666      0         0         0         0         0         0         0         1
## 667      0         0         1         0         0         0         1         1
## 668      1         0         0         0         0         0         1         1
## 669      1         1         1         1         1         1         1         1
## 670      1         1         1         1         1         0         1         1
## 671      1         1         1         1         1         0         0         1
## 672      1         1         1         1         1         0         1         1
## 673      1         1         1         0         1         0         1         1
## 674      1         1         0         0         1         1         0         1
## 675      1         1         1         1         0         0         0         0
## 676      1         1         0         0         0         0         1         0
## 677      1         0         0         0         0         0         1         0
## 678      1         1         1         1         1         0         0         1
## 679      1         1         1         1         1         1         1         1
## 680      1         1         1         1         1         1         1         1
## 681      1         1         0         1         1         1         1         1
## 682      1         1         0         0         0         0         0         1
```

```
## 683         1         1         0         0         0         0         0         1
## 684         1         0         1         0         0         0         0         1
## 685         1         0         1         1         1         0         0         1
## 686         1         0         0         0         1         0         1         1
## 687         1         1         1         0         1         1         1         1
## 688         1         0         1         1         1         1         1         0
## 689         1         0         0         0         1         1         1         1
## 690         0         0         0         0         1         0         0         0
## 691         1         0         0         1         0         0         1         1
## 692         1         1         1         0         1         1         1         1
## 693         1         0         0         1         0         0         0         1
## 694         1         1         1         1         1         0         0         1
## 695         1         0         1         1         0         0         1         1
## 696         1         1         1         1         1         1         0         1
## 697         1         1         1         1         1         0         0         0
## 698         1         1         1         1         1         1         1         1
## 699         0         1         0         1         1         0         1         1
## 700         1         0         0         0         0         0         0         1
## 701         1         0         1         1         1         0         1         1
## 702         1         0         0         1         1         0         1         0
## 703         1         0         1         1         1         0         1         1
##      A9_Score A10_Score        age result
## 1           0         0 0.19148936    0.6
## 2           0         1 0.14893617    0.5
## 3           1         1 0.21276596    0.8
## 4           0         1 0.38297872    0.6
## 5           0         0 0.48936170    0.2
## 6           1         1 0.40425532    0.9
## 7           0         0 0.00000000    0.2
## 8           1         0 1.00000000    0.5
## 9           1         1 0.25531915    0.6
## 10          1         0 0.00000000    0.8
## 11          1         1 0.34042553    1.0
## 12          0         1 0.02127660    0.6
## 13          1         0 0.00000000    0.6
## 14          0         1 0.00000000    0.4
## 15          0         1 0.00000000    0.4
## 16          0         1 0.02127660    0.6
## 17          1         1 0.29787234    0.5
## 18          0         1 0.27659574    0.2
## 19          0         0 0.38297872    0.3
## 20          0         1 0.36170213    0.3
## 21          0         0 0.44680851    0.3
## 22          0         0 0.21276596    0.0
## 23          1         1 0.21276596    0.5
## 24          0         1 0.53191489    0.2
## 25          0         0 0.55319149    0.5
## 26          0         0 0.14893617    0.3
## 27          0         0 0.48936170    0.1
## 28          0         0 0.48936170    0.1
## 29          0         0 0.65957447    0.1
## 30          1         1 0.29787234    0.4
## 31          0         0 0.02127660    0.0
## 32          0         1 0.42553191    0.7
```

```
## 33          0          1 0.80851064    0.4
## 34          1          1 0.02127660    1.0
## 35          1          1 0.02127660    1.0
## 36          0          0 0.80851064    0.1
## 37          1          1 0.70212766    0.6
## 38          1          0 0.36170213    0.6
## 39          1          1 0.76595745    0.7
## 40          1          1 0.38297872    0.8
## 41          0          1 0.06382979    0.7
## 42          0          0 0.23404255    0.2
## 43          0          1 0.36170213    0.3
## 44          0          1 0.40425532    0.4
## 45          0          1 0.21276596    0.8
## 46          1          0 0.76595745    0.7
## 47          0          0 0.14893617    0.5
## 48          0          0 0.14893617    0.4
## 49          0          0 0.80851064    0.3
## 50          0          1 0.27659574    0.6
## 51          0          0 0.08510638    0.3
## 52          1          1 0.38297872    1.0
## 53          0          1 0.08510638    0.8
## 54          1          1 0.63829787    1.0
## 55          1          1 0.27659574    0.9
## 56          1          1 0.23404255    0.8
## 57          1          1 0.55319149    0.9
## 58          0          0 0.31914894    0.3
## 59          0          0 0.57446809    0.5
## 60          0          1 0.06382979    0.8
## 61          0          1 0.06382979    0.7
## 62          0          0 0.21276596    0.0
## 63          1          0 0.04255319    0.5
## 64          0          1 0.25531915    0.9
## 65          0          0 0.08510638    0.3
## 66          0          0 0.21276596    0.2
## 67          0          0 0.08510638    0.6
## 68          0          1 0.38297872    0.4
## 69          0          0 0.53191489    0.1
## 70          0          1 0.25531915    0.5
## 71          0          0 0.87234043    0.3
## 72          0          1 0.08510638    0.6
## 73          1          1 0.08510638    0.6
## 74          1          1 0.42553191    0.6
## 75          0          0 0.08510638    0.7
## 76          0          0 0.06382979    0.3
## 77          1          0 0.34042553    0.8
## 78          0          1 0.06382979    0.4
## 79          0          0 0.59574468    0.2
## 80          0          1 0.31914894    0.5
## 81          0          1 0.27659574    0.3
## 82          1          1 0.34042553    1.0
## 83          0          1 0.53191489    0.4
## 84          0          0 0.00000000    0.2
## 85          0          1 0.21276596    0.3
## 86          1          1 0.38297872    0.8
```

```
## 87    0        0 0.42553191   0.1
## 88    1        1 0.27659574   0.4
## 89    1        1 0.25531915   0.9
## 90    0        1 0.00000000   0.4
## 91    0        1 0.21276596   0.4
## 92    0        1 0.10638298   0.5
## 93    1        1 0.04255319   0.8
## 94    1        1 0.53191489   0.8
## 95    0        1 0.42553191   0.4
## 96    0        0 0.23404255   0.4
## 97    0        0 0.10638298   0.4
## 98    0        0 0.19148936   0.3
## 99    1        0 0.08510638   0.1
## 100   0        0 0.19148936   0.3
## 101   0        0 0.46808511   0.2
## 102   1        1 0.19148936   0.3
## 103   0        0 0.19148936   0.5
## 104   0        1 0.08510638   0.4
## 105   0        0 0.17021277   0.0
## 106   0        1 0.19148936   0.6
## 107   0        1 0.27659574   0.7
## 108   0        0 0.04255319   0.5
## 109   0        0 0.04255319   0.3
## 110   1        1 0.17021277   0.9
## 111   1        1 0.12765957   0.6
## 112   0        1 0.29787234   0.3
## 113   1        1 0.21276596   0.4
## 114   0        1 0.25531915   0.8
## 115   1        0 0.44680851   0.7
## 116   0        1 0.12765957   0.8
## 117   0        0 0.21276596   0.6
## 118   1        1 0.21276596   0.9
## 119   1        0 0.53191489   0.7
## 120   1        1 0.06382979   0.9
## 121   1        1 0.00000000   0.9
## 122   0        0 0.06382979   0.1
## 123   0        1 0.27659574   0.7
## 124   1        1 0.23404255   0.9
## 125   0        1 0.19148936   0.7
## 126   0        0 0.19148936   0.0
## 127   0        1 0.29787234   0.6
## 128   0        1 0.48936170   0.5
## 129   1        1 0.46808511   0.4
## 130   0        0 0.02127660   0.3
## 131   0        1 0.14893617   0.3
## 132   0        0 0.12765957   0.3
## 133   0        1 0.14893617   0.5
## 134   1        0 0.14893617   0.5
## 135   1        1 0.21276596   0.6
## 136   1        1 0.14893617   0.5
## 137   0        1 0.17021277   0.2
## 138   0        1 0.10638298   0.3
## 139   0        1 0.48936170   0.2
## 140   0        1 0.12765957   0.4
```

```
## 141        0        0 0.25531915    0.2
## 142        0        0 0.17021277    0.3
## 143        0        0 0.21276596    0.4
## 144        0        0 0.10638298    0.1
## 145        1        1 0.23404255    0.8
## 146        1        1 0.06382979    0.9
## 147        1        1 0.04255319    1.0
## 148        0        1 0.42553191    0.7
## 149        1        0 0.38297872    0.8
## 150        0        0 0.19148936    0.2
## 151        0        1 0.12765957    0.7
## 152        0        1 0.31914894    0.4
## 153        1        1 0.27659574    0.5
## 154        0        1 0.29787234    0.4
## 155        0        1 0.23404255    0.3
## 156        0        1 0.25531915    0.4
## 157        0        1 0.25531915    0.4
## 158        1        1 0.25531915    0.4
## 159        0        0 0.29787234    0.3
## 160        0        0 0.40425532    0.0
## 161        0        0 0.31914894    0.2
## 162        0        0 0.36170213    0.1
## 163        0        0 0.14893617    0.3
## 164        0        1 0.14893617    0.6
## 165        0        1 0.53191489    0.5
## 166        1        1 0.19148936    0.4
## 167        0        0 0.21276596    0.4
## 168        1        1 0.40425532    0.6
## 169        1        1 0.40425532    0.8
## 170        0        1 0.80851064    0.6
## 171        0        0 0.12765957    0.4
## 172        0        1 0.10638298    0.4
## 173        0        0 0.53191489    0.2
## 174        0        0 0.78723404    0.3
## 175        1        1 0.55319149    0.6
## 176        1        1 0.55319149    0.9
## 177        1        1 0.25531915    0.6
## 178        0        1 0.25531915    0.5
## 179        0        0 0.42553191    0.4
## 180        0        1 0.46808511    0.4
## 181        0        0 0.02127660    0.5
## 182        0        1 0.29787234    0.6
## 183        0        1 0.36170213    0.4
## 184        0        1 0.10638298    0.5
## 185        1        0 0.23404255    0.7
## 186        0        1 0.44680851    0.4
## 187        0        1 0.23404255    0.4
## 188        1        1 0.76595745    0.8
## 189        0        0 0.19148936    0.5
## 190        1        1 0.42553191    0.9
## 191        0        1 0.53191489    0.5
## 192        0        1 0.55319149    0.3
## 193        0        0 0.31914894    0.2
## 194        0        0 0.29787234    0.3
```

```
## 195          1       1 0.76595745     0.9
## 196          1       1 0.23404255     1.0
## 197          1       1 0.44680851     0.9
## 198          1       0 0.29787234     0.7
## 199          0       0 0.29787234     0.4
## 200          1       1 0.08510638     0.9
## 201          1       1 0.17021277     0.6
## 202          1       1 0.17021277     0.7
## 203          1       1 0.91489362     0.9
## 204          0       0 0.46808511     0.3
## 205          1       1 0.76595745     1.0
## 206          1       1 0.06382979     1.0
## 207          1       1 0.17021277     0.7
## 208          0       0 0.70212766     0.6
## 209          1       1 0.23404255     0.8
## 210          1       1 0.42553191     0.9
## 211          1       1 0.27659574     0.5
## 212          0       1 0.31914894     0.6
## 213          0       1 0.36170213     0.4
## 214          0       1 0.53191489     0.5
## 215          1       1 0.10638298     0.8
## 216          0       1 0.42553191     0.4
## 217          0       1 0.46808511     0.4
## 218          0       1 0.02127660     0.7
## 219          0       0 0.78723404     0.2
## 220          0       0 0.53191489     0.3
## 221          0       0 0.21276596     0.1
## 222          0       0 0.10638298     0.6
## 223          1       1 0.10638298     0.8
## 224          1       1 0.08510638     0.9
## 225          0       1 0.23404255     0.4
## 226          1       1 0.00000000     0.9
## 227          0       0 0.23404255     0.1
## 228          0       1 0.08510638     0.5
## 229          1       1 0.29787234     1.0
## 230          0       0 0.06382979     0.3
## 231          0       0 0.08510638     0.2
## 232          0       0 0.10638298     0.3
## 233          1       1 0.08510638     0.4
## 234          0       0 0.14893617     0.2
## 235          0       0 0.14893617     0.2
## 236          0       1 0.17021277     0.6
## 237          0       1 0.00000000     0.2
## 238          1       0 0.08510638     0.3
## 239          0       0 0.12765957     0.2
## 240          0       0 0.08510638     0.5
## 241          1       1 0.10638298     0.6
## 242          0       1 0.14893617     0.4
## 243          1       1 0.36170213     0.5
## 244          0       1 0.27659574     0.6
## 245          0       1 0.25531915     0.4
## 246          0       0 0.06382979     0.5
## 247          1       1 0.12765957     0.6
## 248          0       1 0.19148936     0.2
```

```
## 249          1          1 0.06382979     0.8
## 250          0          0 0.51063830     0.3
## 251          0          0 0.14893617     0.4
## 252          0          0 0.38297872     0.2
## 253          0          0 0.12765957     0.2
## 254          0          0 0.40425532     0.3
## 255          0          0 0.34042553     0.4
## 256          1          1 0.14893617     0.5
## 257          0          0 0.17021277     0.4
## 258          0          1 0.17021277     0.5
## 259          1          1 0.17021277     0.5
## 260          0          1 0.14893617     0.3
## 261          0          1 0.21276596     0.5
## 262          0          0 0.19148936     0.3
## 263          0          0 0.19148936     0.0
## 264          1          0 0.12765957     0.4
## 265          0          1 0.27659574     0.7
## 266          1          0 0.17021277     0.3
## 267          0          1 0.12765957     0.3
## 268          0          0 0.36170213     0.5
## 269          0          1 0.06382979     0.6
## 270          1          1 0.10638298     0.7
## 271          1          1 0.34042553     0.7
## 272          1          1 0.61702128     1.0
## 273          0          0 0.00000000     0.2
## 274          0          0 0.59574468     0.4
## 275          1          0 0.19148936     0.4
## 276          1          0 0.27659574     0.3
## 277          0          0 0.31914894     0.2
## 278          1          1 0.44680851     0.9
## 279          0          0 0.19148936     0.3
## 280          0          0 0.25531915     0.1
## 281          1          1 0.34042553     0.8
## 282          1          1 0.31914894     0.7
## 283          1          1 0.57446809     1.0
## 284          0          1 0.63829787     0.3
## 285          1          1 0.31914894     0.6
## 286          0          0 0.48936170     0.0
## 287          0          1 0.48936170     0.5
## 288          0          0 0.57446809     0.0
## 289          1          1 0.82978723     0.8
## 290          1          1 0.12765957     0.8
## 291          1          1 0.31914894     0.7
## 292          0          1 0.21276596     0.5
## 293          0          1 0.23404255     0.4
## 294          0          0 0.48936170     0.0
## 295          1          1 0.59574468     0.7
## 296          1          1 0.04255319     0.8
## 297          1          1 0.80851064     0.8
## 298          0          1 0.21276596     0.5
## 299          1          1 0.04255319     0.9
## 300          0          0 0.25531915     0.3
## 301          1          1 0.34042553     1.0
## 302          0          0 0.65957447     0.6
```

```
## 303       1       0 0.42553191      0.2
## 304       1       0 0.27659574      0.6
## 305       0       1 0.42553191      0.4
## 306       1       1 0.23404255      0.7
## 307       1       1 0.06382979      0.8
## 308       1       1 0.17021277      0.8
## 309       0       0 0.87234043      0.7
## 310       0       0 0.40425532      0.2
## 311       0       0 0.40425532      0.4
## 312       1       0 0.04255319      0.7
## 313       1       0 0.04255319      0.7
## 314       0       1 0.10638298      0.5
## 315       0       0 0.06382979      0.3
## 316       0       1 0.14893617      0.4
## 317       1       0 0.04255319      0.4
## 318       0       1 0.08510638      0.6
## 319       0       0 0.06382979      0.0
## 320       0       0 0.02127660      0.2
## 321       0       1 0.12765957      0.4
## 322       0       1 0.10638298      0.8
## 323       0       0 0.02127660      0.4
## 324       0       1 0.42553191      0.2
## 325       0       0 0.02127660      0.5
## 326       0       0 0.02127660      0.5
## 327       0       0 0.02127660      0.2
## 328       0       0 0.02127660      0.4
## 329       0       0 0.02127660      0.3
## 330       0       0 0.02127660      0.4
## 331       1       1 0.04255319      1.0
## 332       1       1 0.80851064      0.7
## 333       1       1 0.31914894      0.5
## 334       0       0 0.70212766      0.5
## 335       0       0 0.48936170      0.6
## 336       0       0 0.63829787      0.4
## 337       0       1 0.06382979      0.3
## 338       0       0 0.10638298      0.4
## 339       0       0 0.08510638      0.2
## 340       1       0 0.08510638      0.6
## 341       0       0 0.04255319      0.6
## 342       0       0 0.08510638      0.3
## 343       0       0 0.08510638      0.2
## 344       0       1 0.12765957      0.5
## 345       0       0 0.08510638      0.1
## 346       1       0 0.08510638      0.5
## 347       0       0 0.12765957      0.1
## 348       1       1 0.06382979      0.8
## 349       0       1 0.08510638      0.5
## 350       1       1 0.06382979      0.8
## 351       0       0 0.04255319      0.4
## 352       0       0 0.08510638      0.2
## 353       0       0 0.19148936      0.3
## 354       0       0 0.08510638      0.2
## 355       0       0 0.04255319      0.2
## 356       0       1 0.10638298      0.4
```

```
## 357         0         0 0.04255319   0.2
## 358         0         1 0.10638298   0.4
## 359         0         1 0.06382979   0.2
## 360         0         0 0.12765957   0.4
## 361         0         0 0.04255319   0.2
## 362         0         1 0.06382979   0.3
## 363         0         0 0.14893617   0.2
## 364         0         1 0.04255319   0.4
## 365         0         1 0.06382979   0.4
## 366         0         1 0.12765957   0.5
## 367         0         1 0.06382979   0.4
## 368         0         1 0.06382979   0.5
## 369         1         0 0.06382979   0.2
## 370         0         1 0.06382979   0.3
## 371         0         1 0.08510638   0.5
## 372         0         1 0.04255319   0.2
## 373         0         1 0.06382979   0.3
## 374         0         1 0.06382979   0.5
## 375         1         0 0.17021277   0.3
## 376         0         0 0.06382979   0.2
## 377         0         1 0.10638298   0.5
## 378         0         0 0.06382979   0.2
## 379         0         0 0.06382979   0.3
## 380         0         0 0.06382979   0.2
## 381         0         0 0.12765957   0.2
## 382         1         1 0.08510638   0.8
## 383         0         1 0.10638298   0.4
## 384         0         0 0.08510638   0.3
## 385         0         1 0.06382979   0.3
## 386         0         0 0.10638298   0.2
## 387         0         0 0.08510638   0.6
## 388         0         0 0.06382979   0.4
## 389         0         0 0.06382979   0.2
## 390         0         0 0.08510638   0.3
## 391         1         1 0.08510638   0.6
## 392         0         1 0.12765957   0.4
## 393         0         0 0.08510638   0.3
## 394         0         1 0.10638298   0.5
## 395         0         0 0.04255319   0.5
## 396         0         0 0.06382979   0.4
## 397         0         1 0.08510638   0.3
## 398         0         0 0.19148936   0.3
## 399         0         0 0.04255319   0.1
## 400         0         1 0.06382979   0.5
## 401         0         1 0.19148936   0.3
## 402         0         1 0.12765957   0.4
## 403         0         1 0.23404255   0.4
## 404         0         0 0.04255319   0.3
## 405         0         0 0.06382979   0.3
## 406         0         1 0.04255319   0.5
## 407         1         0 0.14893617   0.8
## 408         0         1 0.04255319   0.5
## 409         0         0 0.10638298   0.2
## 410         0         1 0.06382979   0.4
```

```
## 411          0          0 0.08510638     0.3
## 412          0          0 0.14893617     0.4
## 413          0          1 0.02127660     0.4
## 414          0          1 0.04255319     0.7
## 415          0          0 0.04255319     0.2
## 416          0          1 0.29787234     0.4
## 417          0          0 0.04255319     0.5
## 418          1          1 0.08510638     0.4
## 419          0          1 0.06382979     0.4
## 420          0          1 0.19148936     0.6
## 421          0          0 0.21276596     0.1
## 422          0          0 0.12765957     0.4
## 423          0          0 0.25531915     0.2
## 424          0          0 0.12765957     0.5
## 425          0          1 0.12765957     0.4
## 426          1          1 0.14893617     0.8
## 427          0          0 0.08510638     0.4
## 428          0          0 0.06382979     0.2
## 429          1          0 0.06382979     0.6
## 430          1          1 0.31914894     0.9
## 431          1          1 0.93617021     1.0
## 432          0          0 0.04255319     0.3
## 433          1          0 0.38297872     0.8
## 434          0          1 0.36170213     0.3
## 435          0          0 0.12765957     0.2
## 436          0          1 0.04255319     0.5
## 437          0          1 0.40425532     0.6
## 438          0          1 0.08510638     0.4
## 439          0          0 0.12765957     0.2
## 440          0          1 0.00000000     0.6
## 441          0          0 0.10638298     0.2
## 442          0          1 0.34042553     0.6
## 443          0          1 0.12765957     0.7
## 444          0          1 0.38297872     0.7
## 445          0          1 0.08510638     0.3
## 446          1          1 0.06382979     0.7
## 447          0          0 0.25531915     0.2
## 448          1          1 0.89361702     0.9
## 449          0          1 0.02127660     0.5
## 450          0          0 0.04255319     0.3
## 451          0          0 0.14893617     0.3
## 452          1          0 0.40425532     0.7
## 453          0          1 0.04255319     0.4
## 454          0          0 0.00000000     0.3
## 455          0          1 0.74468085     0.3
## 456          0          0 0.02127660     0.4
## 457          0          0 0.27659574     0.1
## 458          1          1 0.02127660     0.8
## 459          0          0 0.21276596     0.6
## 460          0          0 0.74468085     0.1
## 461          0          0 0.59574468     0.1
## 462          1          0 0.17021277     0.6
## 463          0          1 0.25531915     0.3
## 464          0          1 0.25531915     0.8
```

```
## 465            0          1 0.02127660      0.3
## 466            1          1 0.02127660      0.7
## 467            0          1 0.00000000      0.5
## 468            1          1 0.21276596      1.0
## 469            0          0 0.10638298      0.1
## 470            1          0 0.12765957      0.3
## 471            0          0 0.17021277      0.7
## 472            0          0 0.12765957      0.4
## 473            0          1 0.25531915      0.3
## 474            0          0 0.21276596      0.4
## 475            0          0 0.21276596      0.3
## 476            0          0 0.55319149      0.0
## 477            0          0 0.19148936      0.2
## 478            0          1 0.27659574      0.4
## 479            0          0 0.12765957      0.1
## 480            0          0 0.25531915      0.4
## 481            0          1 0.42553191      0.2
## 482            0          1 0.23404255      0.2
## 483            0          0 0.17021277      0.6
## 484            0          0 0.17021277      0.5
## 485            1          0 0.08510638      0.3
## 486            1          1 0.55319149      0.9
## 487            1          1 0.27659574      0.7
## 488            0          1 0.02127660      0.4
## 489            0          0 0.02127660      0.5
## 490            1          0 0.27659574      0.7
## 491            0          0 0.29787234      0.0
## 492            0          1 0.34042553      0.5
## 493            1          1 0.34042553      1.0
## 494            0          1 0.19148936      0.6
## 495            0          0 0.93617021      0.3
## 496            0          1 0.61702128      0.3
## 497            1          1 0.34042553      0.8
## 498            0          1 0.44680851      0.8
## 499            0          0 0.57446809      0.3
## 500            1          0 0.65957447      0.5
## 501            1          1 0.53191489      0.8
## 502            0          0 0.42553191      0.4
## 503            0          1 0.12765957      0.6
## 504            1          1 0.14893617      0.8
## 505            0          1 0.51063830      0.6
## 506            0          1 0.51063830      0.4
## 507            0          0 0.21276596      0.4
## 508            1          1 0.61702128      1.0
## 509            0          1 0.48936170      0.2
## 510            0          1 0.10638298      0.8
## 511            1          1 0.53191489      0.9
## 512            0          1 0.02127660      0.4
## 513            0          0 0.57446809      0.3
## 514            1          1 0.27659574      0.9
## 515            1          1 0.53191489      0.9
## 516            0          0 0.38297872      0.4
## 517            1          1 0.48936170      0.7
## 518            1          1 0.70212766      0.3
```

```
## 519          0          1 0.44680851     0.3
## 520          1          1 0.19148936     0.8
## 521          0          1 0.21276596     0.7
## 522          1          0 0.63829787     0.7
## 523          0          1 0.08510638     0.6
## 524          1          1 0.42553191     0.8
## 525          0          1 0.04255319     0.4
## 526          0          1 0.31914894     0.4
## 527          0          1 0.19148936     0.3
## 528          1          1 0.61702128     1.0
## 529          0          0 0.25531915     0.2
## 530          0          0 0.27659574     0.2
## 531          0          0 0.31914894     0.4
## 532          0          1 0.38297872     0.4
## 533          1          1 0.10638298     0.9
## 534          0          1 0.04255319     0.4
## 535          0          1 0.14893617     0.3
## 536          0          0 0.74468085     0.2
## 537          1          1 0.74468085     0.5
## 538          0          0 0.31914894     0.4
## 539          0          1 0.14893617     0.6
## 540          1          1 0.14893617     0.9
## 541          0          0 0.68085106     0.1
## 542          1          1 0.27659574     0.9
## 543          1          1 0.27659574     0.9
## 544          1          1 0.38297872     0.9
## 545          0          1 0.38297872     0.7
## 546          0          1 0.42553191     0.4
## 547          0          1 0.55319149     0.5
## 548          0          1 0.74468085     0.6
## 549          1          1 0.57446809     1.0
## 550          0          0 0.61702128     0.2
## 551          0          1 0.53191489     0.3
## 552          0          0 0.06382979     0.1
## 553          1          1 0.02127660     0.7
## 554          1          1 0.44680851     0.9
## 555          0          0 0.14893617     0.4
## 556          0          0 0.31914894     0.3
## 557          0          0 0.25531915     0.4
## 558          0          1 0.10638298     0.9
## 559          0          1 0.04255319     0.6
## 560          1          1 0.46808511     0.9
## 561          1          1 0.00000000     0.8
## 562          1          1 0.04255319     0.6
## 563          1          0 0.02127660     0.4
## 564          1          0 0.04255319     0.4
## 565          0          0 0.23404255     0.2
## 566          0          1 0.25531915     0.4
## 567          0          0 0.65957447     0.4
## 568          1          1 0.21276596     0.9
## 569          0          0 0.36170213     0.3
## 570          0          1 0.29787234     0.4
## 571          0          1 0.63829787     0.3
## 572          0          0 0.63829787     0.3
```

```
## 573          1          1 0.57446809      1.0
## 574          0          0 0.17021277      0.4
## 575          0          0 0.17021277      0.4
## 576          1          1 0.06382979      0.8
## 577          1          1 0.55319149      0.9
## 578          1          1 0.40425532      0.8
## 579          0          0 0.27659574      0.3
## 580          0          0 0.57446809      0.2
## 581          0          1 0.48936170      0.4
## 582          1          0 0.48936170      0.6
## 583          1          0 0.48936170      0.7
## 584          0          1 0.27659574      0.7
## 585          0          1 0.63829787      0.5
## 586          1          1 0.08510638      1.0
## 587          1          1 0.08510638      0.9
## 588          1          1 0.29787234      0.9
## 589          0          0 0.08510638      0.3
## 590          1          0 0.25531915      0.5
## 591          1          0 0.10638298      0.6
## 592          1          1 0.72340426      1.0
## 593          0          0 0.12765957      0.1
## 594          1          1 0.27659574      0.4
## 595          0          0 0.10638298      0.3
## 596          0          1 0.10638298      0.4
## 597          0          1 0.14893617      0.5
## 598          0          1 0.19148936      0.3
## 599          1          1 0.34042553      0.6
## 600          1          0 0.12765957      0.3
## 601          0          0 0.53191489      0.3
## 602          0          0 0.19148936      0.2
## 603          0          0 0.25531915      0.2
## 604          0          1 0.38297872      0.3
## 605          0          0 0.17021277      0.4
## 606          0          0 0.17021277      0.3
## 607          0          0 0.23404255      0.1
## 608          0          0 0.34042553      0.1
## 609          0          0 0.17021277      0.4
## 610          0          1 0.17021277      0.5
## 611          0          0 0.14893617      0.4
## 612          0          1 0.21276596      0.5
## 613          0          0 0.10638298      0.1
## 614          0          1 0.08510638      0.5
## 615          0          1 0.21276596      0.6
## 616          0          0 0.12765957      0.3
## 617          0          1 0.10638298      0.4
## 618          0          1 0.12765957      0.2
## 619          0          1 0.27659574      0.4
## 620          0          0 0.34042553      0.4
## 621          1          0 0.14893617      0.7
## 622          0          0 0.10638298      0.4
## 623          1          1 0.10638298      0.7
## 624          0          1 0.25531915      0.3
## 625          0          1 0.10638298      0.6
## 626          0          0 0.08510638      0.3
```

```
## 627        0          0 0.12765957     0.3
## 628        0          1 0.12765957     0.5
## 629        1          1 0.12765957     0.6
## 630        0          0 0.31914894     0.6
## 631        0          1 0.21276596     0.2
## 632        0          0 0.23404255     0.2
## 633        1          1 0.17021277     0.6
## 634        1          1 0.10638298     0.7
## 635        0          1 0.40425532     0.4
## 636        0          0 0.21276596     0.0
## 637        1          1 0.08510638     1.0
## 638        0          0 0.02127660     0.5
## 639        1          1 0.68085106     0.7
## 640        0          0 0.02127660     0.4
## 641        1          0 0.25531915     0.7
## 642        0          0 0.29787234     0.2
## 643        0          0 0.42553191     0.1
## 644        0          1 0.00000000     0.6
## 645        1          1 0.00000000     0.7
## 646        0          0 0.44680851     0.4
## 647        0          1 0.02127660     0.5
## 648        0          0 0.29787234     0.4
## 649        0          0 0.34042553     0.3
## 650        0          0 0.31914894     0.2
## 651        0          1 0.27659574     0.3
## 652        0          1 0.34042553     0.1
## 653        1          1 0.27659574     1.0
## 654        1          1 0.27659574     0.9
## 655        0          1 0.44680851     0.5
## 656        1          1 0.10638298     0.5
## 657        1          0 0.40425532     0.5
## 658        0          0 0.55319149     0.3
## 659        1          1 0.57446809     0.8
## 660        1          1 0.06382979     0.8
## 661        1          1 0.48936170     0.9
## 662        1          0 0.17021277     0.5
## 663        0          1 0.23404255     0.4
## 664        0          1 0.00000000     0.3
## 665        1          1 0.36170213     0.9
## 666        0          0 0.82978723     0.1
## 667        0          0 0.70212766     0.3
## 668        0          1 0.44680851     0.4
## 669        1          1 0.63829787     1.0
## 670        1          1 0.27659574     0.9
## 671        0          1 0.08510638     0.7
## 672        0          1 0.08510638     0.8
## 673        1          1 0.29787234     0.8
## 674        0          1 0.21276596     0.6
## 675        1          0 0.14893617     0.5
## 676        0          1 0.38297872     0.4
## 677        0          1 0.02127660     0.3
## 678        1          1 0.55319149     0.8
## 679        1          1 0.57446809     1.0
## 680        1          1 0.48936170     1.0
```

```
## 681          1          1 0.68085106    0.9
## 682          0          0 0.14893617    0.3
## 683          1          0 0.27659574    0.4
## 684          0          1 0.76595745    0.4
## 685          1          1 0.44680851    0.7
## 686          0          1 0.23404255    0.5
## 687          1          1 0.23404255    0.9
## 688          1          1 0.19148936    0.8
## 689          1          1 0.46808511    0.7
## 690          0          0 0.29787234    0.1
## 691          0          0 0.14893617    0.4
## 692          0          1 0.23404255    0.8
## 693          0          1 0.29787234    0.4
## 694          0          1 0.21276596    0.7
## 695          0          0 0.23404255    0.5
## 696          1          1 0.29787234    0.9
## 697          0          1 0.61702128    0.6
## 698          1          1 0.21276596    1.0
## 699          1          1 0.17021277    0.7
## 700          0          1 0.36170213    0.3
## 701          0          1 0.14893617    0.7
## 702          1          1 0.38297872    0.6
## 703          1          1 0.19148936    0.8
```

NOTE:There are 97 features in our dataset overall, not including the target variable. As there are no variables that can be combined to form a new feature or which can be split to create two new features, there is no need to apply feature engineering or derived features. Another reason for not applying any kind of transformation to our features is that our algorithms do make the assumption of normality and will not be affected even if the data does not have normal distribution.

```r
# Use PCA to select features
PCA_data <- cbind(numerical_aut_data, catgl_autism_data)
# removing the target column before performing PCA
PCA_data <- PCA_data[,-98]
colnames(PCA_data)
```

```
##  [1] "A1_Score"                "A2_Score"
##  [3] "A3_Score"                "A4_Score"
##  [5] "A5_Score"                "A6_Score"
##  [7] "A7_Score"                "A8_Score"
##  [9] "A9_Score"                "A10_Score"
## [11] "age"                     "result"
## [13] "gender"                  "ethnicityAsian"
## [15] "ethnicityBlack"          "ethnicityHispanic"
## [17] "ethnicityLatino"         "ethnicityMiddle.Eastern."
```

```
## [19] "ethnicityOthers"                "ethnicityPasifika"
## [21] "ethnicitySouth.Asian"           "ethnicityTurkish"
## [23] "ethnicityWhite.European"        "jundice"
## [25] "austim"                         "contry_of_resAfghanistan"
## [27] "contry_of_resAmericanSamoa"     "contry_of_resAngola"
## [29] "contry_of_resArgentina"         "contry_of_resArmenia"
## [31] "contry_of_resAruba"             "contry_of_resAustralia"
## [33] "contry_of_resAustria"           "contry_of_resAzerbaijan"
## [35] "contry_of_resBahamas"           "contry_of_resBangladesh"
## [37] "contry_of_resBelgium"           "contry_of_resBolivia"
## [39] "contry_of_resBrazil"            "contry_of_resBurundi"
## [41] "contry_of_resCanada"            "contry_of_resChile"
## [43] "contry_of_resChina"             "contry_of_resCosta.Rica"
## [45] "contry_of_resCyprus"            "contry_of_resCzech.Republic"
## [47] "contry_of_resEcuador"           "contry_of_resEgypt"
## [49] "contry_of_resEthiopia"          "contry_of_resFinland"
## [51] "contry_of_resFrance"            "contry_of_resGermany"
## [53] "contry_of_resHong.Kong"         "contry_of_resIceland"
## [55] "contry_of_resIndia"             "contry_of_resIndonesia"
## [57] "contry_of_resIran"              "contry_of_resIraq"
## [59] "contry_of_resIreland"           "contry_of_resItaly"
## [61] "contry_of_resJapan"             "contry_of_resJordan"
## [63] "contry_of_resKazakhstan"        "contry_of_resLebanon"
## [65] "contry_of_resMalaysia"          "contry_of_resMexico"
## [67] "contry_of_resNepal"             "contry_of_resNetherlands"
## [69] "contry_of_resNew.Zealand"       "contry_of_resNicaragua"
## [71] "contry_of_resNiger"             "contry_of_resOman"
## [73] "contry_of_resPakistan"          "contry_of_resPhilippines"
## [75] "contry_of_resPortugal"          "contry_of_resRomania"
## [77] "contry_of_resRussia"            "contry_of_resSaudi.Arabia"
## [79] "contry_of_resSerbia"            "contry_of_resSierra.Leone"
## [81] "contry_of_resSouth.Africa"      "contry_of_resSpain"
## [83] "contry_of_resSri.Lanka"         "contry_of_resSweden"
## [85] "contry_of_resTonga"             "contry_of_resTurkey"
## [87] "contry_of_resUkraine"           "contry_of_resUnited.Arab.Emirates"
## [89] "contry_of_resUnited.Kingdom"    "contry_of_resUnited.States"
## [91] "contry_of_resUruguay"           "contry_of_resViet.Nam"
## [93] "used_app_before"                "relationHealth.care.professional"
## [95] "relationParent"                 "relationRelative"
## [97] "relationSelf"
```

```r
# performimg scaled PCA
PCA_scaled <- prcomp(PCA_data, scale. = TRUE, center = TRUE)
summ_PCA_scaled <- summary(PCA_scaled)
summ_PCA_scaled$importance[2,]
```

```
##     PC1     PC2     PC3     PC4     PC5     PC6     PC7     PC8     PC9    PC10
## 0.04889 0.02595 0.02177 0.02041 0.01926 0.01870 0.01667 0.01659 0.01609 0.01582
##    PC11    PC12    PC13    PC14    PC15    PC16    PC17    PC18    PC19    PC20
## 0.01564 0.01542 0.01445 0.01441 0.01401 0.01347 0.01299 0.01280 0.01264 0.01247
##    PC21    PC22    PC23    PC24    PC25    PC26    PC27    PC28    PC29    PC30
## 0.01188 0.01169 0.01161 0.01141 0.01128 0.01107 0.01092 0.01086 0.01074 0.01069
##    PC31    PC32    PC33    PC34    PC35    PC36    PC37    PC38    PC39    PC40
## 0.01055 0.01053 0.01047 0.01045 0.01043 0.01041 0.01040 0.01040 0.01038 0.01038
```

```
##      PC41      PC42      PC43      PC44      PC45      PC46      PC47      PC48      PC49      PC50
## 0.01038 0.01037 0.01037 0.01037 0.01036 0.01036 0.01035 0.01035 0.01035 0.01034
##      PC51      PC52      PC53      PC54      PC55      PC56      PC57      PC58      PC59      PC60
## 0.01034 0.01034 0.01034 0.01033 0.01033 0.01033 0.01033 0.01033 0.01033 0.01033
##      PC61      PC62      PC63      PC64      PC65      PC66      PC67      PC68      PC69      PC70
## 0.01032 0.01032 0.01032 0.01032 0.01032 0.01032 0.00909 0.00865 0.00844 0.00807
##      PC71      PC72      PC73      PC74      PC75      PC76      PC77      PC78      PC79      PC80
## 0.00779 0.00751 0.00716 0.00701 0.00697 0.00656 0.00640 0.00615 0.00592 0.00569
##      PC81      PC82      PC83      PC84      PC85      PC86      PC87      PC88      PC89      PC90
## 0.00551 0.00548 0.00541 0.00506 0.00491 0.00465 0.00446 0.00423 0.00396 0.00391
##      PC91      PC92      PC93      PC94      PC95      PC96      PC97
## 0.00249 0.00224 0.00171 0.00073 0.00000 0.00000 0.00000
```

```r
var_scaled <- PCA_scaled$sdev^2 / sum(PCA_scaled$sdev^2)
var_scaled
```

```
##  [1] 4.889256e-02 2.594803e-02 2.176510e-02 2.040904e-02 1.926158e-02
##  [6] 1.869921e-02 1.666947e-02 1.658714e-02 1.608963e-02 1.581614e-02
## [11] 1.563715e-02 1.542423e-02 1.445229e-02 1.440710e-02 1.400860e-02
## [16] 1.347411e-02 1.298813e-02 1.279803e-02 1.263579e-02 1.247434e-02
## [21] 1.188109e-02 1.169255e-02 1.161020e-02 1.140667e-02 1.128418e-02
## [26] 1.106558e-02 1.091880e-02 1.085553e-02 1.073962e-02 1.068812e-02
## [31] 1.054898e-02 1.053097e-02 1.046834e-02 1.045115e-02 1.043235e-02
## [36] 1.041157e-02 1.040194e-02 1.039872e-02 1.038276e-02 1.037829e-02
## [41] 1.037630e-02 1.037073e-02 1.036893e-02 1.036726e-02 1.036068e-02
## [46] 1.035628e-02 1.035416e-02 1.035066e-02 1.034546e-02 1.034284e-02
## [51] 1.033965e-02 1.033812e-02 1.033652e-02 1.033415e-02 1.033211e-02
## [56] 1.033136e-02 1.032894e-02 1.032789e-02 1.032681e-02 1.032562e-02
## [61] 1.032492e-02 1.032468e-02 1.032440e-02 1.032399e-02 1.032396e-02
## [66] 1.032396e-02 9.092377e-03 8.649994e-03 8.440216e-03 8.066639e-03
## [71] 7.790055e-03 7.514609e-03 7.159540e-03 7.014764e-03 6.966526e-03
## [76] 6.560508e-03 6.399497e-03 6.151210e-03 5.923096e-03 5.688282e-03
## [81] 5.507526e-03 5.483477e-03 5.407426e-03 5.058265e-03 4.907720e-03
## [86] 4.649017e-03 4.458306e-03 4.233942e-03 3.961926e-03 3.905161e-03
## [91] 2.491824e-03 2.238729e-03 1.707774e-03 7.261360e-04 3.641344e-32
## [96] 1.865096e-32 1.001831e-32
```

```r
# plotting scree plot for scaled PCA
qplot(c(1:97), var_scaled) +
  geom_line() +
  xlab("Principal Component (Scaled PCA)") +
  ylab("Variance Explained") +
  ggtitle("Scree Plot") +
  ylim(0, 1)
```

```
## Warning: 'qplot()' was deprecated in ggplot2 3.4.0.
```

Scree Plot
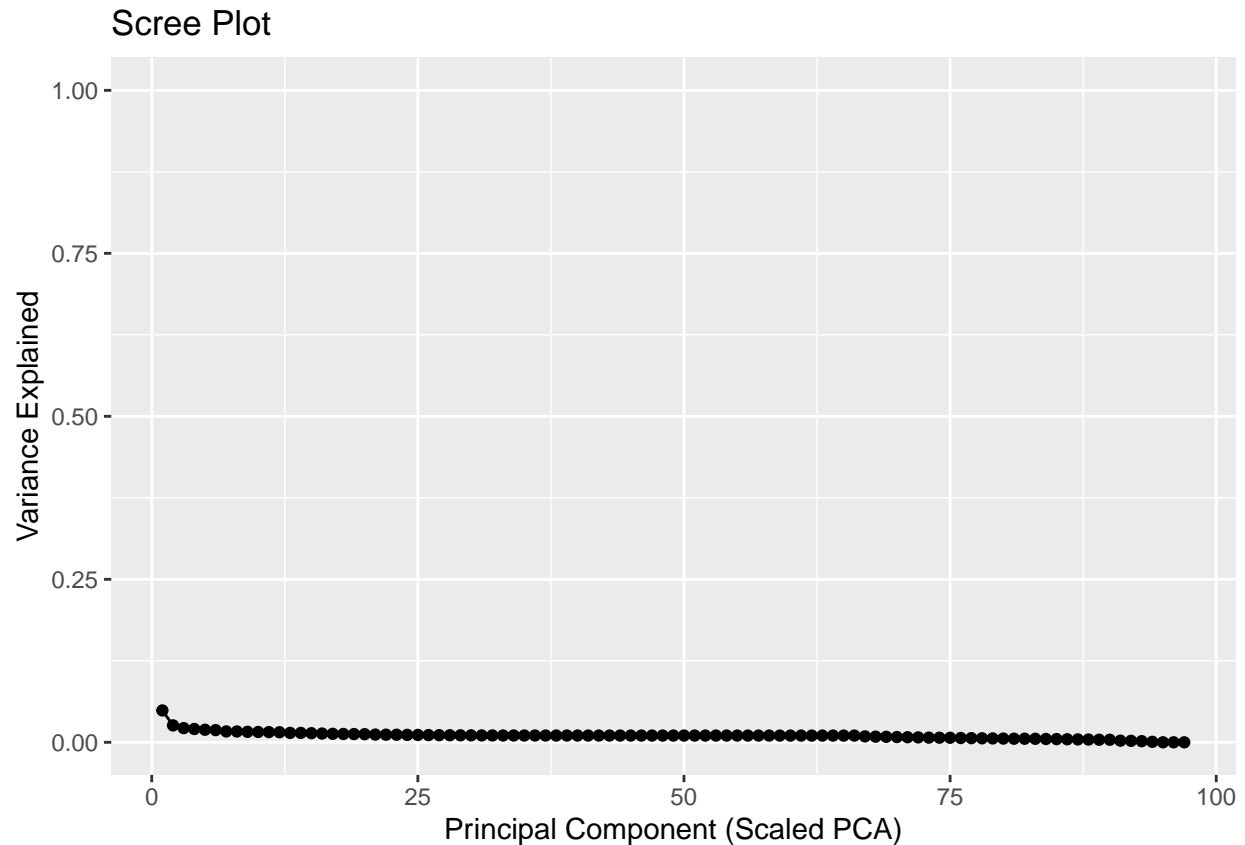
In scaled PCA, the first principal component explains 0.04889 or 4.9% of the variance and the second principal componenet explains 0.02595 or 2.6% of the variance

```r
# performing unscaled PCA
PCA_unscaled <- prcomp(PCA_data)
summ_PCA_unscaled <- summary(PCA_unscaled)
summ_PCA_unscaled
```

```
## Importance of components:
##                            PC1     PC2     PC3     PC4     PC5     PC6     PC7
## Standard deviation      9.7048 2.62280 0.58556 0.56836 0.51553 0.49585 0.49331
## Proportion of Variance  0.8959 0.06543 0.00326 0.00307 0.00253 0.00234 0.00231
## Cumulative Proportion   0.8959 0.96130 0.96457 0.96764 0.97017 0.97250 0.97482
##                            PC8     PC9    PC10    PC11    PC12    PC13    PC14
## Standard deviation      0.45747 0.44993 0.43774 0.41800 0.39434 0.38862 0.38472
## Proportion of Variance  0.00199 0.00193 0.00182 0.00166 0.00148 0.00144 0.00141
## Cumulative Proportion   0.97681 0.97874 0.98056 0.98222 0.98370 0.98514 0.98654
##                           PC15    PC16    PC17    PC18    PC19    PC20    PC21
## Standard deviation      0.36234 0.34819 0.33639 0.33164 0.30533 0.29257 0.27853
## Proportion of Variance  0.00125 0.00115 0.00108 0.00105 0.00089 0.00081 0.00074
## Cumulative Proportion   0.98779 0.98895 0.99002 0.99107 0.99195 0.99277 0.99351
##                           PC22    PC23    PC24    PC25    PC26    PC27    PC28
## Standard deviation      0.27380 0.24424 0.23817 0.21472 0.20061 0.18013 0.1776
## Proportion of Variance  0.00071 0.00057 0.00054 0.00044 0.00038 0.00031 0.0003
## Cumulative Proportion   0.99422 0.99479 0.99533 0.99577 0.99615 0.99646 0.9968
##                           PC29    PC30    PC31    PC32    PC33    PC34    PC35
## Standard deviation      0.16740 0.14089 0.13616 0.13037 0.12906 0.12334 0.11707
```

```
## Proportion of Variance 0.00027 0.00019 0.00018 0.00016 0.00016 0.00014 0.00013
## Cumulative Proportion  0.99702 0.99721 0.99739 0.99755 0.99771 0.99785 0.99798
##                             PC36    PC37   PC38    PC39    PC40    PC41    PC42
## Standard deviation      0.11102 0.10803 0.1043 0.09930 0.09768 0.09577 0.08868
## Proportion of Variance 0.00012 0.00011 0.0001 0.00009 0.00009 0.00009 0.00007
## Cumulative Proportion  0.99810 0.99821 0.9983 0.99841 0.99850 0.99859 0.99866
##                             PC43    PC44    PC45    PC46    PC47    PC48    PC49
## Standard deviation      0.08394 0.08317 0.08144 0.07800 0.07566 0.07489 0.07388
## Proportion of Variance 0.00007 0.00007 0.00006 0.00006 0.00005 0.00005 0.00005
## Cumulative Proportion  0.99873 0.99880 0.99886 0.99892 0.99897 0.99902 0.99908
##                             PC50    PC51    PC52    PC53    PC54    PC55    PC56
## Standard deviation      0.07209 0.06962 0.06763 0.06474 0.06382 0.06322 0.06238
## Proportion of Variance 0.00005 0.00005 0.00004 0.00004 0.00004 0.00004 0.00004
## Cumulative Proportion  0.99913 0.99917 0.99921 0.99925 0.99929 0.99933 0.99937
##                             PC57    PC58    PC59    PC60    PC61    PC62    PC63
## Standard deviation      0.06084 0.05994 0.05613 0.05294 0.05232 0.05176 0.05111
## Proportion of Variance 0.00004 0.00003 0.00003 0.00003 0.00003 0.00003 0.00002
## Cumulative Proportion  0.99940 0.99944 0.99947 0.99949 0.99952 0.99955 0.99957
##                             PC64    PC65    PC66    PC67    PC68    PC69    PC70
## Standard deviation      0.05052 0.05019 0.04805 0.04405 0.04074 0.03774 0.03774
## Proportion of Variance 0.00002 0.00002 0.00002 0.00002 0.00002 0.00001 0.00001
## Cumulative Proportion  0.99960 0.99962 0.99964 0.99966 0.99968 0.99969 0.99970
##                             PC71    PC72    PC73    PC74    PC75    PC76    PC77
## Standard deviation      0.03774 0.03772 0.03770 0.03768 0.03761 0.03757 0.03750
## Proportion of Variance 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001
## Cumulative Proportion  0.99972 0.99973 0.99974 0.99976 0.99977 0.99978 0.99980
##                             PC78    PC79    PC80    PC81    PC82    PC83    PC84
## Standard deviation      0.03742 0.03737 0.03733 0.03710 0.03686 0.03669 0.03659
## Proportion of Variance 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001
## Cumulative Proportion  0.99981 0.99982 0.99984 0.99985 0.99986 0.99988 0.99989
##                             PC85    PC86    PC87    PC88    PC89    PC90    PC91
## Standard deviation      0.03640 0.03595 0.03584 0.03571 0.03521 0.03502 0.03341
## Proportion of Variance 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001
## Cumulative Proportion  0.99990 0.99991 0.99993 0.99994 0.99995 0.99996 0.99997
##                             PC92    PC93    PC94      PC95      PC96     PC97
## Standard deviation      0.03329 0.03272 0.02874 4.343e-15 1.624e-15 2.24e-16
## Proportion of Variance 0.00001 0.00001 0.00001 0.000e+00 0.000e+00 0.00e+00
## Cumulative Proportion  0.99998 0.99999 1.00000 1.000e+00 1.000e+00 1.00e+00
```

```
var_unscaled <- PCA_unscaled$sdev^2 / sum(PCA_unscaled$sdev^2)
var_unscaled
```

```
##  [1] 8.958702e-01 6.543343e-02 3.261449e-03 3.072710e-03 2.527994e-03
##  [6] 2.338709e-03 2.314822e-03 1.990631e-03 1.925566e-03 1.822678e-03
## [11] 1.661943e-03 1.479140e-03 1.436535e-03 1.407821e-03 1.248821e-03
## [16] 1.153179e-03 1.076333e-03 1.046202e-03 8.867421e-04 8.141947e-04
## [21] 7.379317e-04 7.130993e-04 5.674283e-04 5.395552e-04 4.385650e-04
## [26] 3.828109e-04 3.086195e-04 2.999022e-04 2.665512e-04 1.888010e-04
## [31] 1.763498e-04 1.616571e-04 1.584417e-04 1.446959e-04 1.303671e-04
## [36] 1.172478e-04 1.110078e-04 1.035078e-04 9.380114e-05 9.076055e-05
## [41] 8.723607e-05 7.480831e-05 6.701534e-05 6.579001e-05 6.307995e-05
## [46] 5.786980e-05 5.444641e-05 5.334964e-05 5.192155e-05 4.943062e-05
## [51] 4.610092e-05 4.350214e-05 3.986910e-05 3.873665e-05 3.801895e-05
## [56] 3.700889e-05 3.521101e-05 3.417624e-05 2.997256e-05 2.665905e-05
```

```
## [61] 2.603710e-05 2.548463e-05 2.484677e-05 2.427758e-05 2.396233e-05
## [66] 2.195679e-05 1.845695e-05 1.578866e-05 1.354977e-05 1.354977e-05
## [71] 1.354848e-05 1.353519e-05 1.352157e-05 1.350200e-05 1.345758e-05
## [76] 1.342510e-05 1.337876e-05 1.331641e-05 1.328059e-05 1.325390e-05
## [81] 1.309374e-05 1.292344e-05 1.280331e-05 1.273584e-05 1.260238e-05
## [86] 1.229196e-05 1.222009e-05 1.213253e-05 1.179274e-05 1.166231e-05
## [91] 1.061660e-05 1.054368e-05 1.018294e-05 7.855719e-06 1.794417e-31
## [96] 2.508540e-32 4.772531e-34
```

```r
# plotting scree plot for unscaled PCA
qplot(c(1:97), var_unscaled) +
  geom_line() +
  xlab("Principal Component (Unscaled PCA)") +
  ylab("Variance Explained") +
  ggtitle("Scree Plot") +
  ylim(0, 1)
```
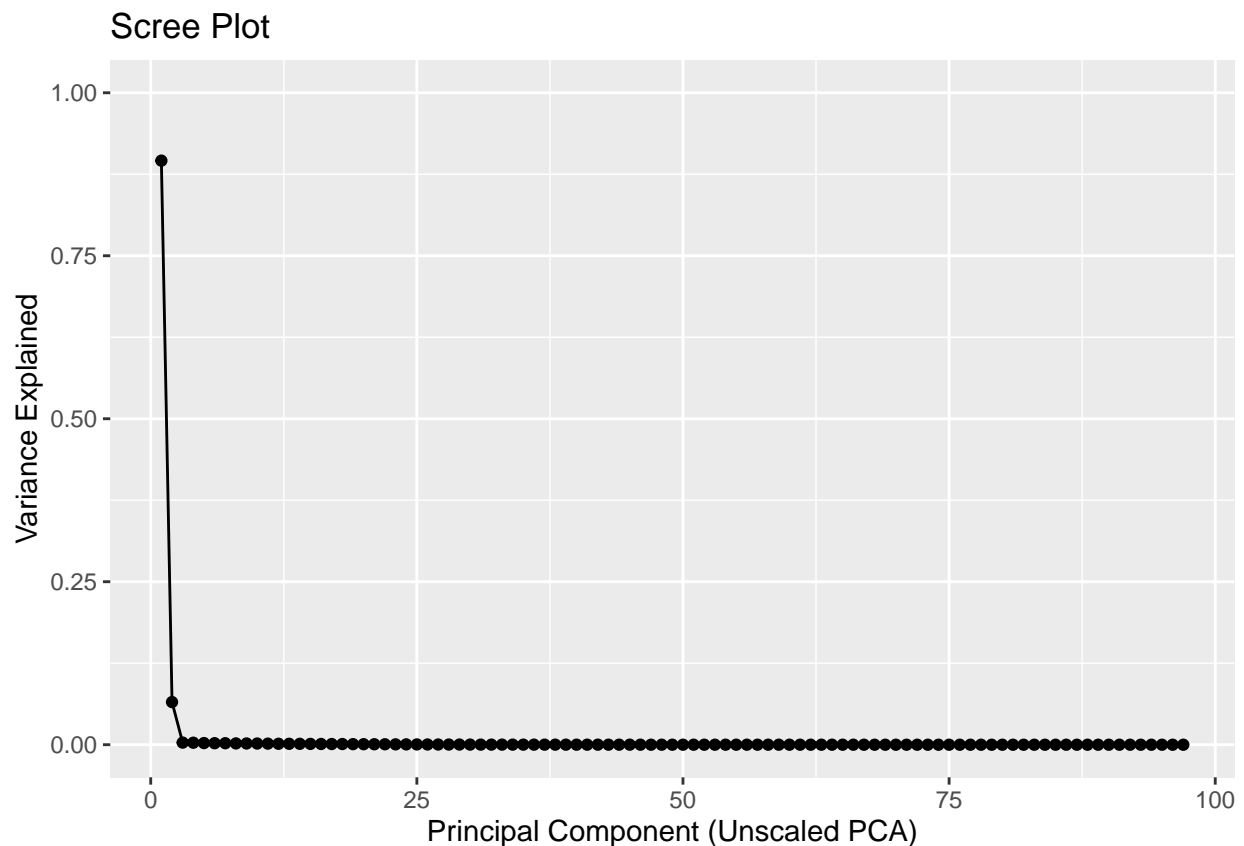


```r
#According to unscaled PCA, the first principal component accounts for 89.6% of the variance, or 0.8958
```

```r
# We can see that unscaled PCA performs better than scaled PCA in terms of reducing the dimensions of th
Class.ASD <- catgl_autism_data$Class.ASD
data <- cbind(as.data.frame(PCA_unscaled$x[,1:5]), Class.ASD)
data
```

```
##                    PC1              PC2              PC3              PC4              PC5
```

```
## 1      3.13648208 -1.2941689175  0.412128939  0.865608295 -0.1979304499
## 2      5.18081872 -0.2597448405  0.032340549  0.222035840  0.3194867792
## 3      2.08781403 -3.3116777781  0.001425604 -1.023481338  0.0988158665
## 4     -5.86087923 -1.0375301438  0.021060088  0.664753700 -0.7576262728
## 5    -10.70351096  3.4322240233  0.118698534 -0.892124071 -0.6165800173
## 6     -6.93232970 -4.0911352459 -0.024982031 -0.707681409  0.4885385027
## 7     12.26505505  2.6376772807  0.483045308  0.622768562  0.0810544464
## 8    -34.81424844  0.9230266844  0.797717431 -0.369788164  0.7053196490
## 9      0.14174275 -1.2339785404 -0.110981354  0.445959955  0.2844754187
## 10    12.08064938 -3.5880800784  0.225753835 -0.616463174  0.6751698891
## 11    -3.97984651 -5.2863474559  0.308550103 -0.432074212  0.3576926594
## 12    11.14868436 -1.5112994587  0.747211054 -0.524184238 -0.4445480197
## 13    12.14163150 -1.5737658808  1.620671668 -0.635666635  0.1098530096
## 14    12.22555127  0.6499362669 -0.433903948 -1.109205570 -0.4173402250
## 15    12.22352708  0.6432476722 -0.216841642 -0.951311950 -1.1214812437
## 16    11.15001758 -1.4490055574  0.369790806 -0.499205330  0.3986636155
## 17    -1.79775565 -0.0003774109 -0.883604017 -0.584940694  0.0306129462
## 18    -0.73032873  2.9946513450 -0.310684722  0.544701876  0.1405340489
## 19    -5.74749335  2.0875374642  0.600061580  0.249171459  0.1205492422
## 20    -4.73191992  2.2002001658 -0.227508712 -1.316255732 -0.0227808898
## 21    -8.74105735  2.2896973045  1.331610985 -0.720226236  0.8731863388
## 22     2.34082490  5.0200034609  0.340921399  0.413873561 -0.2719297012
## 23     2.19135909 -0.1777131472 -0.535016134 -0.261816898  0.4028166894
## 24   -12.69890350  3.4678964251  0.004850729 -0.762045430  0.5335747755
## 25   -13.79731628  0.4023922047  0.689840526 -0.925367918  0.7342349826
## 26     5.24488441  1.8755612181  1.165956681 -0.604302987  0.1772263023
## 27   -10.68176238  4.3958168678 -0.154680635  0.018554370  0.5780176628
## 28   -10.68647624  4.4200675146  0.207108946 -0.686995694  0.5329274441
## 29   -18.67543609  4.6569855165 -0.530267243 -0.098443629  0.6770431934
## 30    -1.79235693  0.9581459149  0.600327260  0.263293278  0.9109812727
## 31    11.30831255  4.6691876842  0.335936162  1.017309824  0.0837752374
## 32    -7.88776568 -2.0813015981 -0.436490929  0.400432322 -1.0357393576
## 33   -25.76022136  1.7810289855 -0.226652778 -0.617228886 -0.7070239490
## 34    11.00858276 -5.7589340189  0.289152602  0.364096549 -0.3664027587
## 35    11.01253008 -5.7495909599  0.218324280  0.387665405 -0.3597087922
## 36   -25.69234224  4.7749194588  0.119023190  0.516496873  0.6401885956
## 37   -20.81704555 -0.5030651807  0.053216412 -0.353696576  1.3140163725
## 38    -4.86394538 -1.1402205528  0.470074467  0.596965019 -0.2712152136
## 39   -23.87549740 -1.5861959966 -0.469482262  0.006040272 -0.9224089392
## 40    -5.92761321 -3.1874356694 -0.078426845  0.427951511 -0.6885294382
## 41     9.12160846 -2.5098251825 -0.340840376  0.062714302 -0.5082388941
## 42     1.27775520  2.9247634104 -0.172474536  0.293669092 -0.2139817211
## 43    -4.75894554  2.0571153893  0.603363468  0.469636826 -0.1319492769
## 44    -6.81702066  0.9859645658  1.208377758  1.100886059 -0.1729893290
## 45     2.07883203 -3.3649163829  0.417258053  0.671503132 -0.1390132110
## 46   -23.87393323 -1.5412282617  0.350557379 -0.380283796 -0.0833671017
## 47     5.17500035 -0.2542711763  1.218886165 -0.071500412  0.0115588710
## 48     5.21277676  0.7412313757  0.329015327 -0.492638273  0.5421546856
## 49   -25.75506635  2.7214494143  0.908844287 -0.151719930  0.8523287697
## 50    -0.83376320 -1.0651268959 -0.770874416 -0.058217444 -0.4610041836
## 51     8.24478405  1.7345914512 -0.045578510  0.422534453 -0.4003665718
## 52    -5.96456912 -5.1454402972  0.297994689 -1.032074045 -0.2321439199
## 54     8.09016669 -3.5405656128 -0.513248395 -0.162978509  0.1155238355
## 55   -17.97112911 -4.8776446317 -0.183779960  0.033121343  0.4559933604
```

```
## 56    -0.93456582 -4.2758819390 -0.043913374  0.039656604  0.2009037940
## 57     1.07750518 -3.3952970127  0.106557145  0.494685890 -0.4402302339
## 58   -13.94384260 -3.9544658456  0.362064947  0.371468967 -0.1010382230
## 59    -2.74778284  2.0464706990 -0.374412498  0.212381319 -0.4952765492
## 60   -14.81911184  0.3130508709  0.551614000  0.785189255  0.0313370537
## 61     9.09725128 -3.5286195258 -0.194633994 -0.468903777 -0.6929720063
## 62     9.12588495 -2.4592728728 -0.091805040 -0.372697505 -0.7161851615
## 63     2.34189854  5.0612512391  0.531823615 -0.743815617  0.1308427824
## 64    10.16635942 -0.4809917333  0.232858217 -0.157254944  0.0623174270
## 65     0.05270967 -4.3530729108  0.098134192  0.450713493 -0.4396679564
## 66     8.24604358  1.7434268952 -0.059039632  0.401688861  0.6991842099
## 67     2.28234532  3.0312833295  0.553695113 -0.502887272  0.8490299238
## 68     8.15318954 -1.4311397861 -0.557624437 -0.017401635  0.3733659275
## 69    -5.76737535  1.1096888435 -0.791230862 -0.257537515 -0.1205376486
## 70   -12.68344733  4.4083337207 -0.241974643  0.002662000  0.5119160083
## 71     0.19469614 -0.0382302223 -0.559596785  0.044812634 -0.4986810411
## 72   -28.73050240  2.8745057188 -0.565989763 -0.033009960  1.1749788747
## 73     8.15501080 -1.3887086837 -0.284307963 -0.303755234  0.0428672153
## 74     8.15006166 -1.3817994097  0.306056786 -0.236534447  0.5772413756
## 75    -7.86692933 -1.0938040670  0.353404040  0.673437310 -0.1650827196
## 76     8.12085068 -2.4579711482 -0.221699650  0.035189412  0.4076514268
## 77     9.25053220  1.7312657339 -0.657345150  0.116903361  0.1954732773
## 78    -3.91283682 -3.1880244568  0.015951041 -0.086451982 -0.2746755489
## 79     9.21100061  0.5932982876 -0.031581259  0.372463211  0.0816677201
## 80   -15.70849720  3.5736547832  0.935263299 -0.984997520 -0.5607603453
## 81    -2.81310326 -0.0118135350  0.236822655 -1.124100639  0.1713319353
## 82    -0.73903390  2.0701188713 -0.137233823 -1.318597709 -0.6043859436
## 83    -3.98367980 -5.3120653099  0.179081842  0.258409276 -0.3884343677
## 84   -12.76331864  1.3190949949 -0.066695809 -0.152530816  0.0600484705
## 85    12.25229346  2.6157819791  0.619420362  1.067137895 -0.4696178081
## 86     2.25120619  1.9222725016 -0.302083530  0.363460908 -0.5027338297
## 87    -5.90051047 -3.0748584290 -0.188254576 -1.080368992 -0.7375113169
## 88    -7.70634851  4.2377083401 -0.029896225  0.758101795 -0.1097756172
## 89    -0.80759207  0.8740180964 -0.132447140  0.676877734 -0.8816081030
## 90     0.04634769 -4.3672997768  0.417545189  0.492733028 -0.0463554392
## 91    12.18337503  0.4449323580  0.658140182  1.115696348 -0.7862922585
## 92     2.22508096  0.8945938243  0.602257484 -1.128914834 -0.7507834554
## 93     7.18250642 -0.3749579488 -0.129372842  0.198897472 -0.2868311639
## 94    10.07889012 -3.6302674423  0.257310096 -0.009895343 -0.4432494456
## 95   -12.91816133 -2.9466355872  0.435881735  0.480836325 -0.1218395829
## 96    -7.79429423  1.1557437719  0.085350032  0.762995497 -0.5776402322
## 97     1.21179234  0.8479918415 -0.572500590  0.459418913 -0.8270603870
## 98     7.21890811  0.7157057507 -0.270179306 -0.415687255 -0.1113603131
## 99     3.25002902  1.9349340034  0.128093788  0.371225762 -0.1411794108
## 100    8.29859286  3.7668838436  0.108325363  0.231761211  0.4408045711
## 101    3.25021270  1.9227261499  0.263624195  0.516490784  0.4631094967
## 102   -9.70694586  3.3683031098 -0.739930126  0.187544438 -0.2689901087
## 103    3.24556927  1.8798256084 -0.730272751  0.071648284  0.1630215809
## 104    3.20241981 -0.1278156183 -1.143443681 -0.096058390  0.5718876046
## 105    8.22286856  0.6754425840 -0.746012422  0.030094620  0.3581299625
## 106    4.34155523  4.9845515573 -0.549826705  0.379970119  0.5457720620
## 107    3.16126749 -1.2631822214 -0.749522729 -0.228212011  0.4711919753
## 108   -0.88618115 -2.2384218991 -0.110170103  0.582543436 -0.6692799813
## 109   10.18548176 -0.4102808313 -0.354147054 -0.490520604 -0.7262899286
```

```
## 110  10.24687452  1.7178771449 -0.454507843 -0.452109047 -0.7966782862
## 111   4.04149002 -4.5255715475 -0.214402488  0.290900660 -0.6300356413
## 112   6.12563425 -1.4587480148  0.280886422  0.624488907  0.4553305693
## 113  -1.74537042  2.0487166704 -0.488235325 -0.627705990 -0.0699493904
## 114   2.21803202  0.8999661079 -0.473358947  0.016695285  0.8848728323
## 115   0.11246755 -3.2019398830 -0.153824139 -0.156507981 -0.2965321955
## 116  -8.89299723 -2.0152665099  0.606725876 -0.144536923 -0.3404265311
## 117   6.07177628 -3.5268254069  0.591973838  0.867801899 -0.2185802913
## 118   2.14398437 -1.2670934614 -0.078966603  0.523471733  0.5000938195
## 119   2.04548764 -4.4435572910  0.495291225  0.515591257 -0.1434730393
## 120 -12.89271156 -1.9449941279  0.714849608  0.537984802  0.6880655655
## 121   9.03558925 -4.6557588768  0.412540465  0.565080106  0.5001866628
## 122  12.03799412 -4.7875505194 -0.094783109  0.494827641 -0.6452376307
## 123   9.30100972  3.7691961503  0.121429699  0.480361363 -0.6337380045
## 124  -0.86586895 -2.1741955942 -1.203015043 -0.341284493  0.0301701676
## 125   1.04360756 -4.4505417734 -0.172681716  0.295786625 -0.7228414501
## 126   3.11655092 -2.3190319066 -0.366378495  0.323822529 -0.6856655710
## 127   3.31839137  4.9098386830  0.418007483  0.995721446 -0.5694355914
## 128  -1.83917372 -1.1280391848 -0.404734211 -0.090822155  0.1635750889
## 129 -10.82951169  0.1318527878  0.044140952  0.698249503 -0.8918086333
## 130  -9.79670070  1.1179091217  0.336101086 -0.144400519 -0.9843421299
## 131  11.22438718  1.6017029434  0.429709762  1.072492556 -0.3600765024
## 132   5.25113866  1.8480952417 -0.613263661  0.059087936  0.0486033720
## 133   6.25463104  1.8750963208 -0.357224860  0.284006297  0.6075036333
## 134   5.19257623 -0.2239089562 -0.800904259  0.261752021  0.5766923942
## 135   5.18583844 -0.2691598968 -0.334150951 -0.064703768  1.0934345515
## 136   2.15596279 -1.2042530569 -0.636561399  0.048581915  0.6770704719
## 137   5.17559296 -0.2923590021  0.144002186  0.152540408  0.9732724952
## 138   4.28336633  2.8664355597 -0.799319039  0.201887892  0.3564216084
## 139   7.24911442  1.7883132314 -1.082568066  0.036210969 -0.1409508571
## 140 -10.71638256  3.3602762016 -0.073991003  0.323512426 -0.0376317716
## 141   6.21982448  0.7603408267 -0.594128078  0.314532736  0.8326263805
## 142   0.29066388  3.0791639990 -0.798298237  0.166391353  0.3410919427
## 143   4.25653220  1.9128498092 -0.830549651  0.264164299  0.7540140801
## 144   2.22926654  0.8971359113 -0.985322658  0.143706478  0.5354719009
## 145   7.30888802  3.8704867933 -0.365611141  0.265049354  0.5804861283
## 146   1.07884807 -3.3619484411 -0.276586472 -0.554524950 -0.3154581691
## 147   9.04610549 -4.6650169082 -0.404390112  0.182820961  0.0377137597
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## 353    8.28400299  2.8636451748  0.742247723 -0.944949514  0.5039886033
## 354    3.24910983  1.9214915868  0.390537207 -1.098594988 -0.1838174911
## 355    8.28260982  2.8254104024  0.539524112 -0.930860249  0.2597239629
## 356   10.28384597  2.7395774872  0.202011702 -0.880739671  0.3096187325
## 357    7.22750563  0.7971555714  0.094339501 -0.559406242  0.1817417456
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## 359    7.22561396  0.7420560017 -0.319913833  0.034679211 -0.0718865951
## 360    9.28020528  2.7350936458  0.317509747  0.332286690  0.6378854374
## 361    6.23187256  0.7844367652 -0.147631599  0.098435326  0.8049069623
## 362   10.27824145  2.7467932606  0.533635306 -0.700566509 -0.4627230525
## 363    9.25912238  1.7386291844  0.039650867 -0.659359108  0.4187155053
## 364    5.28069000  2.8791038179  0.782610803  0.415780566  0.9028312387
## 365   10.22332192  0.6788559560  0.394156738  0.258957528  1.0934055138
## 366    9.22987079  0.7422393243  0.030261490 -1.027573551 -0.1449090520
## 367    6.19548914 -0.2863348212 -0.221711463  0.059904284  0.5098815694
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## 375    9.18890506 -0.4089988265 -0.473352993 -0.022619650 -0.1295821643
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## 377    9.28893049  2.8050131498 -0.061655059  0.341503257 -0.2388521896
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## 379    9.29012163  2.8366992135  0.373594621 -0.693058862 -0.6128792989
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## 383    8.09309598 -3.4774953502   0.898088456 -1.135246996 -0.6064478124
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## 385    8.25432023  1.8402532348   0.756265813 -0.819795431 -0.4654641496
## 386    9.24705008  1.7360431873   0.770230524 -0.741195570 -0.8488510730
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## 388    8.16054812 -1.3609389092   0.407180078 -1.108615575 -0.5974970375
## 389    9.22545845  0.7394314274   0.680132028 -0.909633908 -0.4414829490
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## 392    8.15768135 -1.4411164449   0.229054403  0.085260682  0.5380661214
## 393    6.22515273  0.7893973652   0.366454622  0.229168999  0.0760679927
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## 395    7.19488540 -0.3272254067  -0.349425709  0.026944030 -0.5915141865
## 396   10.18761434 -0.3628215657   1.424364133 -0.560739819  0.2437787723
## 397    9.21915383  0.6686258753   0.375232275  0.517557903  0.1794004326
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## 402    3.26429094  1.9729523675   0.156053793 -0.838643533 -0.8088823055
## 403    6.21928291  0.7436802042  -0.170544655  0.167409517 -0.9234314988
## 404    1.22926561  0.9495661900   0.274274926 -0.902225400 -1.1351723643
## 405   10.24729584  1.6470114469   0.953780656  0.538281439  0.2028964841
## 406    9.26138988  1.7725363166  -0.431336149  0.104359470 -0.4432353967
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## 425    6.19177404 -0.2500668765   0.461287328  0.207902327  0.7314445820
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## 441  12.14441114 -1.5817549316  0.177575402 -0.419184383 -0.0319887633
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500

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## 563  10.14371219 -1.4738933849  0.840453472 -0.589480605 -0.3805723202
## 564  11.19951229  0.5839799409 -0.228347206 -0.344518990 -0.2159198674
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## 576   4.20541620  0.7338909186 -0.474851401  0.604958980 -0.7999587404
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## 578 -13.94165534 -3.9158654987 -0.250122552 -0.003728297  0.5264260441
## 579  -6.92935472 -3.1407190729  0.540410438  0.677572807 -0.2073573044
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## 658  -6.80805020   0.0809996062  -0.033836068  -0.595738803   0.2014466916
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## 660 -14.89638707  -2.7982569365   0.799680874  -1.229803967   0.4335172170
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## 662 -10.93776554  -3.9999375552   0.573760234  -0.514107245  -0.1442806596
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## 665  12.23243785   1.5579483599  -0.577026533   0.445577295  -0.1269581167
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## 668 -20.73204872   2.6754624622  -0.049634016  -0.808305208   0.0878233959
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## 670 -17.97112911  -4.8776446317  -0.183779960   0.033121343   0.4559933604
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## 692   5.21480397   0.7754053936  -0.561112124   0.111657606   0.1073200268
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## 703  -5.83767666  -1.0217852402  -0.703228027  -0.302763130  -0.1372187973
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## 364          0
## 365          0
## 366          0
## 367          0
## 368          0
## 369          0
## 370          0
## 371          0
## 372          0
## 373          0
## 374          0
## 375          0
## 376          0
## 377          0
```

```
## 378          0
## 379          0
## 380          0
## 381          0
## 382          0
## 383          1
## 384          0
## 385          0
## 386          0
## 387          0
## 388          0
## 389          0
## 390          0
## 391          0
## 392          0
## 393          0
## 394          0
## 395          0
## 396          0
## 397          0
## 398          0
## 399          0
## 400          0
## 401          0
## 402          0
## 403          0
## 404          0
## 405          0
## 406          0
## 407          0
## 408          1
## 409          0
## 410          0
## 411          0
## 412          0
## 413          0
## 414          0
## 415          1
## 416          0
## 417          0
## 418          0
## 419          0
## 420          0
## 421          0
## 422          0
## 423          0
## 424          0
## 425          0
## 426          0
## 427          1
## 428          0
## 429          0
## 430          0
## 431          1
```

```
## 432          1
## 433          0
## 434          1
## 435          0
## 436          0
## 437          0
## 438          0
## 439          0
## 440          0
## 441          0
## 442          0
## 443          0
## 444          1
## 445          1
## 446          0
## 447          1
## 448          0
## 449          1
## 450          0
## 451          0
## 452          0
## 453          1
## 454          0
## 455          0
## 456          0
## 457          0
## 458          0
## 459          1
## 460          0
## 461          0
## 462          0
## 463          0
## 464          0
## 465          1
## 466          0
## 467          1
## 468          0
## 469          1
## 470          0
## 471          0
## 472          1
## 473          0
## 474          0
## 475          0
## 476          0
## 477          0
## 478          0
## 479          0
## 480          0
## 481          0
## 482          0
## 483          0
## 484          0
## 485          0
```

```
## 486          0
## 487          1
## 488          1
## 489          0
## 490          0
## 491          1
## 492          0
## 493          0
## 494          1
## 495          0
## 496          0
## 497          0
## 498          1
## 499          1
## 500          0
## 501          0
## 502          1
## 503          0
## 504          0
## 505          1
## 506          0
## 507          0
## 508          0
## 509          1
## 510          0
## 511          1
## 512          1
## 513          0
## 514          0
## 515          1
## 516          1
## 517          0
## 518          1
## 519          0
## 520          0
## 521          1
## 522          1
## 523          1
## 524          0
## 525          1
## 526          0
## 527          0
## 528          0
## 529          1
## 530          0
## 531          0
## 532          0
## 533          0
## 534          1
## 535          0
## 536          0
## 537          0
## 538          0
## 539          0
```

```
## 540           0
## 541           1
## 542           0
## 543           1
## 544           1
## 545           1
## 546           1
## 547           0
## 548           0
## 549           0
## 550           1
## 551           0
## 552           0
## 553           0
## 554           1
## 555           1
## 556           0
## 557           0
## 558           0
## 559           1
## 560           0
## 561           1
## 562           1
## 563           0
## 564           0
## 565           0
## 566           0
## 567           0
## 568           0
## 569           1
## 570           0
## 571           0
## 572           0
## 573           0
## 574           1
## 575           0
## 576           0
## 577           1
## 578           1
## 579           1
## 580           0
## 581           0
## 582           0
## 583           0
## 584           1
## 585           1
## 586           0
## 587           1
## 588           1
## 589           1
## 590           0
## 591           0
## 592           0
## 593           1
```

```
## 594          0
## 595          0
## 596          0
## 597          0
## 598          0
## 599          0
## 600          0
## 601          0
## 602          0
## 603          0
## 604          0
## 605          0
## 606          0
## 607          0
## 608          0
## 609          0
## 610          0
## 611          0
## 612          0
## 613          0
## 614          0
## 615          0
## 616          0
## 617          0
## 618          0
## 619          0
## 620          0
## 621          0
## 622          1
## 623          0
## 624          1
## 625          0
## 626          0
## 627          0
## 628          0
## 629          0
## 630          0
## 631          0
## 632          0
## 633          0
## 634          0
## 635          1
## 636          0
## 637          0
## 638          1
## 639          0
## 640          1
## 641          0
## 642          1
## 643          0
## 644          0
## 645          0
## 646          1
## 647          0
```

```
## 648          0
## 649          0
## 650          0
## 651          0
## 652          0
## 653          0
## 654          1
## 655          1
## 656          0
## 657          0
## 658          0
## 659          0
## 660          1
## 661          1
## 662          1
## 663          0
## 664          0
## 665          0
## 666          1
## 667          0
## 668          0
## 669          0
## 670          1
## 671          1
## 672          1
## 673          1
## 674          1
## 675          0
## 676          0
## 677          0
## 678          0
## 679          1
## 680          1
## 681          1
## 682          1
## 683          0
## 684          0
## 685          0
## 686          1
## 687          0
## 688          1
## 689          1
## 690          1
## 691          0
## 692          0
## 693          1
## 694          0
## 695          1
## 696          0
## 697          1
## 698          0
## 699          1
## 700          1
## 701          0
```

```
## 702           1
## 703           0
## 704           1
```

```
# splitting the data into training and testing set
# Without replacement, random sampling is used to split the rows. Because training is the more difficul
set.seed(10)
rows_testset <- sample(rownames(data), 0.20 * nrow(data), replace = FALSE)
test_set <- data[rows_testset,]
train_set <- data[!row.names(data) %in% rows_testset,]
```

All the implemented ML algorthms will be evaluated using confusion matrix, AUC, precision, recall and F1-score

SVM

Implementing SVM

```
# SVM is compatible with the features in the dataset
SVM <- svm(formula = Class.ASD ~ .,
           data = train_set,
           type = "C-classification",
           kernel = "radial")

summary(SVM)
```

```
##
## Call:
## svm(formula = Class.ASD ~ ., data = train_set, type = "C-classification",
##     kernel = "radial")
##
##
## Parameters:
##    SVM-Type:  C-classification
##  SVM-Kernel:  radial
##        cost:  1
##
## Number of Support Vectors:  115
##
##  ( 61 54 )
##
##
## Number of Classes:  2
##
## Levels:
##   0 1
```

```r
# using our SVM to make predictions on the validation set
svm_prediction <- predict(SVM , test_set)
svm_prediction
```

```
## 492 650 331 369 461 440 585 439 424 512 345 272 144 456 702 537 526 352 393 623
##   0   0   0   0   0   0   1   0   0   1   0   1   0   0   1   0   0   0   0   0
## 232 668 343 339 286 605  50 667 102  33 648 677 671 325  94 115 601 308 289 268
##   0   0   0   0   0   0   0   0   0   0   0   0   1   0   1   1   0   1   0   0
## 336 418 679 348  42 335  13 663 362 374  26 210  48 528 689 483 318 133 271  35
##   0   0   1   0   0   0   0   0   0   0   0   1   0   0   1   0   0   0   1   1
## 267  75 571 693 544 676 436 438 614 622  39 631  90 531 555 395 255 193 462 603
##   0   0   0   1   1   0   0   0   0   1   1   0   1   0   1   0   0   0   0   0
## 659 378 627   4  64 533 576 225 177  95 183 228 509  27  81 433 478 208 370 299
##   0   0   0   0   0   0   0   1   1   1   0   0   1   0   0   0   0   1   0   0
## 458  73 351 538 385 572 303  51 372 700  40 310 161 581 281 118 563 152 146 300
##   0   0   1   0   0   0   0   0   0   1   1   1   0   0   0   0   0   1   1   1
## 130  69 479 350 473 110 103 680 306 413 285 562 476 589 284  61 427 690 625 455
##   0   0   0   0   0   0   0   1   0   0   0   1   0   1   1   1   1   1   0   0
## Levels: 0 1
```

```r
# creating SVM confusion matrix
SVM_confusion_matrix = table(svm_prediction, test_set$Class.ASD)
SVM_confusion_matrix
```

```
##
## svm_prediction   0   1
##              0 102   0
##              1   0  38
```

All 102 healthy people and all 38 ASD patients can be accurately classified using SVM.

```r
# Calculating SVM misclassification rate
SVM_missclass_rate <- mean(svm_prediction != test_set$Class.ASD) * 100
SVM_missclass_rate
```

```
## [1] 0
```

SVM has a misclassification rate of 0%

```r
# Calculating SVM accuracy
SVM_accuracy <- sum(diag(SVM_confusion_matrix)) / sum(SVM_confusion_matrix) * 100
SVM_accuracy
```

```
## [1] 100
```

the accuracy of SVM is 100%

```
# finding true positive, true negative, false positive and false negative from SVM confusion matrix
true_pos_svm <- SVM_confusion_matrix[2,2]
true_pos_svm
```

```
## [1] 38
```

```
true_neg_svm <- SVM_confusion_matrix[1,1]
true_neg_svm
```

```
## [1] 102
```

```
false_pos_svm <- SVM_confusion_matrix[2,1]
false_pos_svm
```

```
## [1] 0
```

```
false_neg_svm <- SVM_confusion_matrix[1,2]
false_neg_svm
```

```
## [1] 0
```

```
# Calculating SVM precision
SVM_prec <- true_pos_svm/(true_pos_svm + false_pos_svm)
SVM_prec
```

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

the precision of SVM is 1

```
# Calculating SVM recall
SVM_rec <- true_pos_svm/(true_pos_svm + false_neg_svm)
SVM_rec
```

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

the recall of SVM is 1

```
# Calculating F1 score for SVM
SVM_F1 <- 2 * ((SVM_prec * SVM_rec)/(SVM_prec + SVM_rec))
SVM_F1
```

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

the F1 score 1

The algorithm is already performing well, so there is no point in repeatedly dividing the dataset and training/testing the model on different portions of it. We can use k-fold cross validation for SVM, but we shouldn't use it.

Decision trees

2.) Implementing Decision Tree

```
# Decision Tree is compatible with the features in the dataset
decision_tree <- rpart(Class.ASD ~., data = train_set, method = 'class')
summary(decision_tree)
```

```
## Call:
## rpart(formula = Class.ASD ~ ., data = train_set, method = "class")
##   n= 563
##
##         CP nsplit  rel error     xerror        xstd
## 1 0.986755      0 1.00000000 1.00000000 0.069615498
## 2 0.010000      1 0.01324503 0.01324503 0.009349003
##
## Variable importance
## PC2 PC1
##  98   2
##
## Node number 1: 563 observations,    complexity param=0.986755
##   predicted class=0  expected loss=0.268206  P(node) =1
##     class counts:    412    151
##    probabilities: 0.732 0.268
##   left son=2 (410 obs) right son=3 (153 obs)
##   Primary splits:
##       PC2 < -1.524075  to the right, improve=217.054100, (0 missing)
##       PC1 < -0.8545333 to the right, improve=  8.850475, (0 missing)
##       PC3 < -0.5720943 to the left,  improve=  7.738034, (0 missing)
##       PC4 < 0.7781198  to the right, improve=  4.446326, (0 missing)
##       PC5 < 0.7869657  to the right, improve=  3.325045, (0 missing)
##   Surrogate splits:
##       PC1 < -25.85237  to the right, agree=0.734, adj=0.02, (0 split)
##
## Node number 2: 410 observations
##   predicted class=0  expected loss=0  P(node) =0.7282416
##     class counts:    410      0
##    probabilities: 1.000 0.000
##
## Node number 3: 153 observations
##   predicted class=1  expected loss=0.0130719  P(node) =0.2717584
##     class counts:      2    151
##    probabilities: 0.013 0.987
```

```r
# using our decision tree to make predictions on the validation set
pred_decision_tree <- predict(decision_tree, test_set, type="class")
pred_decision_tree
```

```
## 492 650 331 369 461 440 585 439 424 512 345 272 144 456 702 537 526 352 393 623
##   0   0   0   0   0   0   1   0   0   1   0   1   0   0   1   0   0   0   0   0
## 232 668 343 339 286 605  50 667 102  33 648 677 671 325  94 115 601 308 289 268
##   0   0   0   0   0   0   0   0   0   0   0   0   1   0   1   1   0   1   0   0
## 336 418 679 348  42 335  13 663 362 374  26 210  48 528 689 483 318 133 271  35
##   0   0   1   0   0   0   1   0   0   0   0   1   0   0   1   0   0   0   1   1
## 267  75 571 693 544 676 436 438 614 622  39 631  90 531 555 395 255 193 462 603
##   0   0   0   1   1   0   0   0   0   1   1   0   1   0   1   0   0   0   0   0
## 659 378 627   4  64 533 576 225 177  95 183 228 509  27  81 433 478 208 370 299
##   0   0   0   0   0   0   0   1   1   1   0   0   1   0   0   0   0   1   0   0
## 458  73 351 538 385 572 303  51 372 700  40 310 161 581 281 118 563 152 146 300
##   0   0   1   0   0   0   0   0   0   1   1   0   0   0   0   0   0   1   1   1
## 130  69 479 350 473 110 103 680 306 413 285 562 476 589 284  61 427 690 625 455
##   0   0   0   0   0   0   0   1   0   0   0   1   0   1   1   1   1   1   0   0
## Levels: 0 1
```

```r
# creating decision tree confusion matrix
dec_tree_confusion_matrix = table(pred_decision_tree, test_set$Class.ASD)
dec_tree_confusion_matrix
```

```
##
## pred_decision_tree   0   1
##                  0 101   1
##                  1   1  37
```

37 ASD patients and 101 healthy individuals can be classified correctly by Decision Tree, but it misclassifies 1 healthy individual as an ASD patient (false positive) and 1 ASD patient as a healthy individual (false negative)

```r
# Calculating decision tree misclassification rate
dec_tree_miss_class_rate <- mean(pred_decision_tree != test_set$Class.ASD) * 100
dec_tree_miss_class_rate
```

```
## [1] 1.428571
```

Decision tree has a misclassification rate of 1.428571%

```r
# Calculating decision tree accuracy
dec_tree_accuracy <- sum(diag(dec_tree_confusion_matrix)) / sum(dec_tree_confusion_matrix) * 100
dec_tree_accuracy
```

```
## [1] 98.57143
```

the accuracy of decision tree is 98.57143%

```
# finding true positive, true negative, false positive and false negative from decision tree confusion
true_pos_dec_tree <- dec_tree_confusion_matrix[2,2]
true_pos_dec_tree
```

```
## [1] 37
```

```
true_neg_dec_tree <- dec_tree_confusion_matrix[1,1]
true_neg_dec_tree
```

```
## [1] 101
```

```
false_pos_dec_tree <- dec_tree_confusion_matrix[2,1]
false_pos_dec_tree
```

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

```
false_neg_dec_tree <- dec_tree_confusion_matrix[1,2]
false_neg_dec_tree
```

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

```
# Calculating decision tree precision
dec_tree_prec <- true_pos_dec_tree/(true_pos_dec_tree + false_pos_dec_tree)
dec_tree_prec
```

```
## [1] 0.9736842
```

the precision of decision tree is 0.9736842

```
# Calculating dec_tree recall
dec_tree_rec <- true_pos_dec_tree/(true_pos_dec_tree + false_neg_dec_tree)
dec_tree_rec
```

```
## [1] 0.9736842
```

the recall of dec_tree is 0.9736842

```
# Calculating F1 score for dec_tree
dec_tree_F1 <- 2 * ((dec_tree_prec * dec_tree_rec)/(dec_tree_prec + dec_tree_rec))
dec_tree_F1
```

```
## [1] 0.9736842
```

the F1 score for decision tree is 0.9736842

```r
# utilizing k fold cross validation for decision tree seeding to ensure repeatability of results
set.seed(10)

# In this case, we are using 10 fold cross validation, the function trainControl generates parameters t
train_control <- trainControl(method = "cv", number = 10, savePredictions=TRUE)
train_control
```

```
## $method
## [1] "cv"
##
## $number
## [1] 10
##
## $repeats
## [1] NA
##
## $search
## [1] "grid"
##
## $p
## [1] 0.75
##
## $initialWindow
## NULL
##
## $horizon
## [1] 1
##
## $fixedWindow
## [1] TRUE
##
## $skip
## [1] 0
##
## $verboseIter
## [1] FALSE
##
## $returnData
## [1] TRUE
##
## $returnResamp
## [1] "final"
##
## $savePredictions
## [1] TRUE
##
## $classProbs
## [1] FALSE
##
## $summaryFunction
```

```
## function (data, lev = NULL, model = NULL)
## {
##     if (is.character(data$obs))
##         data$obs <- factor(data$obs, levels = lev)
##     postResample(data[, "pred"], data[, "obs"])
## }
## <bytecode: 0x00000281d9185020>
## <environment: namespace:caret>
##
## $selectionFunction
## [1] "best"
##
## $preProcOptions
## $preProcOptions$thresh
## [1] 0.95
##
## $preProcOptions$ICAcomp
## [1] 3
##
## $preProcOptions$k
## [1] 5
##
## $preProcOptions$freqCut
## [1] 19
##
## $preProcOptions$uniqueCut
## [1] 10
##
## $preProcOptions$cutoff
## [1] 0.9
##
##
## $sampling
## NULL
##
## $index
## NULL
##
## $indexOut
## NULL
##
## $indexFinal
## NULL
##
## $timingSamps
## [1] 0
##
## $predictionBounds
## [1] FALSE FALSE
##
## $seeds
## [1] NA
##
## $adaptive
```

```
## $adaptive$min
## [1] 5
##
## $adaptive$alpha
## [1] 0.05
##
## $adaptive$method
## [1] "gls"
##
## $adaptive$complete
## [1] TRUE
##
##
## $trim
## [1] FALSE
##
## $allowParallel
## [1] TRUE
```

```r
# Decision tree model construction with 10-fold cross validation. We pass all data inside the train fun
model <- train(factor(Class.ASD) ~., data = data,
               trControl = train_control,
               method = "rpart")

model
```

```
## CART
##
## 703 samples
##   5 predictor
##   2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold)
## Summary of sample sizes: 633, 633, 632, 632, 633, 633, ...
## Resampling results across tuning parameters:
##
##   cp         Accuracy   Kappa
##   0.000000   0.9914487  0.9780722
##   0.489418   0.9914487  0.9780722
##   0.978836   0.8036419  0.2780722
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was cp = 0.489418.
```

we are getting an accuracy of 0.9914475 at cp = 0.489418 using k-fold cross validation

Logistic Regression

3.) Implementing Logistic Regression

```
# Logistic Regression is compatible with the features in the dataset
log_regression_model <- glm(Class.ASD ~.,
                           data = train_set,
                           family = "binomial")
```

```
## Warning: glm.fit: algorithm did not converge
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
summary(log_regression_model)
```

```
##
## Call:
## glm(formula = Class.ASD ~ ., family = "binomial", data = train_set)
##
## Deviance Residuals:
##        Min          1Q      Median          3Q         Max
## -5.138e-05  -2.100e-08  -2.100e-08   2.100e-08   6.283e-05
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)   -74.329  13368.736  -0.006    0.996
## PC1            -1.272    603.456  -0.002    0.998
## PC2           -43.353   7629.752  -0.006    0.995
## PC3            -2.106   6985.649   0.000    1.000
## PC4            -2.228   8204.870   0.000    1.000
## PC5             0.320   8733.300   0.000    1.000
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 6.5473e+02  on 562  degrees of freedom
## Residual deviance: 5.2698e-08  on 557  degrees of freedom
## AIC: 12
##
## Number of Fisher Scoring iterations: 25
```

```
# using Logistic Regression model to make predictions on the validation set
pred_logistic_reg <- predict(log_regression_model, test_set, type="response")
pred_logistic_reg <- ifelse(pred_logistic_reg > 0.5, 1, 0)
pred_logistic_reg
```

```
## 492 650 331 369 461 440 585 439 424 512 345 272 144 456 702 537 526 352 393 623
```

```
##   0   0   0   0   0   0   1   0   0   1   0   1   0   0   1   0   0   0   0   0
## 232 668 343 339 286 605  50 667 102  33 648 677 671 325  94 115 601 308 289 268
##   0   0   0   0   0   0   0   0   0   0   0   0   1   0   1   1   0   1   0   0
## 336 418 679 348  42 335  13 663 362 374  26 210  48 528 689 483 318 133 271  35
##   0   0   1   0   0   0   0   0   0   0   0   1   0   0   1   0   0   0   1   1
## 267  75 571 693 544 676 436 438 614 622  39 631  90 531 555 395 255 193 462 603
##   0   0   0   1   1   0   0   0   0   1   1   0   1   0   1   0   0   0   0   0
## 659 378 627   4  64 533 576 225 177  95 183 228 509  27  81 433 478 208 370 299
##   0   0   0   0   0   0   0   1   1   1   0   0   1   0   0   0   0   1   0   0
## 458  73 351 538 385 572 303  51 372 700  40 310 161 581 281 118 563 152 146 300
##   0   0   1   0   0   0   0   0   0   1   1   1   0   0   0   0   0   1   1   1
## 130  69 479 350 473 110 103 680 306 413 285 562 476 589 284  61 427 690 625 455
##   0   0   0   0   0   0   0   1   0   0   0   1   0   1   1   1   1   1   0   0
```

```r
# creating logistic regression confusion matrix
log_reg_confusion_matrix = table(pred_logistic_reg, test_set$Class.ASD)
log_reg_confusion_matrix
```

```
##
## pred_logistic_reg   0   1
##                 0 102   0
##                 1   0  38
```

Logistic Regression is able to correctly classify all ASD patients and all normal people

```r
# Calculating logistic regression misclassification rate
log_reg_miss_class_rate <- mean(pred_logistic_reg != test_set$Class.ASD) * 100
log_reg_miss_class_rate
```

```
## [1] 0
```

Logistic Regression has a misclassification rate of 0%

```r
# Calculating logistic regression accuracy
log_reg_acc <- sum(diag(log_reg_confusion_matrix)) / sum(log_reg_confusion_matrix) * 100
log_reg_acc
```

```
## [1] 100
```

the accuracy of logistic regression is 100%

```r
# finding true positive, true negative, false positive and false negative from logistic regression conf
true_pos_log_reg <- log_reg_confusion_matrix[2,2]
true_pos_log_reg
```

```
## [1] 38
```

```r
true_neg_log_reg <- log_reg_confusion_matrix[1,1]
true_neg_log_reg
```

```
## [1] 102
```

```r
false_pos_log_reg <- log_reg_confusion_matrix[2,1]
false_pos_log_reg
```

```
## [1] 0
```

```r
false_neg_log_reg <- log_reg_confusion_matrix[1,2]
false_neg_log_reg
```

```
## [1] 0
```

```r
# Calculating log_reg precision
log_reg_prec <- true_pos_log_reg/(true_pos_log_reg + false_pos_log_reg)
log_reg_prec
```

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

the precision of Logistic Regression is 1

```r
# Calculating log_reg recall
log_reg_rec <- true_pos_log_reg/(true_pos_log_reg + false_neg_log_reg)
log_reg_rec
```

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

the recall of log__reg is 1

```r
# Calculating F1 score for log_reg
log_reg_F1 <- 2 * ((log_reg_prec * log_reg_rec)/(log_reg_prec + log_reg_rec))
log_reg_F1
```

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

the F1 score for logistic regression is 1

Since the algorithm is already effective, there is no point in repeatedly dividing the dataset and training/testing the model on different portions of it. We can use k-fold cross validation for logistic regression, but we shouldn't use.

Artificial Neural Networks

4.) Implementing Artificial Neural Network

```
# fitting the neural network
set.seed(10)
ANN <- neuralnet(Class.ASD ~ .,
                 data = train_set,
                 hidden = c(4))
```

number of neurons in the hidden layer taken as 1 less than the number of features

```
# making predictions using ANN
ANN_result <- compute(ANN, rep = 1, test_set[, -6])
ANN_predictions <- ANN_result$net.result
ANN_predictions <- ifelse(ANN_predictions > 0.5, 1, 0)
ANN_predictions
```

```
##       [,1]
## 492    0
## 650    0
## 331    0
## 369    0
## 461    0
## 440    0
## 585    1
## 439    0
## 424    0
## 512    1
## 345    0
## 272    1
## 144    0
## 456    0
## 702    1
## 537    0
## 526    0
## 352    0
## 393    0
```

```
## 623     0
## 232     0
## 668     0
## 343     0
## 339     0
## 286     0
## 605     0
## 50      0
## 667     0
## 102     0
## 33      0
## 648     0
## 677     0
## 671     1
## 325     0
## 94      1
## 115     1
## 601     0
## 308     1
## 289     0
## 268     0
## 336     0
## 418     0
## 679     1
## 348     0
## 42      0
## 335     0
## 13      0
## 663     0
## 362     0
## 374     0
## 26      0
## 210     1
## 48      0
## 528     0
## 689     1
## 483     0
## 318     0
## 133     0
## 271     1
## 35      1
## 267     0
## 75      0
## 571     0
## 693     1
## 544     1
## 676     0
## 436     0
## 438     0
## 614     0
## 622     1
## 39      1
## 631     0
## 90      1
```

```
## 531   0
## 555   1
## 395   0
## 255   0
## 193   0
## 462   0
## 603   0
## 659   0
## 378   0
## 627   0
## 4     0
## 64    0
## 533   0
## 576   0
## 225   1
## 177   1
## 95    1
## 183   0
## 228   0
## 509   1
## 27    0
## 81    0
## 433   0
## 478   0
## 208   1
## 370   0
## 299   0
## 458   0
## 73    0
## 351   1
## 538   0
## 385   0
## 572   0
## 303   0
## 51    0
## 372   0
## 700   1
## 40    1
## 310   1
## 161   0
## 581   0
## 281   0
## 118   0
## 563   0
## 152   1
## 146   1
## 300   1
## 130   0
## 69    0
## 479   0
## 350   0
## 473   0
## 110   0
## 103   0
```

```
## 680    1
## 306    0
## 413    0
## 285    0
## 562    1
## 476    0
## 589    1
## 284    1
## 61     1
## 427    1
## 690    1
## 625    0
## 455    0
```

```r
# creating ANN confusion matrix
ANN_confusion_matrix <- table(ANN_predictions, test_set$Class.ASD)
ANN_confusion_matrix
```

```
##
## ANN_predictions   0   1
##               0 102   0
##               1   0  38
```

ANN is able to correctly classify all ASD patients and all normal people

```r
# calulating ANN misclassification rate
ANN_misclass_rate <- mean(ANN_predictions != test_set$Class.ASD) * 100
ANN_misclass_rate
```

```
## [1] 0
```

ANN misclassification rate is 0%

```r
# calulating ANN accuracy
ANN_acc <- sum(diag(ANN_confusion_matrix)) / sum(ANN_confusion_matrix) * 100
ANN_acc
```

```
## [1] 100
```

the accuracy from neural network is 100%

```r
# calculating true positive, true negative, false positive and false negative from the ANN confusion ma
true_pos_ANN <- ANN_confusion_matrix[2,2]
true_pos_ANN
```

```
## [1] 38
```

```
true_neg_ANN <- ANN_confusion_matrix[1,1]
true_neg_ANN
```

```
## [1] 102
```

```
false_pos_ANN <- ANN_confusion_matrix[2,1]
false_pos_ANN
```

```
## [1] 0
```

```
false_neg_ANN <- ANN_confusion_matrix[1,2]
false_neg_ANN
```

```
## [1] 0
```

```
# calculating ANN precision
ANN_prec <- true_pos_ANN/(true_pos_ANN + false_pos_ANN)
ANN_prec
```

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

ANN precision is 1

```
# calculating ANN recall
ANN_recall <- true_pos_ANN/(true_pos_ANN + false_neg_ANN)
ANN_recall
```

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

ANN recall is 1

```
# Calculating F1 score for log_reg
ANN_F1 <- 2 * ((ANN_prec * ANN_recall)/(ANN_prec + ANN_recall))
ANN_F1
```

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

the F1 score for ANN is 1

For logistic regression, we can use k-fold cross validation, but we shouldn't because the algorithm is already effective and there is no point in repeatedly dividing the dataset and training/testing the model on different portions of it.

The SVM model, Logistic regression model, and ANN model achieved a accuracy of 100% whereas the Decision tree acheived an accuracy of 98% while it acheived 0.9914475 at cp = 0.489418 using k-fold cross validation.

Applying two ensemble techniques bagging and boosting

```r
# Applying two Bagging algorithms
# 1.) Treebag
control <- trainControl(method="repeatedcv", number=10, repeats=3)
seed <- 7
metric <- "Accuracy"
metric
```

```
## [1] "Accuracy"
```

```r
# Bagged CART
set.seed(seed)
fit.treebag <- train(factor(Class.ASD)~., data=data, method="treebag", metric=metric, trControl=control)
fit.treebag
```

```
## Bagged CART
##
## 703 samples
##   5 predictor
##   2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 3 times)
## Summary of sample sizes: 632, 632, 632, 633, 632, 633, ...
## Resampling results:
##
##   Accuracy   Kappa
##   0.9905229  0.9759094
```

```r
#  Random Forest
set.seed(seed)
fit.rf <- train(factor(Class.ASD)~., data=data, method="rf", metric=metric, trControl=control)
fit.rf
```

```
## Random Forest
```

```
##
## 703 samples
##    5 predictor
##    2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 3 times)
## Summary of sample sizes: 632, 632, 632, 633, 632, 633, ...
## Resampling results across tuning parameters:
##
##   mtry  Accuracy   Kappa
##   2     0.9966732  0.9913496
##   3     0.9947818  0.9866647
##   5     0.9924145  0.9807606
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was mtry = 2.
```

```
# summarize results for both bagging algorithms
bagging_results <- resamples(list(treebag=fit.treebag, rf=fit.rf))
summary(bagging_results)
```

```
##
## Call:
## summary.resamples(object = bagging_results)
##
## Models: treebag, rf
## Number of resamples: 30
##
## Accuracy
##              Min.   1st Qu.    Median      Mean 3rd Qu. Max. NA's
## treebag 0.9571429 0.9857143 0.9859155 0.9905229       1    1    0
## rf      0.9714286 1.0000000 1.0000000 0.9966732       1    1    0
##
## Kappa
##              Min.   1st Qu.    Median      Mean 3rd Qu. Max. NA's
## treebag 0.8898216 0.9637107  0.964659 0.9759094       1    1    0
## rf      0.9252935 1.0000000  1.000000 0.9913496       1    1    0
```

```
dotplot(bagging_results)
```

Confidence Level: 0.95
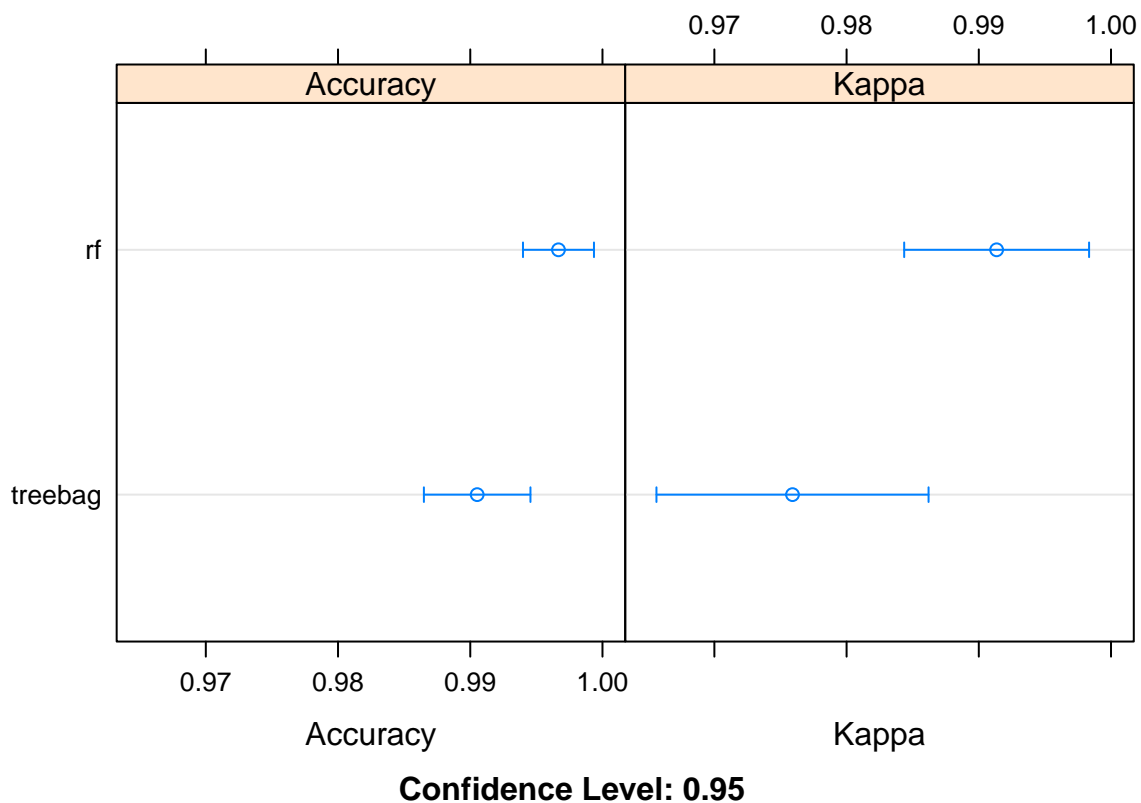
treebag is giving a mean accuracy of 0.9856107 whereas random forest is giving a mean accuracy of 0.9926671

```r
# Applying two boosting algorithms:
# C5.0
set.seed(seed)
fit.c50 <- train(factor(Class.ASD)~., data=data, method="C5.0", metric=metric, trControl=control)
```

```
## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 9 for this object. Predictions generated using 9
## trials

## Warning: 'trials' should be <= 9 for this object. Predictions generated using 9
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials
```

```
## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials
```

```
## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials
```

```
## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials
```

```
## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials
```

```
## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 4 for this object. Predictions generated using 4
## trials

## Warning: 'trials' should be <= 4 for this object. Predictions generated using 4
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 8 for this object. Predictions generated using 8
## trials

## Warning: 'trials' should be <= 7 for this object. Predictions generated using 7
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials

## Warning: 'trials' should be <= 1 for this object. Predictions generated using 1
## trials

## Warning: 'trials' should be <= 3 for this object. Predictions generated using 3
## trials
```

```
## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials

## Warning: 'trials' should be <= 6 for this object. Predictions generated using 6
## trials
```

```
fit.c50
```

```
## C5.0
##
## 703 samples
##    5 predictor
##    2 classes: '0', '1'
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 3 times)
## Summary of sample sizes: 632, 632, 632, 633, 632, 633, ...
## Resampling results across tuning parameters:
##
##   model  winnow  trials  Accuracy   Kappa
##   rules  FALSE    1      0.9952515  0.9878082
##   rules  FALSE   10      0.9957277  0.9890325
##   rules  FALSE   20      0.9957277  0.9890325
##   rules   TRUE    1      0.9933602  0.9830833
##   rules   TRUE   10      0.9938296  0.9841818
##   rules   TRUE   20      0.9928771  0.9818931
##   tree   FALSE    1      0.9952515  0.9878082
##   tree   FALSE   10      0.9952515  0.9878082
##   tree   FALSE   20      0.9952515  0.9878082
##   tree    TRUE    1      0.9933602  0.9830833
##   tree    TRUE   10      0.9942989  0.9854792
##   tree    TRUE   20      0.9928771  0.9818931
##
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were trials = 10, model = rules and
##  winnow = FALSE.
```

```
# Stochastic Gradient Boosting
set.seed(seed)
fit.gbm <- train(factor(Class.ASD)~., data=data, method="gbm", metric=metric, trControl=control, verbose
fit.gbm
```

```
## Stochastic Gradient Boosting
##
## 703 samples
##    5 predictor
##    2 classes: '0', '1'
```

```
## 
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 3 times)
## Summary of sample sizes: 632, 632, 632, 633, 632, 633, ...
## Resampling results across tuning parameters:
## 
##   interaction.depth  n.trees  Accuracy   Kappa
## 1                     50       0.9919314  0.9793236
## 1                    100       0.9938362  0.9842629
## 1                    150       0.9943056  0.9854809
## 2                     50       0.9938362  0.9842204
## 2                    100       0.9938362  0.9841807
## 2                    150       0.9943056  0.9853587
## 3                     50       0.9962037  0.9903330
## 3                    100       0.9957275  0.9890687
## 3                    150       0.9957275  0.9890687
## 
## Tuning parameter 'shrinkage' was held constant at a value of 0.1
## 
## Tuning parameter 'n.minobsinnode' was held constant at a value of 10
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were n.trees = 50, interaction.depth =
##   3, shrinkage = 0.1 and n.minobsinnode = 10.
```

```r
# summarize results
boosting_results <- resamples(list(c5.0=fit.c50, gbm=fit.gbm))
summary(boosting_results)
```

```
## 
## Call:
## summary.resamples(object = boosting_results)
## 
## Models: c5.0, gbm
## Number of resamples: 30
## 
## Accuracy
##           Min.    1st Qu. Median      Mean 3rd Qu. Max. NA's
## c5.0 0.9571429 1.0000000      1 0.9957277       1    1    0
## gbm  0.9855072 0.9894366      1 0.9962037       1    1    0
## 
## Kappa
##           Min.    1st Qu. Median      Mean 3rd Qu. Max. NA's
## c5.0 0.8898216 1.0000000      1 0.9890325       1    1    0
## gbm  0.9617304 0.9734943      1 0.9903330       1    1    0
```

```r
dotplot(boosting_results)
```

Confidence Level: 0.95
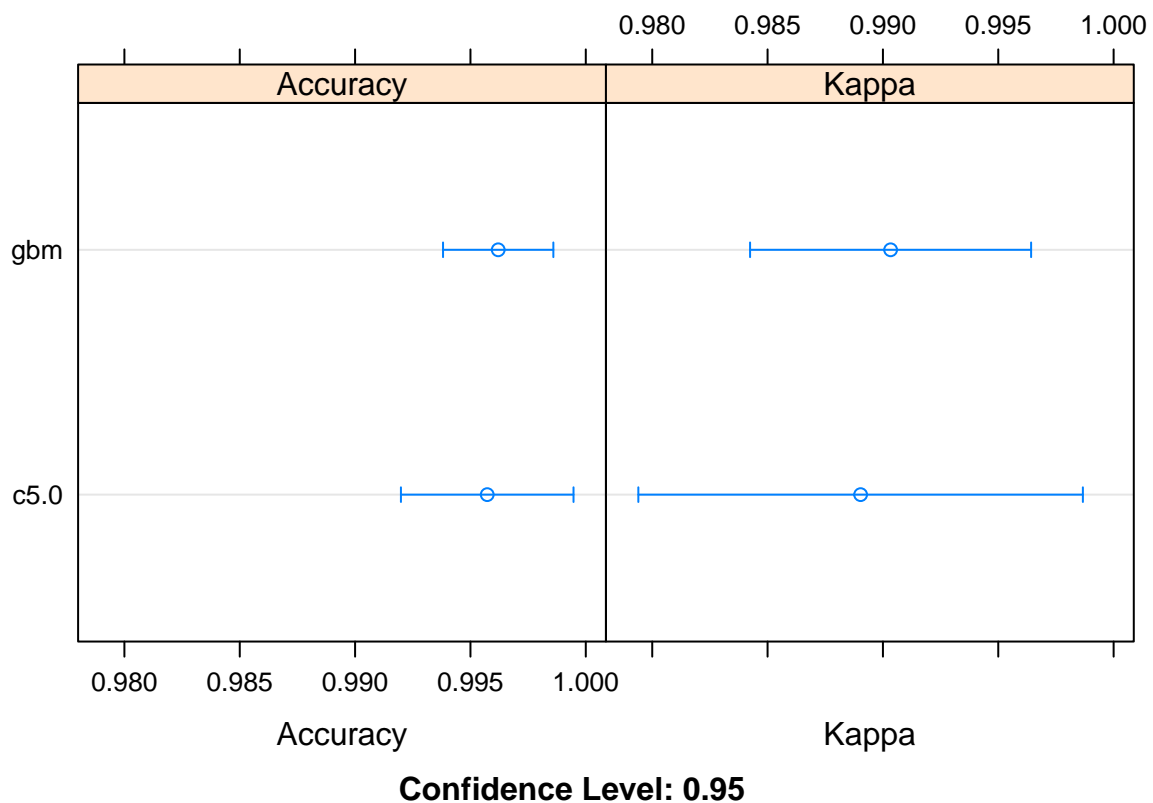
Mean accuracy of C5.0 is 0.9971429 and gbm is also 0.9971429 and both the boosting algorithms are giving same accuracy

```
# Performing hyperparameter tuning for stochastic gradient boosting
hyperparameter_grid <- expand.grid(
  .n.trees = c(250, 500),
  .interaction.depth=c(2,3),
  .shrinkage=0.5,
  .n.minobsinnode=10
)

data_2 <- data[,-6]
target_class <- factor(ifelse(data$Class.ASD == 0, "No", "Yes"))
data_2 <- cbind(data_2, target_class)
fit_hypertune <- train(target_class ~ . , data = data_2,
          method = "gbm",
          trControl = trainControl(method="cv", number = 5, verboseIter = TRUE, classProbs = TRUE),
          tuneGrid = hyperparameter_grid)
```

```
## + Fold1: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##    1        0.4599             nan      0.5000    0.3435
```

```
##     2       0.2674            nan       0.5000     0.0939
##     3       0.1683            nan       0.5000     0.0467
##     4       0.1118            nan       0.5000     0.0244
##     5       0.0811            nan       0.5000     0.0118
##     6       0.0524            nan       0.5000     0.0102
##     7       0.0416            nan       0.5000    -0.0002
##     8       0.0257            nan       0.5000     0.0046
##     9       0.0226            nan       0.5000    -0.0001
##    10       0.0220            nan       0.5000    -0.0009
##    20       0.0132            nan       0.5000    -0.0039
##    40       0.0054            nan       0.5000    -0.0008
##    60       0.0033            nan       0.5000    -0.0008
##    80       0.0004            nan       0.5000    -0.0001
##   100       0.0003            nan       0.5000    -0.0001
##   120       0.0003            nan       0.5000    -0.0001
##   140       0.0002            nan       0.5000    -0.0000
##   160       0.0000            nan       0.5000    -0.0000
##   180       0.0000            nan       0.5000    -0.0000
##   200       0.0000            nan       0.5000    -0.0000
##   220       0.0000            nan       0.5000    -0.0000
##   240       0.0000            nan       0.5000     0.0000
##   260       0.0001            nan       0.5000    -0.0001
##   280       0.0000            nan       0.5000    -0.0000
##   300       0.0000            nan       0.5000    -0.0000
##   320       0.0000            nan       0.5000    -0.0000
##   340       0.0002            nan       0.5000    -0.0001
##   360       0.0000            nan       0.5000    -0.0000
##   380       0.0000            nan       0.5000    -0.0000
##   400       0.0000            nan       0.5000    -0.0000
##   420       0.0000            nan       0.5000    -0.0000
##   440       0.0000            nan       0.5000    -0.0000
##   460       0.0001            nan       0.5000    -0.0000
##   480       0.0001            nan       0.5000    -0.0000
##   500       0.0000            nan       0.5000    -0.0000
##
## - Fold1: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## + Fold1: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize    Improve
##     1       0.4595            nan       0.5000     0.3808
##     2       0.2714            nan       0.5000     0.0879
##     3       0.1679            nan       0.5000     0.0498
##     4       0.1078            nan       0.5000     0.0278
##     5       0.0616            nan       0.5000     0.0248
##     6       0.0382            nan       0.5000     0.0079
##     7       0.0265            nan       0.5000     0.0040
##     8       0.0205            nan       0.5000     0.0019
##     9       0.0164            nan       0.5000     0.0001
##    10       0.0134            nan       0.5000     0.0012
##    20       0.0065            nan       0.5000    -0.0007
##    40       0.0012            nan       0.5000    -0.0002
##    60       0.0012            nan       0.5000    -0.0003
##    80       0.0011            nan       0.5000    -0.0000
##   100       0.0009            nan       0.5000    -0.0000
##   120       0.0006            nan       0.5000    -0.0001
```

```
##     140       0.0008            nan        0.5000    -0.0002
##     160       0.0016            nan        0.5000    -0.0005
##     180       0.0005            nan        0.5000    -0.0001
##     200       0.0004            nan        0.5000     0.0000
##     220       0.0004            nan        0.5000    -0.0001
##     240       0.0004            nan        0.5000    -0.0001
##     260       0.0006            nan        0.5000    -0.0002
##     280       0.0003            nan        0.5000    -0.0000
##     300       0.0001            nan        0.5000    -0.0000
##     320       0.0006            nan        0.5000    -0.0002
##     340       0.0002            nan        0.5000    -0.0000
##     360       0.0000            nan        0.5000    -0.0000
##     380       0.0005            nan        0.5000    -0.0002
##     400       0.0001            nan        0.5000    -0.0000
##     420       0.0000            nan        0.5000    -0.0000
##     440       0.0000            nan        0.5000    -0.0000
##     460       0.0003            nan        0.5000    -0.0001
##     480       0.0001            nan        0.5000    -0.0000
##     500       0.0000            nan        0.5000    -0.0000
##
## - Fold1: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## + Fold2: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize    Improve
##       1       0.4597            nan        0.5000     0.3460
##       2       0.2610            nan        0.5000     0.0956
##       3       0.1649            nan        0.5000     0.0466
##       4       0.1108            nan        0.5000     0.0229
##       5       0.0660            nan        0.5000     0.0160
##       6       0.0455            nan        0.5000     0.0089
##       7       0.0351            nan        0.5000     0.0039
##       8       0.0270            nan        0.5000     0.0014
##       9       0.0241            nan        0.5000     0.0007
##      10       0.0208            nan        0.5000    -0.0006
##      20       0.0027            nan        0.5000     0.0004
##      40       0.0007            nan        0.5000    -0.0001
##      60       0.0003            nan        0.5000     0.0000
##      80       0.0005            nan        0.5000     0.0001
##     100       0.0001            nan        0.5000     0.0000
##     120       0.0001            nan        0.5000    -0.0000
##     140       0.0002            nan        0.5000    -0.0001
##     160       0.0000            nan        0.5000    -0.0000
##     180       0.0000            nan        0.5000    -0.0000
##     200       0.0000            nan        0.5000    -0.0000
##     220       0.0000            nan        0.5000    -0.0000
##     240       0.0000            nan        0.5000    -0.0000
##     260       0.0000            nan        0.5000    -0.0000
##     280       0.0000            nan        0.5000    -0.0000
##     300       0.0000            nan        0.5000    -0.0000
##     320       0.0000            nan        0.5000    -0.0000
##     340       0.0000            nan        0.5000    -0.0000
##     360       0.0000            nan        0.5000    -0.0000
##     380       0.0000            nan        0.5000    -0.0000
##     400       0.0000            nan        0.5000    -0.0000
##     420       0.0000            nan        0.5000    -0.0000
```

```
##    440        0.0000           nan      0.5000     -0.0000
##    460        0.0000           nan      0.5000     -0.0000
##    480        0.0000           nan      0.5000     -0.0000
##    500        0.0000           nan      0.5000     -0.0000
##
## - Fold2: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## + Fold2: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.4612           nan      0.5000      0.3445
##      2        0.2650           nan      0.5000      0.0968
##      3        0.1638           nan      0.5000      0.0510
##      4        0.1075           nan      0.5000      0.0256
##      5        0.0747           nan      0.5000      0.0120
##      6        0.0478           nan      0.5000      0.0118
##      7        0.0331           nan      0.5000      0.0051
##      8        0.0214           nan      0.5000      0.0030
##      9        0.0148           nan      0.5000      0.0031
##     10        0.0133           nan      0.5000     -0.0006
##     20        0.0049           nan      0.5000     -0.0002
##     40        0.0046           nan      0.5000     -0.0003
##     60        0.0003           nan      0.5000     -0.0001
##     80        0.0002           nan      0.5000     -0.0000
##    100        0.0000           nan      0.5000     -0.0000
##    120        0.0001           nan      0.5000     -0.0000
##    140        0.0000           nan      0.5000     -0.0000
##    160        0.0000           nan      0.5000     -0.0000
##    180        0.0000           nan      0.5000     -0.0000
##    200        0.0000           nan      0.5000      0.0000
##    220        0.0000           nan      0.5000     -0.0000
##    240        0.0000           nan      0.5000     -0.0000
##    260        0.0000           nan      0.5000     -0.0000
##    280        0.0000           nan      0.5000     -0.0000
##    300        0.0000           nan      0.5000     -0.0000
##    320        0.0000           nan      0.5000     -0.0000
##    340        0.0000           nan      0.5000     -0.0000
##    360        0.0000           nan      0.5000      0.0000
##    380        0.0000           nan      0.5000     -0.0000
##    400        0.0000           nan      0.5000     -0.0000
##    420        0.0000           nan      0.5000     -0.0000
##    440        0.0000           nan      0.5000     -0.0000
##    460        0.0000           nan      0.5000     -0.0000
##    480        0.0000           nan      0.5000     -0.0000
##    500        0.0000           nan      0.5000     -0.0000
##
## - Fold2: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## + Fold3: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.4643           nan      0.5000      0.3402
##      2        0.2622           nan      0.5000      0.1039
##      3        0.1598           nan      0.5000      0.0501
##      4        0.1020           nan      0.5000      0.0281
##      5        0.0680           nan      0.5000      0.0150
##      6        0.0483           nan      0.5000      0.0077
##      7        0.0311           nan      0.5000      0.0057
```

```
##      8        0.0217        nan        0.5000     0.0027
##      9        0.0184        nan        0.5000     0.0005
##     10        0.0126        nan        0.5000     0.0013
##     20        0.0018        nan        0.5000     0.0001
##     40        0.0032        nan        0.5000    -0.0007
##     60        0.0015        nan        0.5000    -0.0004
##     80        0.0007        nan        0.5000    -0.0001
##    100        0.0005        nan        0.5000    -0.0001
##    120        0.0002        nan        0.5000    -0.0000
##    140        0.0001        nan        0.5000    -0.0000
##    160        0.0001        nan        0.5000    -0.0000
##    180        0.0001        nan        0.5000    -0.0000
##    200        0.0000        nan        0.5000    -0.0000
##    220        0.0000        nan        0.5000    -0.0000
##    240        0.0000        nan        0.5000     0.0000
##    260        0.0000        nan        0.5000     0.0000
##    280        0.0000        nan        0.5000     0.0000
##    300        0.0000        nan        0.5000    -0.0000
##    320        0.0000        nan        0.5000    -0.0000
##    340        0.0000        nan        0.5000    -0.0000
##    360        0.0000        nan        0.5000     0.0000
##    380        0.0000        nan        0.5000    -0.0000
##    400        0.0000        nan        0.5000     0.0000
##    420        0.0000        nan        0.5000    -0.0000
##    440        0.0000        nan        0.5000    -0.0000
##    460        0.0000        nan        0.5000    -0.0000
##    480        0.0000        nan        0.5000    -0.0000
##    500        0.0000        nan        0.5000    -0.0000
##
## - Fold3: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## + Fold3: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize     Improve
##      1        0.4548        nan        0.5000     0.3306
##      2        0.2636        nan        0.5000     0.0929
##      3        0.1634        nan        0.5000     0.0474
##      4        0.1085        nan        0.5000     0.0257
##      5        0.0762        nan        0.5000     0.0139
##      6        0.0536        nan        0.5000     0.0083
##      7        0.0316        nan        0.5000     0.0110
##      8        0.0264        nan        0.5000     0.0011
##      9        0.0172        nan        0.5000     0.0003
##     10        0.0144        nan        0.5000    -0.0012
##     20        0.0059        nan        0.5000    -0.0007
##     40        0.0032        nan        0.5000    -0.0007
##     60        0.0010        nan        0.5000    -0.0001
##     80        0.0035        nan        0.5000    -0.0008
##    100        0.0007        nan        0.5000    -0.0000
##    120        0.0004        nan        0.5000    -0.0000
##    140        0.0011        nan        0.5000     0.0006
##    160        0.0004        nan        0.5000    -0.0000
##    180        0.0003        nan        0.5000    -0.0000
##    200        0.0008        nan        0.5000    -0.0003
##    220        0.0001        nan        0.5000    -0.0000
##    240        0.0006        nan        0.5000    -0.0002
```

```
##    260      0.0001          nan      0.5000   -0.0000
##    280      0.0001          nan      0.5000   -0.0000
##    300      0.0001          nan      0.5000   -0.0000
##    320      0.0001          nan      0.5000   -0.0000
##    340      0.0001          nan      0.5000   -0.0000
##    360      0.0001          nan      0.5000   -0.0000
##    380      0.0001          nan      0.5000   -0.0000
##    400      0.0002          nan      0.5000   -0.0001
##    420      0.0003          nan      0.5000   -0.0001
##    440      0.0001          nan      0.5000   -0.0000
##    460      0.0002          nan      0.5000    0.0001
##    480      0.0001          nan      0.5000   -0.0000
##    500      0.0000          nan      0.5000   -0.0000
##
## - Fold3: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## + Fold4: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize    Improve
##      1      0.4479          nan      0.5000    0.3721
##      2      0.2580          nan      0.5000    0.0902
##      3      0.1564          nan      0.5000    0.0500
##      4      0.0967          nan      0.5000    0.0274
##      5      0.0634          nan      0.5000    0.0164
##      6      0.0416          nan      0.5000    0.0099
##      7      0.0297          nan      0.5000    0.0049
##      8      0.0213          nan      0.5000    0.0027
##      9      0.0116          nan      0.5000    0.0019
##     10      0.0102          nan      0.5000   -0.0002
##     20      0.0029          nan      0.5000   -0.0005
##     40      0.0006          nan      0.5000   -0.0001
##     60      0.0003          nan      0.5000   -0.0001
##     80      0.0002          nan      0.5000   -0.0000
##    100      0.0002          nan      0.5000   -0.0000
##    120      0.0000          nan      0.5000    0.0000
##    140      0.0000          nan      0.5000   -0.0000
##    160      0.0000          nan      0.5000    0.0000
##    180      0.0001          nan      0.5000   -0.0000
##    200      0.0001          nan      0.5000    0.0000
##    220      0.0000          nan      0.5000    0.0000
##    240      0.0000          nan      0.5000   -0.0000
##    260      0.0000          nan      0.5000   -0.0000
##    280      0.0000          nan      0.5000    0.0000
##    300      0.0000          nan      0.5000    0.0000
##    320      0.0000          nan      0.5000   -0.0000
##    340      0.0000          nan      0.5000    0.0000
##    360      0.0000          nan      0.5000   -0.0000
##    380      0.0000          nan      0.5000   -0.0000
##    400      0.0000          nan      0.5000    0.0000
##    420      0.0000          nan      0.5000   -0.0000
##    440      0.0000          nan      0.5000   -0.0000
##    460      0.0000          nan      0.5000   -0.0000
##    480      0.0000          nan      0.5000    0.0000
##    500      0.0000          nan      0.5000    0.0000
##
## - Fold4: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
```

```
## + Fold4: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1          0.4558             nan     0.5000     0.3571
##      2          0.2585             nan     0.5000     0.0960
##      3          0.1557             nan     0.5000     0.0504
##      4          0.0968             nan     0.5000     0.0287
##      5          0.0603             nan     0.5000     0.0174
##      6          0.0412             nan     0.5000     0.0078
##      7          0.0312             nan     0.5000     0.0034
##      8          0.0224             nan     0.5000     0.0023
##      9          0.0136             nan     0.5000     0.0012
##     10          0.0101             nan     0.5000     0.0010
##     20          0.0032             nan     0.5000    -0.0006
##     40          0.0009             nan     0.5000    -0.0001
##     60          0.0008             nan     0.5000     0.0000
##     80          0.0002             nan     0.5000    -0.0000
##    100          0.0001             nan     0.5000    -0.0000
##    120          0.0000             nan     0.5000     0.0000
##    140          0.0001             nan     0.5000    -0.0000
##    160          0.0000             nan     0.5000    -0.0000
##    180          0.0000             nan     0.5000    -0.0000
##    200          0.0000             nan     0.5000    -0.0000
##    220          0.0000             nan     0.5000     0.0000
##    240          0.0000             nan     0.5000     0.0000
##    260          0.0000             nan     0.5000    -0.0000
##    280          0.0000             nan     0.5000    -0.0000
##    300          0.0000             nan     0.5000    -0.0000
##    320          0.0000             nan     0.5000    -0.0000
##    340          0.0000             nan     0.5000    -0.0000
##    360          0.0000             nan     0.5000     0.0000
##    380          0.0000             nan     0.5000    -0.0000
##    400          0.0000             nan     0.5000    -0.0000
##    420          0.0000             nan     0.5000    -0.0000
##    440          0.0000             nan     0.5000    -0.0000
##    460          0.0000             nan     0.5000    -0.0000
##    480          0.0000             nan     0.5000    -0.0000
##    500          0.0000             nan     0.5000    -0.0000
##
## - Fold4: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## + Fold5: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1          0.4513             nan     0.5000     0.3659
##      2          0.2601             nan     0.5000     0.0941
##      3          0.1607             nan     0.5000     0.0458
##      4          0.1010             nan     0.5000     0.0279
##      5          0.0672             nan     0.5000     0.0143
##      6          0.0426             nan     0.5000     0.0101
##      7          0.0306             nan     0.5000     0.0053
##      8          0.0219             nan     0.5000     0.0012
##      9          0.0201             nan     0.5000    -0.0000
##     10          0.0163             nan     0.5000     0.0011
##     20          0.0044             nan     0.5000    -0.0003
##     40          0.0014             nan     0.5000    -0.0001
##     60          0.0017             nan     0.5000    -0.0002
```

```
##      80         0.0022             nan      0.5000    -0.0006
##     100         0.0009             nan      0.5000    -0.0000
##     120         0.0007             nan      0.5000    -0.0001
##     140         0.0008             nan      0.5000    -0.0001
##     160         0.0002             nan      0.5000     0.0000
##     180         0.0001             nan      0.5000    -0.0000
##     200         0.0001             nan      0.5000    -0.0000
##     220         0.0001             nan      0.5000    -0.0000
##     240         0.0000             nan      0.5000    -0.0000
##     260         0.0000             nan      0.5000    -0.0000
##     280         0.0000             nan      0.5000    -0.0000
##     300         0.0001             nan      0.5000    -0.0000
##     320         0.0000             nan      0.5000    -0.0000
##     340         0.0000             nan      0.5000    -0.0000
##     360         0.0000             nan      0.5000    -0.0000
##     380         0.0000             nan      0.5000    -0.0000
##     400         0.0000             nan      0.5000    -0.0000
##     420         0.0001             nan      0.5000    -0.0000
##     440         0.0000             nan      0.5000    -0.0000
##     460         0.0001             nan      0.5000     0.0000
##     480         0.0000             nan      0.5000    -0.0000
##     500         0.0001             nan      0.5000    -0.0000
##
## - Fold5: shrinkage=0.5, interaction.depth=2, n.minobsinnode=10, n.trees=500
## + Fold5: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##       1         0.4505             nan      0.5000     0.3436
##       2         0.2590             nan      0.5000     0.0943
##       3         0.1580             nan      0.5000     0.0482
##       4         0.1003             nan      0.5000     0.0264
##       5         0.0679             nan      0.5000     0.0145
##       6         0.0376             nan      0.5000     0.0125
##       7         0.0268             nan      0.5000     0.0046
##       8         0.0180             nan      0.5000     0.0012
##       9         0.0126             nan      0.5000     0.0019
##      10         0.0087             nan      0.5000     0.0021
##      20         0.0031             nan      0.5000    -0.0003
##      40         0.0033             nan      0.5000    -0.0007
##      60         0.0028             nan      0.5000    -0.0006
##      80         0.0105             nan      0.5000     0.0017
##     100         0.0016             nan      0.5000    -0.0004
##     120         0.0003             nan      0.5000    -0.0000
##     140         0.0002             nan      0.5000    -0.0000
##     160         0.0001             nan      0.5000    -0.0000
##     180         0.0005             nan      0.5000     0.0001
##     200         0.0002             nan      0.5000    -0.0001
##     220         0.0004             nan      0.5000    -0.0002
##     240         0.0001             nan      0.5000    -0.0000
##     260         0.0001             nan      0.5000    -0.0000
##     280         0.0001             nan      0.5000    -0.0000
##     300         0.0001             nan      0.5000    -0.0000
##     320         0.0002             nan      0.5000    -0.0001
##     340         0.0001             nan      0.5000    -0.0000
##     360         0.0001             nan      0.5000    -0.0000
```

```
##     380        0.0003              nan      0.5000    -0.0001
##     400        0.0002              nan      0.5000    -0.0000
##     420        0.0000              nan      0.5000    -0.0000
##     440        0.0000              nan      0.5000    -0.0000
##     460        0.0001              nan      0.5000    -0.0000
##     480        0.0000              nan      0.5000    -0.0000
##     500        0.0000              nan      0.5000    -0.0000
##
## - Fold5: shrinkage=0.5, interaction.depth=3, n.minobsinnode=10, n.trees=500
## Aggregating results
## Selecting tuning parameters
## Fitting n.trees = 500, interaction.depth = 3, shrinkage = 0.5, n.minobsinnode = 10 on full training
## Iter   TrainDeviance   ValidDeviance   StepSize   Improve
##      1        0.4581              nan      0.5000     0.3488
##      2        0.2632              nan      0.5000     0.0920
##      3        0.1602              nan      0.5000     0.0515
##      4        0.1030              nan      0.5000     0.0275
##      5        0.0685              nan      0.5000     0.0151
##      6        0.0479              nan      0.5000     0.0089
##      7        0.0368              nan      0.5000     0.0040
##      8        0.0281              nan      0.5000     0.0030
##      9        0.0202              nan      0.5000     0.0015
##     10        0.0172              nan      0.5000     0.0003
##     20        0.0104              nan      0.5000    -0.0007
##     40        0.0103              nan      0.5000    -0.0011
##     60        0.0030              nan      0.5000    -0.0007
##     80        0.0016              nan      0.5000    -0.0003
##    100        0.0019              nan      0.5000    -0.0005
##    120        0.0003              nan      0.5000     0.0000
##    140        0.0005              nan      0.5000    -0.0002
##    160        0.0005              nan      0.5000    -0.0002
##    180        0.0003              nan      0.5000    -0.0000
##    200        0.0003              nan      0.5000    -0.0000
##    220        0.0004              nan      0.5000    -0.0001
##    240        0.0003              nan      0.5000    -0.0000
##    260        0.0002              nan      0.5000    -0.0001
##    280        0.0002              nan      0.5000    -0.0000
##    300        0.0003              nan      0.5000    -0.0001
##    320        0.0007              nan      0.5000    -0.0002
##    340        0.0002              nan      0.5000    -0.0000
##    360        0.0001              nan      0.5000    -0.0000
##    380        0.0015              nan      0.5000     0.0007
##    400        0.0004              nan      0.5000    -0.0000
##    420        0.0001              nan      0.5000    -0.0000
##    440        0.0003              nan      0.5000    -0.0000
##    460        0.0003              nan      0.5000    -0.0000
##    480        0.0005              nan      0.5000    -0.0002
##    500        0.0004              nan      0.5000    -0.0001
```

```
print(fit_hypertune)
```

```
## Stochastic Gradient Boosting
##
## 703 samples
```

```
##   5 predictor
##   2 classes: 'No', 'Yes'
##
## No pre-processing
## Resampling: Cross-Validated (5 fold)
## Summary of sample sizes: 564, 562, 562, 562, 562
## Resampling results across tuning parameters:
##
##   interaction.depth  n.trees  Accuracy   Kappa
##   2                  250      0.9943058  0.9855108
##   2                  500      0.9943058  0.9855108
##   3                  250      0.9928874  0.9818179
##   3                  500      0.9943262  0.9854695
##
## Tuning parameter 'shrinkage' was held constant at a value of 0.5
##
## Tuning parameter 'n.minobsinnode' was held constant at a value of 10
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were n.trees = 500, interaction.depth =
##  3, shrinkage = 0.5 and n.minobsinnode = 10.
```

```
plot(fit_hypertune)
```
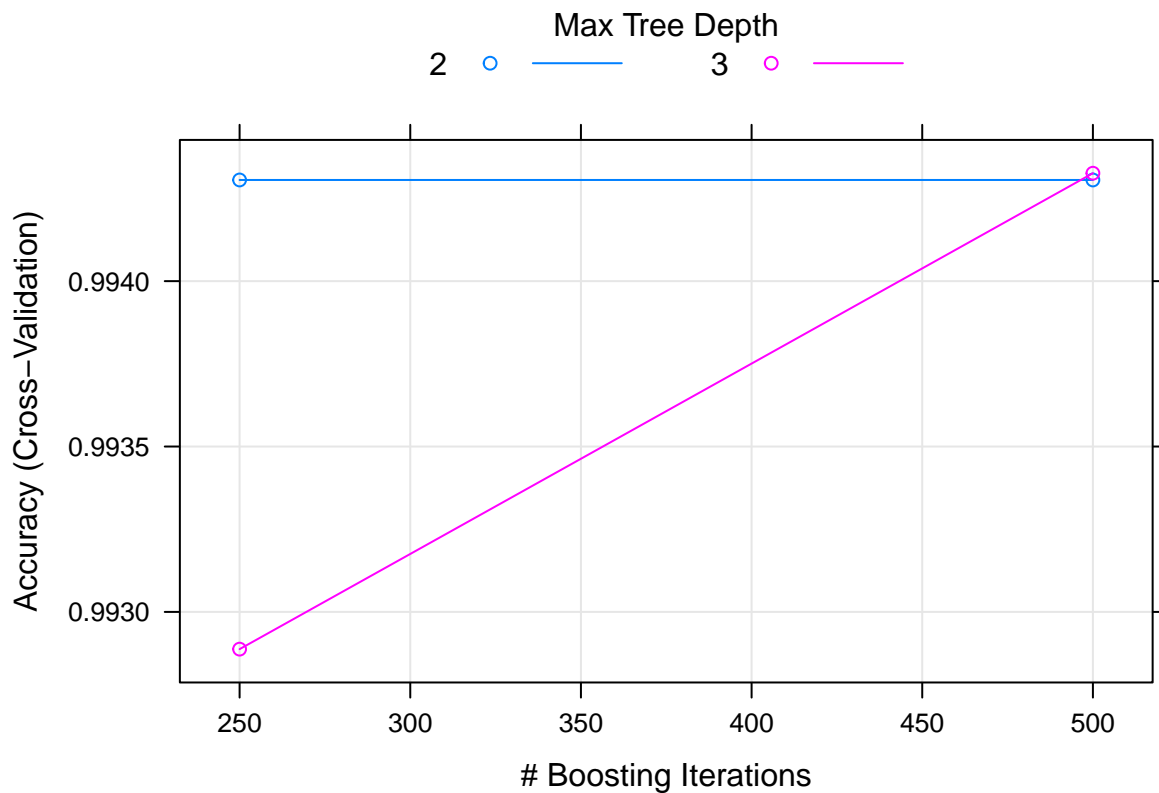
The following accuracies were obtained corresponding to the hyperparameters

n.trees Accuracy Kappa
250 0.9971631 0.9927946 500 0.9957447 0.9892223 250 0.9971631 0.9926734 500 0.9957345 0.9891526

We can see that the accuracy of the gbm slightly improved after hyperparameter tuning, going from 0.9971429 to 0.9971631 at interaction depth 2 and 250 trees.

In conclusion, all of the implemented algorithms successfully classified the individuals in our dataset # into ASD patients and normal individuals based on the 20 independent features. These 20 features were subjected to PCA, and the first five principal components were chosen because they accounted for more than 95% of the variation in the dataset. These five principal components were then used as independent features by all machine learning algorithms, including ANN.

Including Plots

You can also embed plots, for example:

```
Final_plot <- plot(pressure)
```

```
Final_plot
```

```
## NULL
```

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.